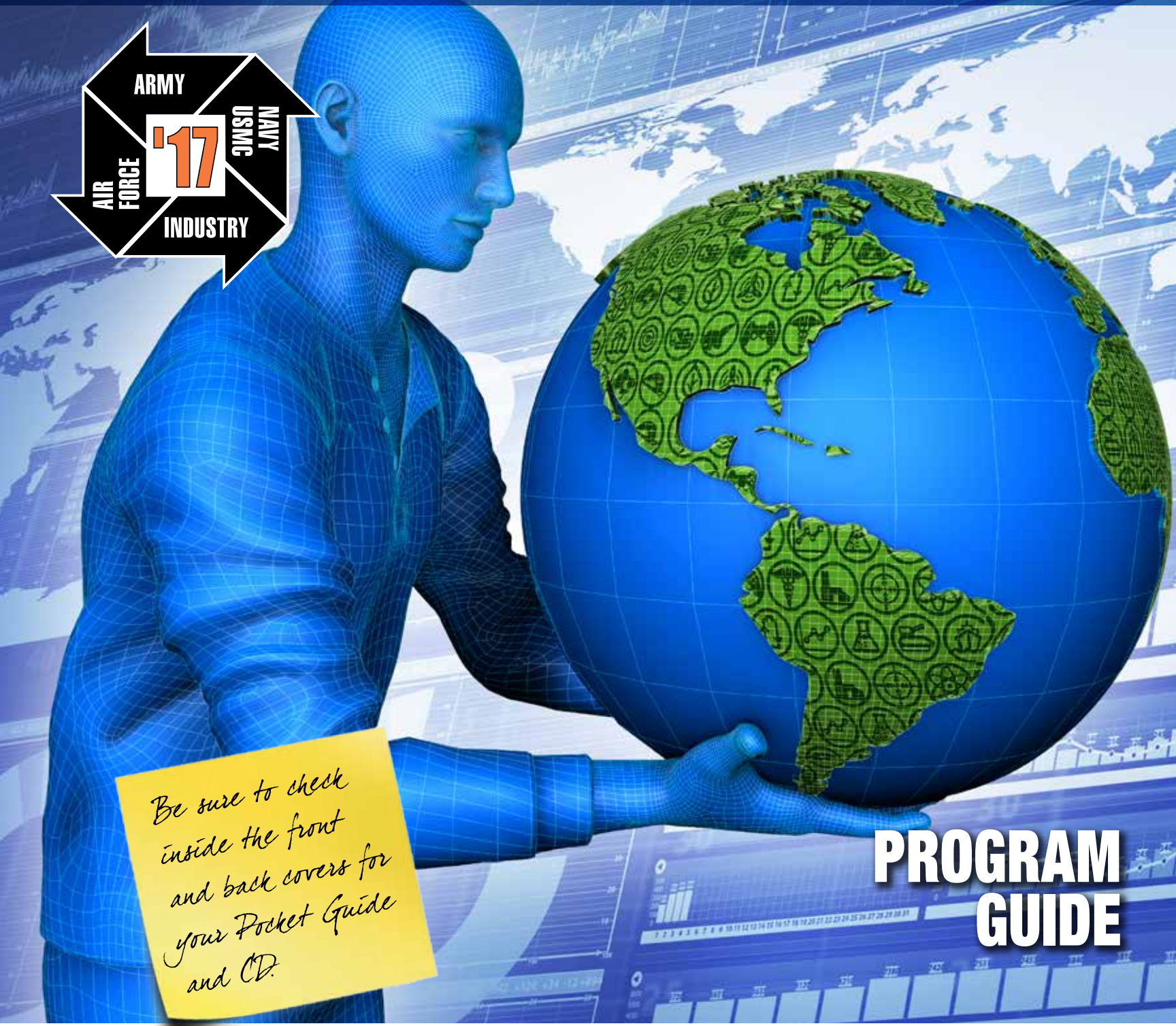
NTSA

NATIONAL TRAINING AND SIMULATION ASSOCIATION
THE WORLD'S LARGEST MODELING & SIMULATION EVENT

I/ITSEC | INTERSERVICE/INDUSTRY TRAINING, SIMULATION & EDUCATION CONFERENCE

HARNESSING NEW TECHNOLOGIES TO WIN IN A COMPLEX WORLD



PROGRAM GUIDE

WWW.IITSEC.ORG ▶ NOVEMBER 27 - DECEMBER 1, 2017 ▶ ORLANDO, FLORIDA

NDIA

TABLE OF CONTENTS

WELCOME & INTRODUCTIONS
Conference Welcome 2
Keynote Speakers 3
Conference Leadership 4
Interservice Executives 5
Principals & Advisor 6

AGENDA
Pre-Conference Agenda 7
Dress Code 7
Conference Agenda 8
Orange County Convention Center Diagram 12
Hyatt Regency Diagram 13

SPECIAL EVENTS
Signature Events 15
Focus Events 26
Communities of Interest 34
Program Briefs 36
Special Guests 37
International Programs 38

PROFESSIONAL DEVELOPMENT
Continuing Education Units/Continuous Learning Points 41
Tutorial Grid 42
Tutorial Synopses & Schedule 43
Paper Session Grid 54
Papers/Authors Presentation Schedule 58
Professional Development Workshops 66

STEM
STEM Workforce Initiative 69
Future Leaders • Students at I/ITSEC 70
America's Teachers at I/ITSEC • Educators (techPATH) 71
Serious Games Showcase & Challenge 72
STEM Pavilion: Project Based Learning 73
I/ITSEC Scholarships 74

EXHIBITS
Hall Happenings 75
2016 Exhibitors 79

COMMITTEES
Conference Committee • Council of Chairs 83
Program Subcommittees 84
Special Teams 86

CONFERENCE INFORMATION
Registration Information • Parking • Dress Code 89
Lodging 90
Getting Around 91
Publications & Media 92
Association Sponsors 93
Safety & Security 94
Golf Tournament 95
5K Run 96

I/ITSEC 2018
I/ITSEC 2018 Save the Date 97
Call for Papers and Tutorials 98
Serious Games Showcase & Challenge 99

ABSTRACTS 101

WELCOME ATTENDEES OF I/ITSEC 2017

On behalf of the United States Army, this year's Lead Service, our sponsoring organization, the National Training and Simulation Association, the Service Executives and their Principals, and the 200-plus volunteers from the Army, Navy, Marine Corps, Air Force, Coast Guard, Office of the Secretary of Defense, Veteran's Health Administration, Federal Law Enforcement Training Center, Industry, and Academia, it is my distinct honor and great pleasure to welcome you to the 2017 Interservice/Industry Training, Simulation and Education Conference!

After celebrating the 50th Anniversary of the conference in 2016, it is only fitting that the theme selected for this year's conference, "Harnessing New Technologies to Win in a Complex World," emphasizes the need to embrace "non-traditional" technologies for training military and civilian personnel on the complex tasks enabled by today's technological advances that are not practical, or possible, in the real world. Building on the Conference's military-focused legacy, I/ITSEC has grown into the largest cross-industry forum for modeling, simulation and training, drawing an increasing number of attendees from a broad range of industries including healthcare, energy, transportation and manufacturing – all of whom are in search of new innovations to change the way people learn and perform, to drive down costs, and win more business in an increasingly competitive business environment.

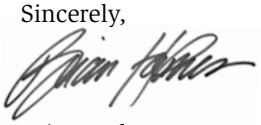
The volunteer "army" consisting of our six Subcommittees, the Tutorial Board, and the Conference Committee has spent this year finding the best technical papers (129), tutorials (21), educationally-focused special events (26), and a range of special programs including our third annual Operation Blended Warrior event that will highlight emerging Live, Virtual, Constructive (LVC) integration capabilities. This year's Black Swan panel is called "A Blast to the Past", where Military and academic experts will discuss the scenario of earth being hit by a solar geomagnetic storm generated by our sun during a Coronal Mass Ejection. The panel will describe modeling the widespread electrical outages from electro-magnetic pulse (EMP) effects as well as the broad technical and societal challenges in dealing with this type of solar event.

Other special programs include the Future Leaders Pavilion, Serious Games Showcase and Challenge, and workshops designed to complement the other aspects of this year's conference - I am certain you will find the 2017 Program to be rich, diverse, and chock full of new technologies just waiting to be harnessed! All Monday tutorials, Friday workshops, and paper sessions are available for Continuing Education Credits (CEUs) and Continuous Learning Credits (CLCs). Additional information regarding CEU registration is available on the www.iitsec.org website. Don't forget to come to the awards banquet on Thursday night, where our Best Paper and Scholarship winners will be announced!

Coming to I/ITSEC wouldn't be complete without a visit to the exhibit hall, which hosts the largest display of training systems capabilities in the world with over 400 exhibitors presenting leading-edge technology and innovative concepts. This year, we also welcome continued growth in the number of international attendees. With over 2000 attendees from over 70 countries expected, we have created even more opportunities for networking to promote dialogue and idea exchange with international partners.

Finally, I want to express my sincere thanks and appreciation to our dedicated volunteers and their sponsors. Their commitment and support have made I/ITSEC 2017 a reality and ensured this conference remains the premier professional development event across the globe for the training and simulation professional. As you attend the events and walk the exhibit floor over the next few days, please take a moment to thank the authors and other volunteers who have helped make this program a success.

Sincerely,



Brian Holmes, 2017 Program Chair

General David G. Perkins, USA
Commanding General
U.S. Army Training and Doctrine Command

Service Keynote

GENERAL DAVID G. PERKINS, USA, commands the U.S. Army Training and Doctrine Command. He is responsible for selecting and recruiting every U.S. Army Soldier, training and educating Army professionals, and designing the future U.S. Army.

His numerous senior leadership positions include Special Assistant to the Speaker of the House, 104th U.S. Congress; Battalion Commander during Operation Able Sentry; Brigade Commander for the invasion of Iraq; Executive Assistant to the Vice Chairman of the Joint Chiefs of Staff; and Division Commander during the transition of U.S. Forces from Iraq in 2010-2011.

General Perkins commanded the U.S. Army's premier education and leader development institution at Fort Leavenworth. In this role, he was responsible for managing training development and support, developing U.S. Army doctrine, and synchronizing leader development.

A native of New Hampshire, he graduated from the U.S. Military Academy, holds a Masters degree in Mechanical Engineering as well as a Masters degree in National Security and Strategic Studies.

Don Ariel
Co-Founder and Chief Executive Officer,
Raydon Corporation

Industry Keynote

DON ARIEL is Co-Founder and Chief Executive Officer of Raydon Corporation, a trailblazer in science-based virtual reality training used by soldiers in training locations globally. Over his long career, Mr. Ariel has been a staunch advocate for acquisition reforms that promote innovation and efficiency. By doing what is best for the soldier and taxpayer, Don consistently strives to disrupt the status quo and create thought-provoking, innovative solutions and resourcing for military training.

As a schooled engineer, Don possesses a rare blend and balance of deep technical understanding and an innovative business mindset. He was recruited straight out of college into the single largest and most boldly ambitious simulation program the U.S. Army had ever executed, the Conduct of Fire Trainer (COFT). Don's mission was to deploy, install, and maintain this complex infrastructure. His years at General Electric shaped his thinking about the purpose and value of simulation. Along with his partners, he built a market-aligned operation with an innovation pipeline. Mr. Ariel continues to shape discussions about how a holistic view of training infrastructures, combined with open standards and industry collaboration, impacts quality, cost and efficiency of military training for total force readiness.

Don's personal and professional interests center around understanding and improving human performance. His contagious enthusiasm and expertise on this subject is what fuels his passion as a tech visionary, futurist, thought leader, executive, trailblazer and entrepreneur. Mr. Ariel is passionate about helping to shape new standards, new breakthroughs, new frontiers and new ways to train humans – especially for those risking their lives for us.

Conference Chairs

Dave Hutchings
I/ITSEC 2017
Conference Chair

DAVID HUTCHINGS founded DDH and Associates, LLC in 2016 to provide strategic business development, business capture, proposal management, business operations, and mergers/acquisition consulting services to Government contractors and commercial businesses. He also joined the Coe & Naylor Group in 2016 as VP Business Development. From 2010-2015, Mr. Hutchings served as the SVP Strategic Business Development for Raydon Corporation. In this role, his primary responsibility was for the planning and execution of the strategic growth plan with primary focus on strategic pursuits, partnerships, and M&A. Mr. Hutchings has over 34 years of business development and operations management experience in DoD, commercial and other government agencies with a strong focus on custom training and simulation solutions. He has held senior level management positions in regional and national business development, operations, and sales for Raydon Corporation, Camber Corporation, Teledyne Brown Engineering, Interactive Media Corporation, APEX Technology, Simms Industries, and General Physics Corporations. Mr. Hutchings has served on the NDIA Central Florida Board of Directors since 2003. He has also served in numerous roles for I/ITSEC having served as the I/ITSEC 2015 Program Chair, the I/ITSEC STEM Student Tour Coordinator from 2009 - 2014 as well as other I/ITSEC subcommittees in prior years including the Training, Education, Best Paper and PSMA Subcommittees. He holds a B.S. degree in Business Management and Marketing. Mr. Hutchings also served six years in the U.S. Navy's Submarine Force.

Brian Holmes
I/ITSEC 2017
Program Chair

BRIAN HOLMES is the Vice President of Sales and Marketing at Nova Technologies, a small business that specializes in creating innovative solutions to ensure mission success for our nation's warfighters, and is the prime contractor on the U.S. Army's Call for Fire Trainer III (CFFT III), Special Operations Forces Training, Engineering and Maintenance Support II (SOFTEAMS II) and Special Operations Mission Planning and Environment (SOMPE) contracts. Prior to joining Nova, Brian's experience includes working with entire departments, teams, small groups, and individuals, at every level in an organization, from Boards of Directors and upper management to support staff. Brian has held positions as Project Engineer, Systems Engineer, Lead Engineer, Project/Program Manager, Capture Manager, Proposal Manager, Director of Operations and Vice President during his 29 years in the MS&T Industry. He currently serves as the Vice Chairman of the Board of Directors for the National Center for Simulation, and as a Board member for Fairways for Warriors and the Sunshine Chapter of the Association of the United States Army. Brian received his Masters of Science Degree in Industrial Engineering (with an emphasis on Simulation and Training) from the University of Central Florida in 1998, and an Executive Development Certificate in Business Excellence from Vanderbilt University in 2015. He has authored more than 10 papers for professional organizations and magazines, and has been a proud participant on I/ITSEC Subcommittees and Conference Committee for eight years.

Conference Sponsor

RADM James Robb, USN (Ret.)
President National Training and Simulation Association

Following graduation from Rensselaer Polytechnic Institute, designation as a Naval Aviator, and training in the F-14 Tomcat, Admiral Robb deployed nine times across the globe accumulating over 5,000 hours and 1,000 carrier landings. Following a tour flying Russian fighters in the Nevada desert, he commanded Fighter Squadron Fifty One, Carrier Air Wing Nine, the Navy Fighter Weapons School (TOPGUN), and Carrier Strike Group Seven. As a Flag Officer he managed all Naval Aviation Programs (N980) and was the Director of Navy Readiness (N43). Following 9/11, he joined USCENTCOM as the Director of Plans (J5) deploying to the Middle East in support of combat operations. Retiring in 2006, he built a successful small consulting business before joining the National Training and Simulation Association as President in June 2012.

General Herbert J. Carlisle, USAF (Ret.)
President and Chief Executive Officer
National Defense Industrial Association

Herbert J. "Hawk" Carlisle became president and chief executive officer of the National Defense Industrial Association (NDIA) June 15, 2017. Gen. Carlisle came to NDIA after a 39-year career in the Air Force, from which he retired as a four-star general in March 2017. His last assignment was as commander, Air Combat Command at Langley Air Force Base in Virginia. Before that, Gen. Carlisle was the commander of Pacific Air Forces; the air component commander for U.S. Pacific Command; and executive director of Pacific Air Combat Operations staff, Joint Base Pearl Harbor in Hawaii. Gen. Carlisle has served in various operational and staff assignments throughout the Air Force and commanded a fighter squadron, an operations group, two wings and a Numbered Air Force. He was a joint service officer and served as Chief of Air Operations, U.S. Central Command Forward in Riyadh, Saudi Arabia. During that time, he participated in Operation Restore Hope in Somalia.

BG William E. Cole, USA
U.S. Army Program Executive Officer for Simulation, Training and Instrumentation

CAPT Erik Etz, USN
Commanding Officer Naval Air Warfare Center Training Systems Division, and Naval Support Activity

Col Walt Yates, USMC
Program Manager, Marine Corps Systems Command PM Training Systems

Col Philip E. Carpenter, USAF
Chief, Simulators Program Office, Air Force Materiel Command

Gregory Knapp
Senior Systems Engineer & Program Manager/Acting OSD Executive

Army Service Executive (Lead Service)

BG WILLIAM E. COLE, USA, is the Program Executive Officer for Simulation, Training and Instrumentation (PEO STRI) which executes an annual multi-billion dollar program staffed by more than 1,200 military, government civilian, and service support contractors. Prior to this assignment, he served as the Deputy Program Executive Officer, Missiles and Space, Redstone Arsenal, AL. He was responsible for the development, production, fielding, and life cycle management of the Army's missile and space related systems. Previously he served simultaneously as both the Deputy Commanding General of the Research, Development and Engineering Command, Aberdeen Proving Ground, Maryland, and senior commander of the Natick Soldier Systems Center, Natick, Massachusetts. Among other distinguished assignments during his career, BG Cole served with the 319th Airborne Field Artillery Regiment in Kuwait during Operations Desert Shield and Storm, and later in Afghanistan as the Director of Forward Operations for the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology.

Navy Service Executive

CAPT ERIK "ROCK" ETZ commands the Naval Air Warfare Center Training Systems Division (NAWCTSD), the Navy's principal center for modeling, simulation, and training systems technologies. The command provides training solutions and research for a wide spectrum of military programs, including aviation, surface & undersea warfare, and other specialized requirements. CAPT Etz leads a workforce of more than 1,000 scientists, evaluators, engineers, technicians, logisticians, contracting specialists, and support personnel. CAPT Etz was commissioned through the Naval ROTC program in 1990 upon earning a Bachelor of Science degree in Electrical Engineering from Stanford University. As a Naval Aviator, CAPT Etz logged over 3,500 flight hours in over 35 types of aircraft, including over 2,950 F/A-18 hours and over 840 carrier landings on 14 different aircraft carriers. He has commanded an F/A-18 squadron and served in acquisition and flight test positions. CAPT Etz served as the Executive Officer of NAWCTSD for two years prior to assuming command in April 2016. His awards include the Bronze Star Medal, two Defense Meritorious Service Medals, two Meritorious Service Medals, three Air Medals (Strike/Flight), three Navy Commendation Medals, the Navy Achievement Medal, and various unit and service awards.

Marine Corps Service Executive

Col WALT YATES, USMC, is the Marine Corps Systems Command Program Manager, Training Systems (PM TRASYS). He is responsible for managing a workforce of over 150 personnel in the acquisition and sustainment of training systems used throughout the Marine Corps. Col Yates graduated from Texas A&M University in 1990 with a B.S. in Mechanical Engineering Technology. He graduated from the Naval Postgraduate School in 2004 with an M.S. in the field of Modeling, Virtual Environments and Simulation. As a Field Artillery officer, he served ashore and deployed afloat in billets including Forward Observer, Platoon Commander, Fire Direction Officer, and Battery Commander. Col Yates served as the officer in charge of the Battle Simulation Center for MAGTF Training Command from 2004 to 2007. From 2007 to 2011, he served on the Program Manager for Training Systems staff, including a year as the Marine Corps Systems Command Liaison Officer to the Command Element of Multinational Force-West, Iraq. In 2011, Col Yates returned to Marine Corps Systems Command as the Deputy for Modeling and Simulation. He completed his assignment as a Secretary of Defense Corporate Fellow at Norfolk Southern Corporation prior to reporting for duty as PM TRASYS.

Air Force Service Executive

Col PHILIP E. CARPENTER, USAF, is the Chief, Simulators Program Office. He leads a 430-member team, executes a $5.8B portfolio, and is responsible for developing and maintaining 50+ training systems for ACC, AMC, AETC, AFSOC, AFGSC, and multiple FMS partner nations. He enlisted in the Air Force in 1986, and served as an avionics technician on the SR-71, and a communications systems operator on EC-130 and EC-135 aircraft. He was commissioned in 1995 through Air Force Officer Training School, and has held a variety of program management positions in space, intelligence, command and control, cyber, and weapons. As a company grade officer, he served as a C-5 and KC-10 aircraft maintenance officer. He deployed in support of Operation Iraqi Freedom and was named the 60th Air Mobility Wing Maintenance Support Officer of the Year. Col Carpenter served as the Chief of Acquisition Officer Assignments at the Air Force Personnel Center and completed a joint tour with U.S. Forces, Japan. During this assignment, he served as an Operations Officer, Combat Ops and Exercises; Chief, Integrated Air and Missile Defense; and Executive Officer to the Commander. He also participated in Operation Tomodachi following the devastating 9.0 earthquake and tsunami. Col Carpenter was the Materiel Leader for AIM-120 development, and most recently, he was the Chief, F-16 Foreign Military Sales, where he managed a $23B portfolio to produce and modify over 750 aircraft for 10 nations. Col Carpenter holds an APDP Level III in Program Management and is a Level II Credentialed Space Professional.

Senior Advisor for Readiness and Training

GREGORY KNAPP supports the U.S. Army AMRDEC and the Office of the Deputy Assistant Secretary of Defense (Force Education and Training) performing program management, technology and acquisition functions in a wide-variety of training and technology areas. He recently served as the Vice Deputy Director for Future Joint Force Development, J7, Joint Staff, overseeing Operational Analysis, Chairman's Wargaming, Doctrine Development, Joint Concepts and Experimentation. He currently supports coalition training, industry engagement, simulation innovation, spectrum training management and cyber programs. Recent supported projects include development of the Defense Readiness Reporting System, SECDEF Nuclear Review, and joint development of: ballistic missile defense; cyber; command and control; cloud computing; Intelligence, Surveillance & Reconnaissance; logistics; automated systems; interagency cooperation; and space capability. He supported the development of the Joint Operational Access Concept, Capstone Concept for Joint Operations, dozens of studies including the Mali study and the Decade of War analysis. He managed over 50 projects affecting all Combatant Commands, Services, Interagency and Coalition partners.

Service Principals

Traci Jones
Army (Lead Service)
G5, Plans & Strategy
U.S. Army Program Executive Office, Simulation, Training and Instrumentation
(PEO STRI)

Diana Teel
Navy
Industry Outreach Program Manager
Naval Air Warfare Center Training Systems Division (NAWCTSD)

Martin Bushika
Marine Corps
Director, Program Integration
Marine Corps Systems Command (MARCORSYSCOM), Program Manager, Training Systems (PM TRASYS)

Tony DalSasso
Air Force
Chief Engineer
Simulators Program Office, Air Force Materiel Command (AFMC)

OSD Principal

Shep Barge, Ph.D.
Director
Joint Assessment Enabling Capability, Office of the Deputy Assistant Secretary of Defense for Force Education and Training

Education and Training Advisor

VADM Al Harms, USN (Ret.)

Agenda

ARMY
NAVY
USMC
AIR FORCE
INDUSTRY
'17

HARNESSING NEW TECHNOLOGIES
TO WIN IN A COMPLEX WORLD

WEDNESDAY, 22 NOVEMBER 2017

TIME		LOCATION
0730	Exhibitor Registration Open	South Concourse, S320CDE
1700	Exhibitor Registration Close	

THURSDAY, 23 NOVEMBER 2017
CLOSED FOR THANKSGIVING

FRIDAY, 24 NOVEMBER AND SATURDAY, 25 NOVEMBER 2017

TIME		LOCATION
0730	Exhibitor Registration Open	South Concourse, S320CDE
1800	Exhibitor Registration Close	

SUNDAY, 26 NOVEMBER 2017

TIME		LOCATION
0730	Exhibitor Registration Open	South Concourse, S320CDE
1200	Conference Registration Open	South Concourse, S320CDE
1200	Satellite Registration Open	Hyatt Regency/Convention Center Entrance
1800	All Registrations Close	

Dress Code

BRANCH	CONFERENCE AND GENERAL SESSIONS	BANQUET
Army	ACUs or Duty Uniform	Army Blue *(Army Evening Mess optional)*
Marine Corps	Service "C"	Evening Dress *(Dress Blue "B" or Service "A" optional)*
Navy	Service Khaki, Navy Service Uniform	Dinner Dress White *(Service Dress White optional)*
Air Force	Short or Long Service Blues	Service Dress Blue with tie and jacket *(Mess Dress optional)*
Coast Guard	Tropical Blue Long	Dinner Dress White *(Service Dress White optional)*
Civilian	Business attire	Black tie *(optional)* or international traditional costume

MONDAY, 27 NOVEMBER 2017

TIME		LOCATION
0730	**Conference and Exhibit Registration Open**	South Concourse, S320CDE
0730	**Satellite Registration Open**	Hyatt Regency/Convention Center Entrance
0830 - 1000	**TUTORIALS** (Synopses begin on page 43)	
	Introduction to HLA (1729)	Room S320A
	Planning and Execution of a LVC Multi-Architecture Distributed Event (1705)	Room S320B
	Cybersecurity Trends: Protecting LVC Networks, Training and Simulation Systems (1711)	Room S320C
	Effective Face Validation Methodology to Evaluate Simulation Fidelity for Training (1722)	Room S320D
	An Introduction to Cognitive Systems for Modeling & Simulation (1715)	Room S320E
	Introduction to DoD Modeling and Simulation (1718)	Room S320F
	Fundamentals of Modeling and Simulation (1710)	Room S320GH
	Team Training Environment Specification and Selection (1740)	Room S330G
1030 - 1200	**SIGNATURE EVENT 1:** Congressional Modeling and Simulation Event (page 15)	Room S330BCD
1245 - 1415	**TUTORIALS** (Synopses begin on page 47)	
	TENA/JMETC: Live-Virtual-Constructive Integration for Test and Training (1716)	Room S320A
	Distributed LVC Event Integration and Execution (1706)	Room S320B
	Trade Compliance in Uncertain Times—Simulation and Export Controls 2017 (1709)	Room S320C
	Addressing the Challenges of Rigorous Simulation Validation (1733)	Room S320D
	Spoken-dialogue Interaction for Serious Games and Virtual Training Simulators (1735)	Room S320E
	Enterprise Solutions for M&S Asset Discovery and Reuse (1720)	Room S320F
	M&S by Example: Understanding Modeling & Simulation Applications by Design (1704)	Room S320GH
	Discovery Experimentation: What, Why, How (1744)	Room S330G
1400	**Exhibits Open**	Exhibit Hall
1400 - 1530	**FOCUS EVENT 1:** Small Business Senior Executive Leadership Panel (page 26)	Room S329
1430 - 1600	**TUTORIALS** (Synopses begin on page 51)	
	Distributed Interactive Simulation (DIS) 101: The Basics (1731)	Room S320A
	Modern Network Architectures to support Distributed Simulation and LVC (1737)	Room S320B
	The Essential Guide to Cyberspace Training (1732)	Room S320C
	Demystifying xAPI and Learning Analytics (1728)	Room S320D
	Simulation Conceptual Modeling Theory and Use Cases (1703)	Room S320E
1430 - 1600	**SIGNATURE EVENT 2:** Operation Blended Warrior (OBW) (page 16) *Interoperability Data Management*	Booth 449
1800	**Exhibits Close**	
1800	**All Registration Stations Close**	

TUESDAY, 28 NOVEMBER 2017

TIME		LOCATION
0700	**Conference and Exhibit Registration Open**	South Concourse, S320CDE
0700	**Satellite Registration Open**	Hyatt Regency/Convention Center Entrance
0830 - 1000	**OPENING CEREMONIES**	Hyatt Regency/Regency Ballroom
	Call to Order **Presentation of Colors** **National Anthem** **Invocation** OPENING REMARKS **David Hutchings,** 2017 Conference Chair KEYNOTE ADDRESSES **General David G. Perkins, USA** Commanding General, U.S. Army Training and Doctrine Command **Don Ariel** Co-Founder and Chief Executive Officer, Raydon Corporation	
1030 - 1200	**SIGNATURE EVENT 3:** General/Flag Officer Panel (page 17)	Hyatt Regency/Regency Ballroom
1200	**Exhibits Open**	Exhibit Hall
1200 - 1330	**Lunch** (Opening of Exhibits and Lunch will occur at 1200 or upon adjournment of the General/Flag Officer Panel)	South Hall B
1400 - 1530	**PAPER SESSIONS** (Title/Author List begins on page 58. Session schedules for this timeframe are on page 54.)	Rooms S320ABCDEF
1400 - 1530	**SIGNATURE EVENT 4:** Cyber Operations in a Complex World (page 18)	Room S330BCD
1400 - 1530	**FOCUS EVENT 2:** Open Source Software: A Debate (page 27)	Room S320GH
1530 - 1700	**SIGNATURE EVENT 2:** Operation Blended Warrior (OBW) (page 16) *Live Asset Integration* and *Cyber*	Booth 449
1600 - 1730	**PAPER SESSIONS** (Title/Author List begins on page 58. Session schedules for this timeframe are on page 54.)	Rooms S320ABCDEF
1600 - 1730	**SIGNATURE EVENT 5:** Human-in-the-Loop Simulators for Test and Training (page 19)	Room S320GH
1600 - 1730	**FOCUS EVENT 3:** Augmented Reality/Virtual Reality (AR/VR) in Navy Training (page 28)	Room S330BCD
1600 - 1730	**COMMUNITY OF INTEREST 1:** Buying Innovation in Military Technology	Room S329
1600 - 1730	**PROGRAM BRIEF 1:** USAF Acquisition Update (page 36)	Room S330EF
1700 - 1830	**Exhibitor Networking Event**	Exhibit Hall
1800	**Senior Leaders Networking Hour and M&S Awards Dinner, by invitation from NTSA only**	Hyatt Regency
1800	**All Registration Stations Close**	
1830	**Exhibits Close**	

WEDNESDAY, 29 NOVEMBER 2017

TIME		LOCATION
0700	Conference and Exhibit Registration Open	South Concourse, S320CDE
0830 - 1000	**PAPER SESSIONS** (Title/Author List begins on page 58. Session schedules for this timeframe are on page 55.)	Rooms S320ABCDEF
0830 - 1000	**SIGNATURE EVENT 6:** Global General/Flag Officer Perspectives in Learning (page 20)	Room S330BCD
0830 - 1000	**FOCUS EVENT 4:** Cloud-Based Simulation: Hype or Reality? (page 29)	Room S320GH
0830 - 1000	**PROGRAM BRIEF 2:** U.S. Army PEO STRI TSIS Update (page 36) *0830 - 0900* PM ITTS *0900 - 0930* PM TRADE *0930 - 1000* JPMO MMS	Room S330EF
0930	Exhibits Open	Exhibit Hall
1000 - 1130	**SIGNATURE EVENT 2:** Operation Blended Warrior (OBW) (page 16) *Coalition Support Multi-Level Security*	Booth 449
1030 - 1200	**SIGNATURE EVENT 7:** Warfighter Decision Superiority (page 21)	Room S330BCD
1030 - 1200	**PAPER SESSIONS** (Title/Author List begins on page 58. Session schedules for this timeframe are on page 55.)	Rooms S320ABCDEF
1030 - 1200	**FOCUS EVENT 5:** Ignite I/ITSEC (page 30)	Room S320GH
1200 - 1330	Lunch	South Hall B
1400 - 1530	**PAPER SESSIONS** (Title/Author List begins on page 58. Session schedules for this timeframe are on page 56.)	Rooms S320ABCDEF
1400 - 1530	**SIGNATURE EVENT 8:** International Collaboration 2017 (page 22)	Room S330BCD
1400 - 1530	**SIGNATURE EVENT 9:** I/ITSEC Fellows (page 23)	Room S320GH
1400 - 1530	**FOCUS EVENT 6:** Army Synthetic Environment: Standard, Sharable, Geospatial Framework for the Army M&S Enterprise (page 31)	Room S330EF
1500 - 1630	**SIGNATURE EVENT 2:** Operation Blended Warrior (OBW) (page 16) *Dense Urban Areas* and *Performance Measurement*	Booth 449
1600 - 1730	**PAPER SESSIONS** (Title/Author List begins on page 58. Session schedules for this timeframe are on page 56.)	Rooms S320ABCDEF
1600 - 1730	The Future is Now: Future Leaders Pavilion presentations	Room S320D
1600 - 1730	**SIGNATURE EVENT 10:** Narratives in Information Warfare (page 24)	Room S320GH
1600 - 1730	**SIGNATURE EVENT 11:** Black Swan-A Blast to the Past (page 25)	Room S330BCD
1600 - 1730	**COMMUNITY OF INTEREST 2:** GeoSpatial Standards (page 34)	Room S329
1600 - 1730	**PROGRAM BRIEF 2:** U.S. Army PEO STRI TSIS Update (page 36) *1600 - 1625* PM ITE *1625 - 1650* IPO *1650 - 1715* Project Lead Field Operations *1715 - 1730* Army Contracting Command-Orlando	Room S330EF
1630 - 1730	**SPECIAL SESSION:** International Future Authors Session	Room S310C
1800	All Registration Stations Close	
1800	Exhibits Close	

THURSDAY, 30 NOVEMBER 2017

TIME		LOCATION
0700	Conference and Exhibit Registration Open	South Concourse, S320CDE
0830 - 1000	**PAPER SESSIONS** (Title/Author List begins on page 58. Session schedules for this timeframe are on page 57.)	Rooms S320ABCDEF
0830 - 1000	**FOCUS EVENT 7:** Agents from the Future (page 32)	Room S320GH
0830 - 1000	**COMMUNITY OF INTEREST 3:** Research Challenges in M&S in the Era of Big Data and the Internet of Things (page 35)	Room S329
0830 - 1000	**PROGRAM BRIEF 3:** Navy Vision from the Training System's Program Managers (page 36)	Room S330EF
0930	Exhibits Open	Exhibit Hall
1000 - 1130	**SIGNATURE EVENT 2:** Operation Blended Warrior (OBW) (page 16) *Gaming Solutions* and *Interoperability*	Booth 449
1030 - 1200	**PAPER SESSIONS** (Title/Author List begins on page 58. Session schedules for this timeframe are on page 57.)	Rooms S320ABCDEF
1030 - 1500	**FOCUS EVENT 8:** Big Data & M&S (page 33)	Room S320GH
1200 - 1330	Lunch	South Hall B
1330 - 1500	**PAPER SESSIONS** (Title/Author List begins on page 58. Session schedules for this timeframe are on page 57.)	Rooms S320ABCDEF
1500	Exhibit Hall and Registration Close	Exhibit Hall
1800	Hosted Reception sponsored by Lockheed Martin	Hyatt Regency Regency Ballroom Foyer
1900	Conference Awards Banquet *Reception & Awards* Dinner Music provided by Bob Dehne on the Vibraphones Best Paper Award Presentation RADM Fred Lewis Postgraduate I/ITSEC Scholarship After Dinner Entertainment Passing of the Flag for I/ITSEC 2018 Dance Music provided by Captain Harry and the Surfriders	Hyatt Regency Regency Ballroom

FRIDAY, 1 DECEMBER 2017

TIME	PROFESSIONAL DEVELOPMENT WORKSHOPS (Synopses on pages 66 - 67)	LOCATION
0800 - 1200	**PDW1:** Modeling & Simulation for Acquisition	Room S330H
0800 - 1200	**PDW2:** Live-Virtual-Constructive (LVC) Interoperability Techniques	Room S330G
0800 - 1200	**PDW3:** Managing Innovations in Simulation: Incorporating Mobile, 3D, Gaming, Augmented Reality, AI and More Into Your Programs	Room S331D
0800 - 1200	**PDW4:** Certified Modeling & Simulation Professional (CMSP)	Room S331C
0800 - 1200	**PDW5:** Big Data: Harnessing the Power of Data Analytics to Optimize Training	Room S331B
0800 - 1200	**PDW6:** Export Controls on the Technology and Software Transfers	Room S330F
0800 - 1200	**PDW7A:** Measuring the ROI of Training, Simulation, and Education Programs	Room S331A
1300 - 1700	**PDW7B:** Measuring the ROI of Training, Simulation, and Education Programs	Room S331A
0800 - 1700	**PDW8:** Serious Game Development Workshop	Room S330E

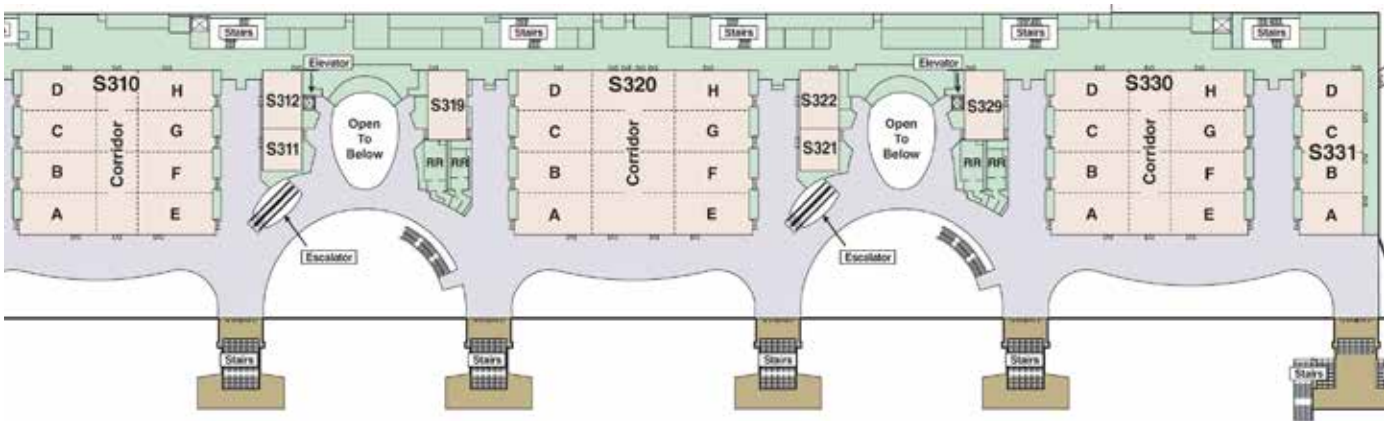
South Concourse

Although the buildings are large, a five minute walk will take you...

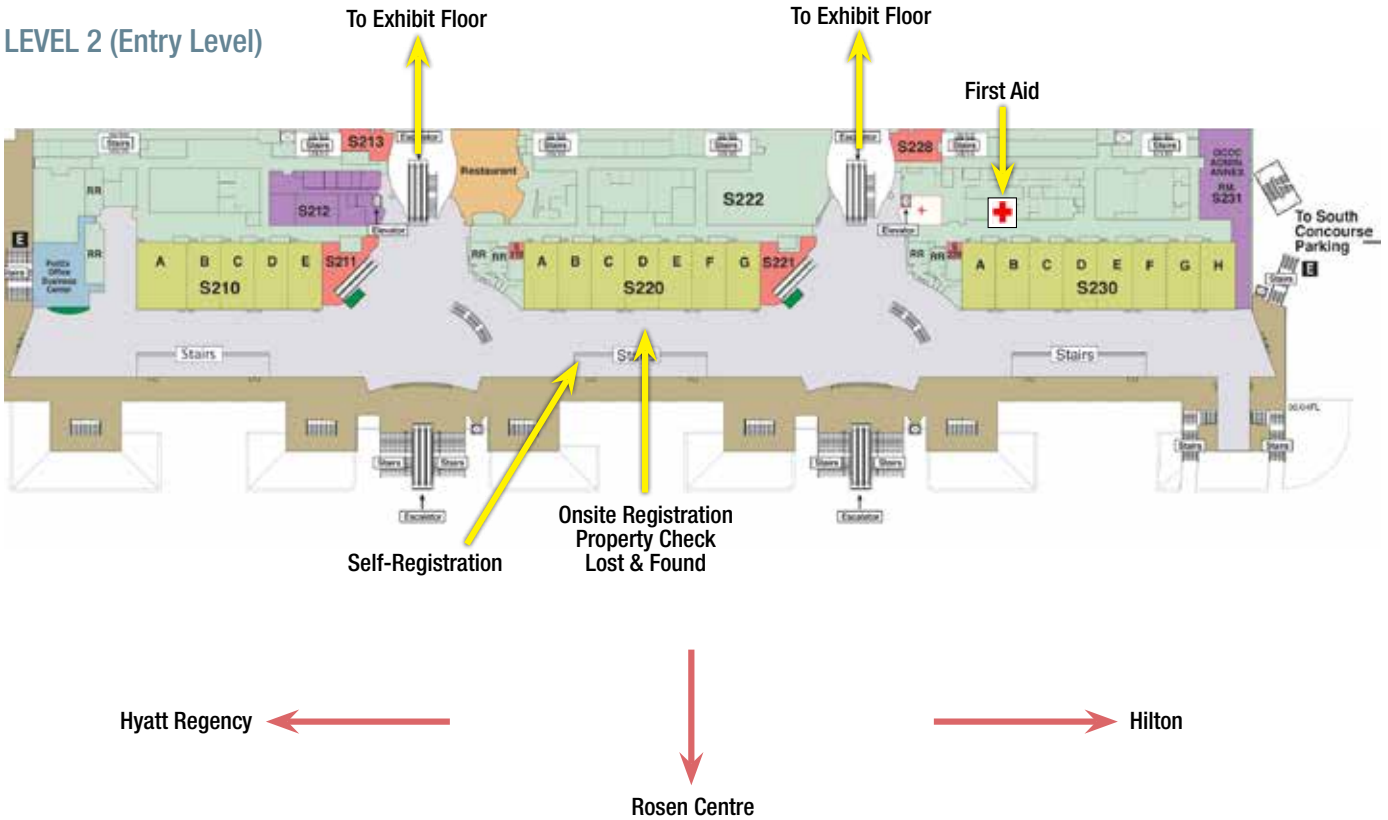
- from the South Concourse to the North Concourse
- from the South Concourse to the Hilton
- from the South Concourse to the Hyatt Regency, formerly Peabody Orlando
- from the South Concourse to the Rosen Center

(In comparison, a walk from Hall A to Hall F in the West Concourse takes about ten minutes.)

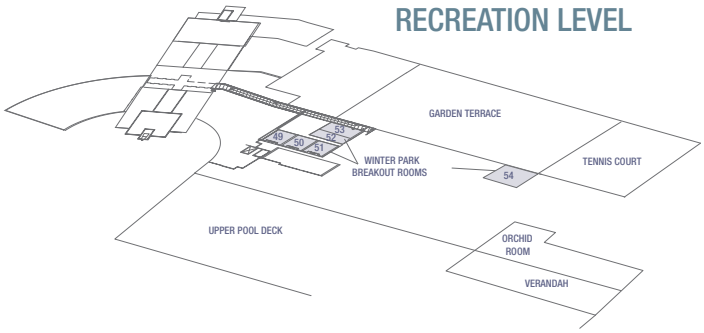
LEVEL 3 (Presentations/Events/Practice Rooms)



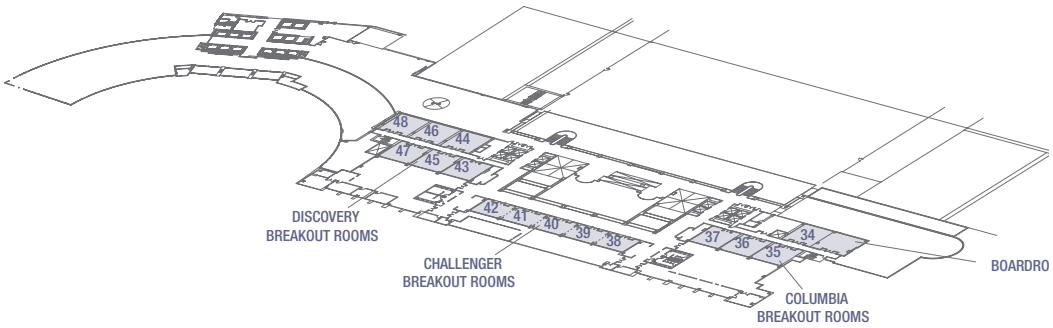
LEVEL 2 (Entry Level)



RECREATION LEVEL

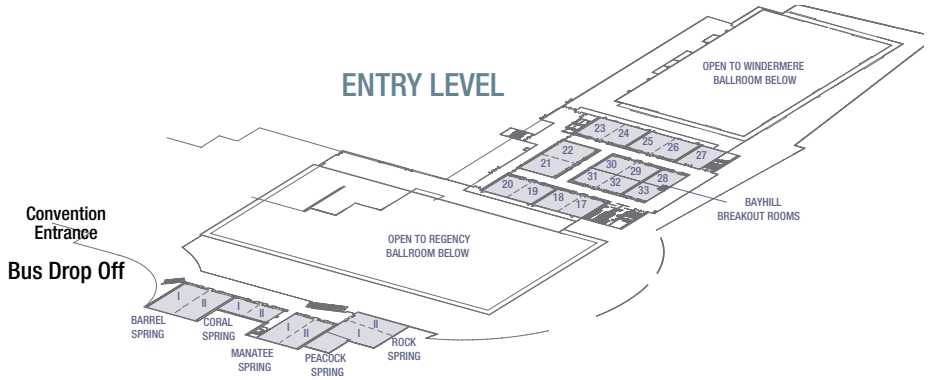


MEZZANINE LEVEL

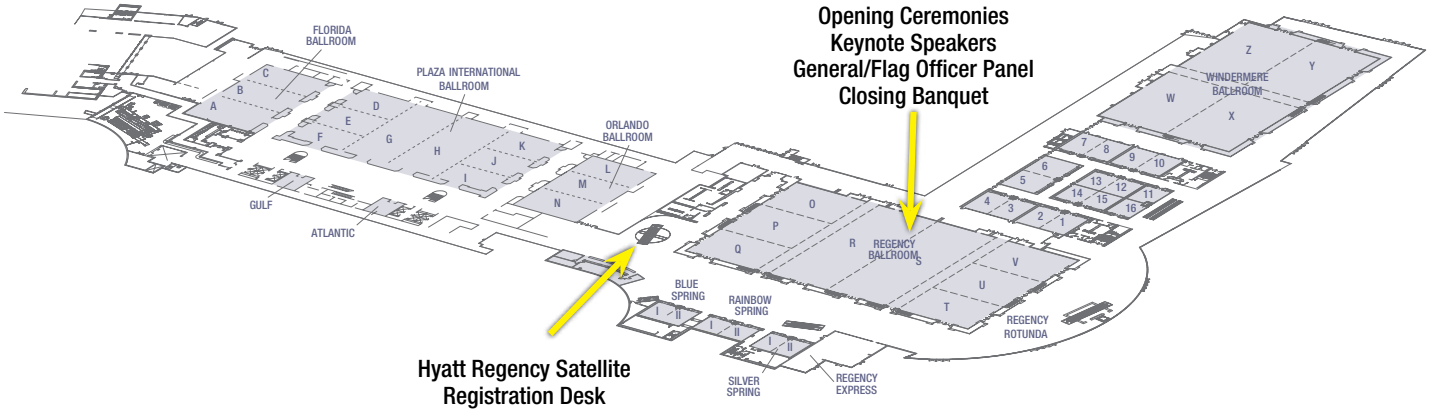


B-Line Diner

ENTRY LEVEL



CONVENTION LEVEL



NOTES

Special Events

ARMY
NAVY
USMC
AIR FORCE
INDUSTRY
'17

HARNESSING NEW TECHNOLOGIES
TO WIN IN A COMPLEX WORLD

Congressional Modeling and Simulation Event

SELECT MEMBERS OF CONGRESS WILL PARTICIPATE IN THIS I/ITSEC EVENT

MONDAY, 27 NOVEMBER
1030 – 1200 • ROOM S330BCD
SE1

This special event invites everyone attending the conference or exposition to hear from the training and simulation leaders in congress. It is also a great opportunity for you to interact with Congressional Members on issues of importance to you or your company and to impress upon them your priorities. With defense budgets constantly in flux, this forum provides you an opportunity to advocate for the value of training and simulation in support of national security. Attendees will hear from the new leadership of the Congressional Caucus on their perspective of the situation in Washington and have the opportunity to make their case for timely investments in Modeling and Simulation. With every budget dollar being scrutinized, strong advocacy for training and readiness has never been more important. This event is always standing room only, so get there early.

The following members of Congress have been invited to address the M&S Community at I/ITSEC:

Bobby Scott*
Caucus Chair
Virginia 3rd District

Stephanie Murphy*
Caucus Co-Chair
Florida 7th District

John Rutherford*
Caucus Co-Chair
Florida 4th District

Scott Taylor*
Caucus Co-Chair
Virginia 2nd District

Robert Aderholt*
Alabama 4th District

Gus Bilirakis*
Florida 12th District

Diane Black*
Tennessee 6th District

Jim Bridenstine*
Oklahoma 1st District

Mo Brooks*
Alabama 5th District

Vern Buchanan*
Florida 16th District

Ken Calvert*
California 42nd District

John Carter*
Texas 31st District

Steve Cohen*
Tennessee 9th District

Mike Conaway*
Texas 11th District

John Cornyn
Texas

Ted Cruz
Texas

Susan Davis*
California 53rd District

Blake Farenthold
Texas, 7th District

Dianne Feinstein
California

Virginia Foxx*
North Carolina 5th District

Duncan Hunter
California 50th District

Tim Kaine
Virginia

Doug Lamborn*
Colorado 5th District

Ed Markey
Massachusetts

Bill Nelson
Florida

Scott Peters*
California 52nd District

Bill Posey*
Florida 8th District

Tom Rooney*
Florida 17th District

Marco Rubio
Florida

C.A. Dutch Ruppersberger*
Maryland 2nd District

Richard Shelby
Alabama

Niki Tsongas*
Massachusetts 3rd District

Tim Walz*
Minnesota 1st District

Mark Warner
Virginia

Elizabeth Warren
Massachusetts

Joe Wilson*
South Carolina 2nd District

Robert Wittman*
Virginia 1st District

**denotes members of the Congressional M&S Caucus*

Congressman Scott addresses the audience and visits the exhibit floor during I/ITSEC 2016.

SIGNATURE EVENT

SIGNATURE EVENT

Operation Blended Warrior

LEARN HOW AND WHY LVC TODAY IS NOT AS EASY AS "PLUG AND PLAY"

MONDAY, 27 NOVEMBER
1430 – 1600
Interoperability Data Management
TUESDAY, 28 NOVEMBER
1530 – 1700
Live Asset Integration
Cyber
WEDNESDAY, 29 NOVEMBER
1000 – 1130
Coalition Support Multi-Level Security
WEDNESDAY, 29 NOVEMBER
1500 – 1630
Dense Urban Areas
Performance Measurement
THURSDAY, 30 NOVEMBER
1000 – 1130
Gaming Solutions
Interoperability

BOOTH 449 AND OTHER FLOOR LOCATIONS

SE2

PERFORMANCE MEASUREMENT, DENSE URBAN AREAS, CENTRALIZED DISTRIBUTION

Blended Operation Warrior I/ITSEC

Readiness Through LVC

MULTI-LEVEL SECURITY, COMMERCIAL GAMING SOLUTIONS, LIVE ASSET INTEGRATION

LVC IS VITAL TO MISSION SUCCESS!

2017 marks the third year for the Special Event, Operation Blended Warrior (OBW). This year, we will create a unique Live-Virtual-Constructive (LVC) environment in order to showcase issues, challenges and solutions associated with implementing LVC capabilities into our training systems. LVC is a critical requirement for our Warfighters to meet operational requirements.

We have over 40 industry and government participants working together across a variety of operational mission sets in the following domains: air, cyber, ground, and maritime. The efforts from this year's event are critical to defining the standards and requirements for future development of LVC initiatives.

During each OBW time slot, you'll see industry showcase some of the latest LVC capabilities across a wide range of operational missions from Booth 449 (a Command Center perspective) – or visit industry members in their booths to talk to them and see the capability from the operator's perspective.

WHY OPERATION BLENDED WARRIOR?

Over the years there has been a lot of progress in the individual disciplines (Live, Virtual Constructive), but there hasn't been a lot of progress in the rapid integration of all three. Operation Blended Warrior aims to address this through a four year special event, each year adding scope and complexity while identifying big challenges and driving down planning time and costs.

Check your Meeting Bags or stop by Booth 449 for a full listing of the participants and the programs to be demonstrated.

General/Flag Officer Panel

TUESDAY, 28 NOVEMBER
1030 – 1200
HYATT REGENCY
REGENCY BALLROOM
SE3

Moderator

Rear Admiral James A. Robb, USN (Ret.)
President, National Training and Simulation Association

Panelists

General Denis Mercier, French Air Force
Supreme Allied Commander Transformation, North Atlantic Treaty Organization

Fred Drummond, SES
Deputy Assistant Secretary of Defense (Force Education and Training)

Vice Admiral Paul A. Grosklags, USN
Commander, Naval Air Systems Command

Lieutenant General Michael D. Lundy, USA
Commanding General, U.S. Army Combined Arms Center and Fort Leavenworth, KS

Major General Scott F. Smith, USAF
Director of Training and Readiness, Deputy Chief of Staff for Operations

Major General Kevin liams, USMC
Commanding General, Training and Education Command (TECOM)

RADM Robb, USN (Ret.)

Gen Mercier, French Air Force

Mr. Drummond, SES

VADM Grosklags

LTG Lundy, USA

Maj Gen Smith, USAF

MajGen liams, USMC

Global forces continue to be challenged by erratic budgets and expanding threats. Services continue to engage a wide range of threats that span from disaster assistance to nation state aggression and on to rogue nation antagonism. Nations continue to deal with the effects of mass migration from the Middle East and cyber-attacks on all of our systems. Our Senior Officer panel will be asked to address current and future environments while they discuss this year's conference theme - "Harnessing New Technology To Win in a Complex World". This year's panel will include senior representatives from all the U.S. Military Services and NATO. Following opening remarks, the audience will be able to interact with the panel through written questions. Don't miss the opportunity to hear from national leaders on the way ahead.

SIGNATURE EVENT

Cyber Operations in a Complex World

EMBRACING THE CYBER FRONTIER

TUESDAY, 28 NOVEMBER
1400 – 1530 • S330BCD
SE4

Moderator

Colonel Richard Haggerty, USA
U.S. Army PEO STRI, PM ITTS

Panelists

James McStravic, SES
Performing the Duties of Under Secretary of Defense Acquisition, Technology & Logistics

Major General Patricia Frost, USA
Director of Cyber, Office of the Deputy Chief of Staff, G-3/5/7, U.S. Army Cyber Command

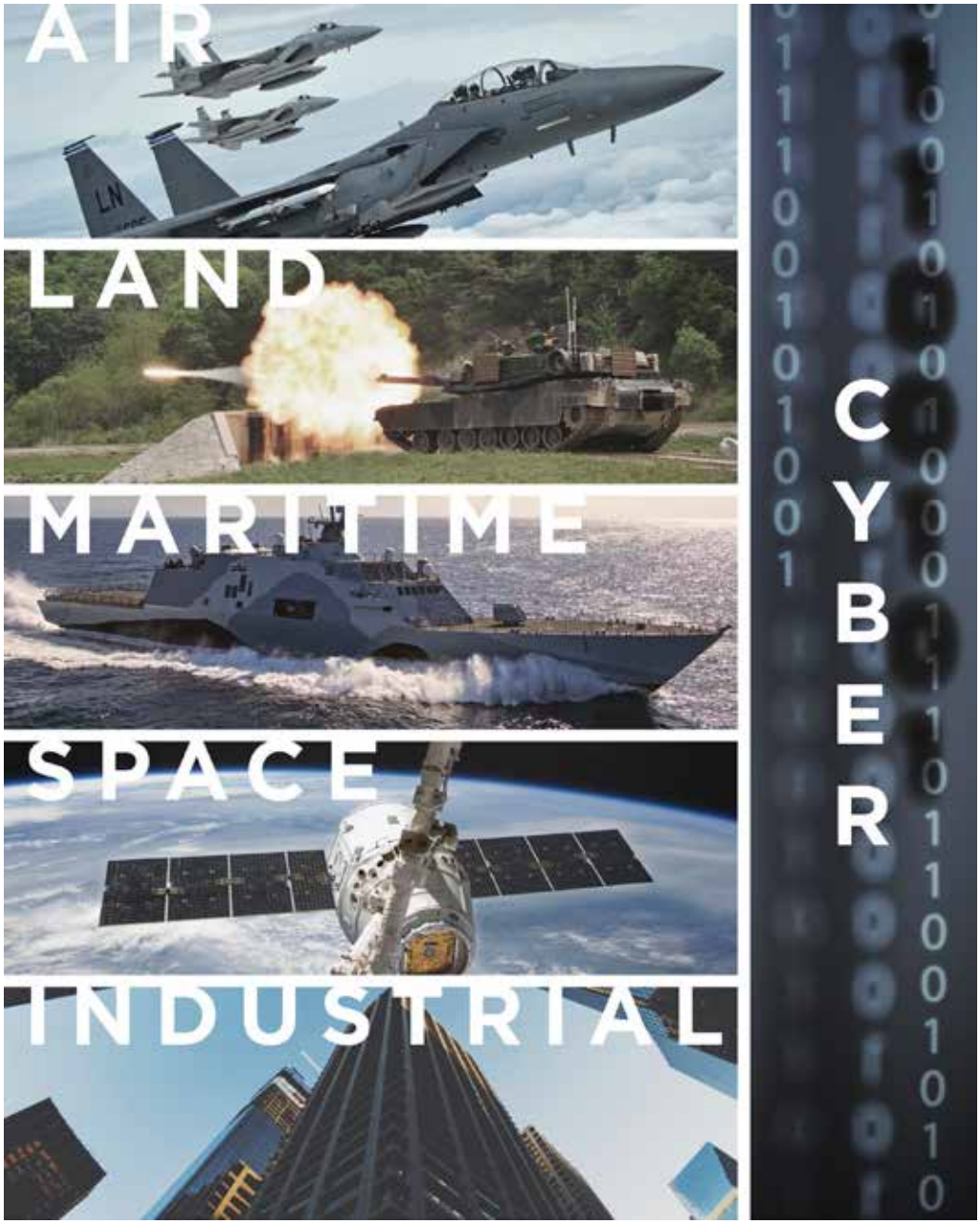
Ronald Pontius, SES
Deputy Commanding General, U.S. Army Cyber Command

Rear Admiral Dave Dermanelian, USN
Director of Training and Exercises (J7), U.S. Cyber Command

Derrick Hinton
Acting Director, Test Resources Management Center

Mike Macedonia, Ph.D.
Assistant Vice President for Research and Innovation, University of Central Florida

Session Chair:
Lisa Jean Bair, SAIC



Cyber epitomizes this year's I/ITSEC theme — *Harnessing New Technologies to Win in a Complex World*. From Russia's synchronization of cyber operations to kinetic warfare in Estonia and the Ukraine, to North Korea's hacks of the Sony corporation and private emails to influence U.S. economic activities, to alleged Russian influence in the 2016 Presidential election, cyber plays a major role across the various domains (Air, Land, Maritime, Space and Industrial). Cyber is complimentary to the elements of national power (diplomacy, information, military, and economic) and its influence is magnified as the population becomes increasingly more connected. In their May 2017 Wi-Fi Risk Report, Norton by Symantec estimates that more than half of consumers globally (55%) wouldn't think twice about exchanging, sharing or even doing something risky to get a strong Wi-Fi signal.

The Cyber Operations in a Complex World executive panel brings together key leaders from Industry, Congress, Academia, and the Department of Defense to discuss the tough issues associated with cyber, including policy, training, talent management, and education.

Human-in-the-Loop Simulators for Test and Training

MODELING AND SIMULATION FOR TESTING AND TRAINING — COMMON TOOLS FOR COMMON GOALS

TUESDAY, 28 NOVEMBER
1600 – 1730 • S320GH
SE5

Moderator

Kristen Alexander, Ph.D.
Technical Advisor, Land and Expeditionary Warfare Director, Operational Test and Evaluation

Panelists

Lieutenant General Michael Lundy, USA
Commanding General, U.S. Army Combined Arms Center and Fort Leavenworth, KS

Major General Matthew Molloy, USAF
Commander, Air Force Operational Test and Evaluation Command (AFOTEC)

Rear Admiral Paul Sohl, USN
Commander, Operational Test and Evaluation Force (COTF)

Steve Griffin
Senior Manager Defense Support Services, The Boeing Company

All DoD weapon systems must be tested, many using modeling and simulation suites. To accurately represent the operational capability of weapon systems, the effects of human operators (human-in-the-loop simulation) must be accounted for. Historically, the training community has developed its own modeling and simulation tools to support training objectives. This panel will discuss the need for such modeling and simulation suites for testing and training and looks to explore ways in which existing human-in-the-loop training systems might be leveraged for use in operational testing and provide a high-fidelity leave-behind for the training community.

During this event, the Commanders of the Services' Operational Test Agencies will present their perspectives on the challenges and requirements for the use of human-in-the-loop simulations during operational testing. The Commanding General of the Army Combined Arms Center will provide a perspective on the need for simulation to support training. Industry test leadership will present challenges producing simulators that are adequate for both testing and training.

Session Chair:
Robbie Robson, Eduworks

SIGNATURE EVENT

SIGNATURE EVENT

Global GO/FO Perspectives in Learning

MANY PERSPECTIVES, ONE MESSAGE: LEARNING QUALITY FOR TRAINING AND EDUCATION TECHNOLOGIES

WEDNESDAY, 29 NOVEMBER
0830 – 1000 • S330BCD
SE6

Moderator

Sae Schatz, Ph.D.
Director, Advanced Distributed Learning Initiative, Office of the Deputy Assistant Secretary of Defense for Force Education and Training

Panelists

Major General Anders Callert
Assistant Chief of Armed Forces Training and Development, Chief of Training, Sweden

Major General Thomas Deale, USAF
Vice Director for Joint Force Development, Joint Staff, United States

Rear Admiral Timo Junttila
Deputy Chief of Staff, Personnel, Finland

Air Vice-Marshal C J Luck
The Commandant, Joint Services Command and Staff College, Defence Academy of the United Kingdom

Major General Stefano Salamida
Deputy Chief of Staff Joint Force Trainer, NATO

Brigadier General Virginia Tattersall
Deputy Commander, Military Personnel Generation, Canadian Armed Forces

Major General Mladen Vuruna
Rector, University of Defense, Serbia

MG Callert
Sweden

Maj Gen Deale
United States

RADM Junttila
Finland

AVM Luck
United Kingdom

MG Salamida
Italy

BGen Tattersall
Canada

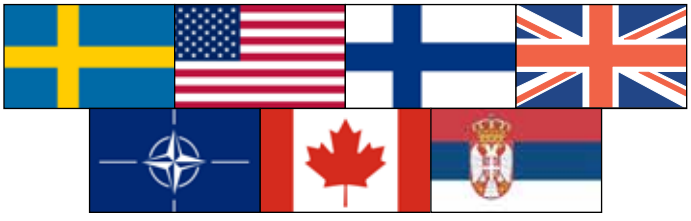
BG Vuruna
Serbia

Training and education technologies have amazing promise; however, without the guiding blueprint of learning science, technological solutions can become costly, cumbersome, and ineffectual. At worst, technologies may be seen as "silver bullets" or magical solutions, capable of solving training or education challenges by simply purchasing the latest systems (a road that leads to disillusionment, waste, and potentially expensive failure).

Modeling, simulation, training, and education professionals know better. Subject matter experts realize that effective learning technologies can only realize their promise when implemented smartly—with well-designed instructional content, intentional performance assessment, and thoughtful learning strategies. This panel brings together senior personnel from across the Coalition military enterprise to convey this important, shared message. That is:

> Learning *technologies*, alone, will not solve our training and education challenges. Only when consistently paired with learning *science* will we realize the benefits of these advanced systems.

This special event will include a moderated panel discussion, beginning with short individual statements from the General and Flag Officer participants. The speakers will each discuss an aspect of their shared message, from their own perspectives. Following this, the audience will be invited to offer questions.



Session Chair:
Benjamin Bell, Ph.D., Eduworks

Warfighter Decision Superiority

SUPERIOR HUMAN PERFORMANCE THROUGH HIGH VELOCITY LEARNING

WEDNESDAY, 29 NOVEMBER
1030 – 1200 • ROOM S330BCD
SE7

Keynote

Admiral Bill Moran
Vice Chief of Naval Operations

Panelists

Vice Admiral Paul A. Grosklags
Commander, Naval Air Systems Command

Rear Admiral Kyle Cozad
Commander, Naval Education and Training Command

Rear Admiral John P. Neagley
Program Executive Officer, Littoral Combat Ships
(Invited)

Rear Admiral Daniel L. Cheever
Commander, Naval Aviation Warfighting Development Center

ADM Moran, USN

VADM Grosklags, USN

RADM Cozad, USN

RADM Neagley, USN

RADM Cheever, USN

Technological innovation continues to be an important defense advantage for the United States Navy. In this special event, Navy leaders will discuss the critical importance of having the best-prepared fighting force in the world. This year's I/ITSEC theme, "Harnessing New Technologies to Win in a Complex World" highlights how the Navy applies the latest learning innovations to hone the human performance of our warfighters to further our asymmetrical advantage against rapidly evolving potential adversaries.

The United States Navy is a force that is forward, engaged and ready. In the face of any potential opponent, it is the readiness of our personnel – their ability to make sound decisions under pressure – that will provide our greatest warfighting advantage. Because highly-skilled warfighters are able to make superior decisions and perform their missions better, training sits at the very core of naval readiness. Simply put, training is one of the most effective tools available to guarantee that our Sailors remain America's greatest asymmetrical advantage. To that end, the Chief of Naval Operations, Adm. John M. Richardson called for the fleet to achieve "high velocity learning" at every level. High velocity learning methods enable Sailors to quickly learn the skills they need, when they need them, and without the inefficiencies of traditional learning methods.

The United States maritime strategy calls for the sea services to "create a true learning competency that unites our acquisition, requirements, and programming efforts to deliver the latest in technology and design, resulting in realistic simulation and live, virtual, and constructive scenarios before our people deploy…" It is understood that high-quality training is an investment in improving the human performance of our warfighters, but in developing training we also have the responsibility to make affordability a priority throughout the training system cycle of research, development, acquisition and sustainment. To remain flexible, agile and ready, our Navy seeks out and employs innovative training methods to train Sailors more efficiently and to ever-higher levels of proficiency.

At the same time, the Navy taking efforts to prevent inefficiencies both in the training pipeline and in the training acquisition process. For the Navy a key measure in deciding whether to invest in a new training technology is to ask whether it will make the force more lethal. The Navy does not have the luxury of investing in anything that does not make the force stronger. As the Chief of Naval Operations said to senior Navy leaders, "If it's not making our Navy and Marine Corps more lethal… stop doing it." Efforts like "Sailor 2025," which will educate Sailors more efficiently than ever before, ensure that the Navy is making meaningful strides toward modernizing training efforts while creating a more lethal force.

The sea services of the United States are critical to defending the nation's security around the globe. The Sailors who serve today are a well-trained force, critical to the Navy's ability to meet its mission. This panel of senior Navy leaders will provide insight from acquisition, research and technology and mission readiness perspectives into how effective and relevant training optimizes the human performance of U.S. Navy Sailors so that they can be counted upon to make superior decisions in the face of pressure. Sailors with superior training are an essential component of maintaining maritime superiority, now and in the future.

Session Chair:
Sherry Steward, NAWCTSD

SIGNATURE EVENT

SIGNATURE EVENT

International Collaboration 2017

IDENTIFYING ISSUES AND EXPLORING SOLUTIONS

WEDNESDAY, 29 NOVEMBER
1400 – 1530 • ROOM S330BCD
SE8

Moderator

Al Shaffer
Director, Collaboration Support Office, NATO Science and Technology

Panelists

Brigadier General James Daniel
Head, Soldier, Training & Special Programmes (STSP), United Kingdom MOD

Brigadier General Gyungwon Jung
Director, Center for Army Analysis and Simulation, Republic of Korea

Forrest Crain, Ph.D.
Director, Center for Army Analysis and Director, Army Modeling and Simulation Office, U.S. Army

Commodore Allison Norris,
Director General, Australian Defence Simulation and Training Centre

BG Daniel
United Kingdom

BG Jung
Republic of Korea

Dr. Crain
United States

Cmdr Norris
Australia

There are enduring issues that many nations continue to face when working internationally. While these interoperability and integration issues are being resolved in the host countries, we have yet to realize a comprehensive international solution to achieving collaboration on M&S tools and technologies, for either government or industry. One notable example relevant to modeling and simulation is the limitation caused by a lack of a solution to multi-level security across partner nations, which presents challenges in terms of sharing data, applications, algorithms, and standards. What are some of the other collaboration issues facing our international partners?

The Panel will be comprised of senior International participants who will:
1) Tee up their top barrier to better collaborate in modeling and simulation, and
2) Offer an approach (including any possible non-proprietary capability that can be shared) to address the same or another issue.

The ensuing discussion will seek questions and ideas from the audience to both better define and mitigate the challenges.

Interest by current Industry and Government partners can focus on real world operational and training issues within and outside of the M&S community. The resulting benefit of fostering collaboration among partner nations can lead to continuing discussion at other NDIA and NTSA events.

Session Chair:
Craig Langhauser, Rockwell Collins

I/ITSEC Fellows

WEDNESDAY, 29 NOVEMBER
1400 – 1530 • ROOM S320GH
SE9

I/ITSEC 2017 Fellow
Henry C. "Hank" Okraski

Henry C. "Hank" Okraski served 32 years as a government engineer/manager/executive. As a Senior Executive, he was the Director of Research and Engineering, Deputy Technical Director and Chief Scientist at the Naval Air Warfare Center Training Systems Division. He is a founding member of the National Center for Simulation (NCS) and was inducted into the NCS M&S Hall of Fame in 2014. He developed and implemented a high school curriculum and the nation's first certification in Modeling and Simulation (M&S) for high school and technical school students. He was selected Federal Engineer of the Year by the National Society of Professional Engineers. Mr. Okraski has a bachelors degree in electrical engineering from Clarkson University and a masters degree in systems engineering from the University of Florida, and is the author of "The Wonderful World of Simulation."

As the 2017 I/ITSEC Fellow, Mr. Okraski takes readers on a journey of his experiences and education in the simulation and training world, both as a member of industry and as a Government employee. Throughout this journey, he informs readers of the important lessons learned, giving an outstanding insight into how this industry has evolved throughout his lifetime.

Key quotes from "Remembrances of a Simulationist: An Exciting Career of 'Make Believe'"

"The importance of synthetic training was recognized in 1934 by the U.S. Army Air Corps, when they assumed the responsibility for air mail delivery. When visibility was poor, pilots would have to rely on instruments and the current cadre of about 100 pilots were ill-equipped to fly by instruments alone. Several of the military aircraft crashed in bad weather. An emergency appropriation of funds was approved by Congress and the President. The first 6 Link Trainers were delivered and a new industry was born (Kelly)."

"The base facilities were old, built in the 1940's for the Army Air Corps, and many buildings were without reliable air conditioning. Orlando was a small town in the orange groves at the time, before the Disney presence, with few technology firms in the area. The Martin Company was the only major contractor in Central Florida and was primarily in the missiles business. The company had a simple helicopter trainer, a testbed for research with a giant model board used for cockpit visual display experiments. The politics leading to the decision to move the approximately 1,100 Navy and Army personnel from Long Island to Orlando was intense and complex but that decision led to the creation of a national asset 'The Center for Modeling & Simulation' in Central Florida."

"We moved to special-purpose computers that were expensive, some using machine language and difficult to program. Then came FORTRAN and multi-purpose computers that facilitated software development and modifications. The DoD language of choice became ADA, causing our industry to 're-tool' software development. In spite of the entire industry, including the commercial computer developers, moving to C Plus and C Plus Plus, DoD stood steadfast on ADA as the software requirement. This was costly and really unnecessary."

Session Chair:
Mike Genetti, Ph.D., Rockwell Collins Simulation & Training Solutions

SIGNATURE EVENT

Narratives in Information Warfare

PREPARING TO FIGHT AGAINST, WITH, AND THROUGH NARRATIVES

WEDNESDAY, 29 NOVEMBER
1600 – 1730 • S320GH
SE10

Moderator

Shep Barge, Ph.D.
Director, Joint Assessment Enabling Capability, Office of the Deputy Assistant Secretary of Defense for Force Education and Training

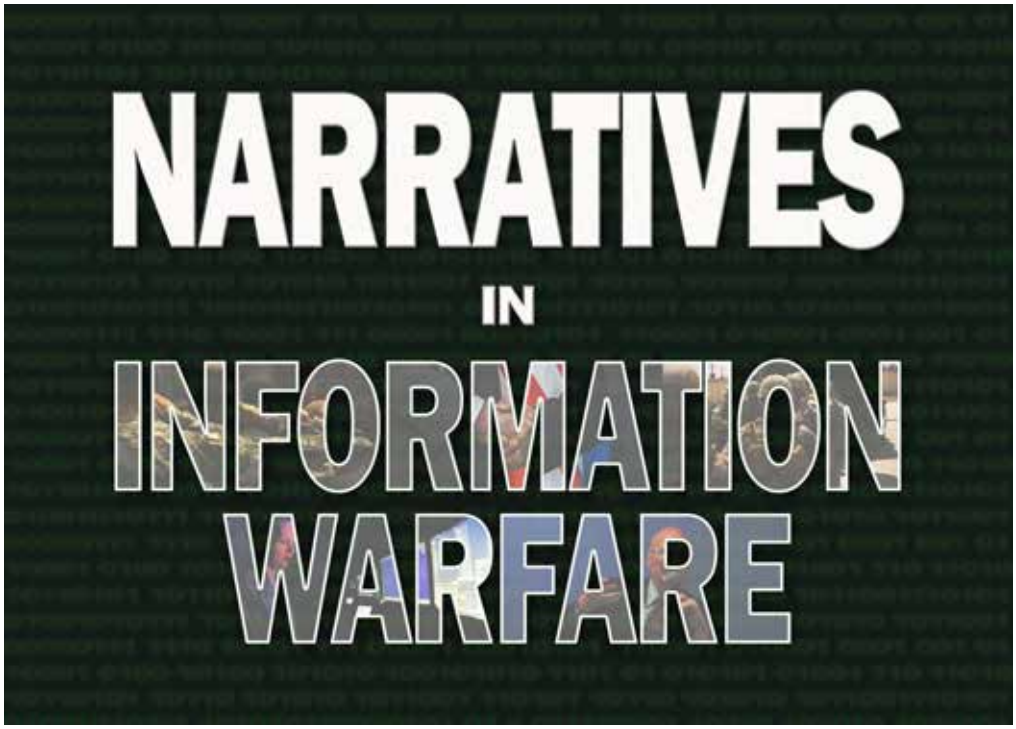
Panelists

Gregory C. Radabaugh, SES
Director, Joint Information Operations Warfare Center, Joint Staff

Richard Boyd
Founder and CEO, Tanjo, Inc.

Christopher Paul, Ph.D.
Senior Social Scientist, RAND Corporation

Scott W. Ruston, Ph.D.
Research Scientist, Global Security Initiative, Arizona State University



With the advancements in technology today the speed of information flow has never been faster. The general public has become increasingly aware of the impact of how information is received and interpreted, through media and information campaigns. Recent world events have demonstrated how a narrative can be weaponized.

Understanding how narratives are created and how they influence behavior is just one discussion topic for this panel. We need to understand how best to train our warfighters to win in this new and complex battlefield: the information environment.

The Chairman of the Joint Chiefs of Staff has established Information as a new joint function in military doctrine (in addition to Command & Control, Intelligence, Fires, Movement & Maneuver, Protection, Sustainment), taking action to provide strategic guidance in the employment of Information.

To explore how we can better provide our warfighters with the means to understand, train, and win in this new, complex battlefield, this panel seeks to bring together:

- The science of how our warfighters and adversaries create and respond to narratives,
- Current initiatives within the Department of Defense to conduct operations in the Information Environment, and
- Technology and Industry insight on understanding and employing narratives.

Session Chair:
Robert Snyder, Whitney Bradley and Brown Inc.

Black Swan-A Blast to the Past

TECHNOLOGY-CRIPPLING SOLAR FLARE COULD SEND OUR USE OF ELECTRONICS BACK TO THE 1800s!

WEDNESDAY, 29 NOVEMBER
1600 – 1730 • ROOM S330BCD
SE11

Moderator

Brigadier General William E. Cole, USA
Program Executive Officer, U.S. Army PEO STRI

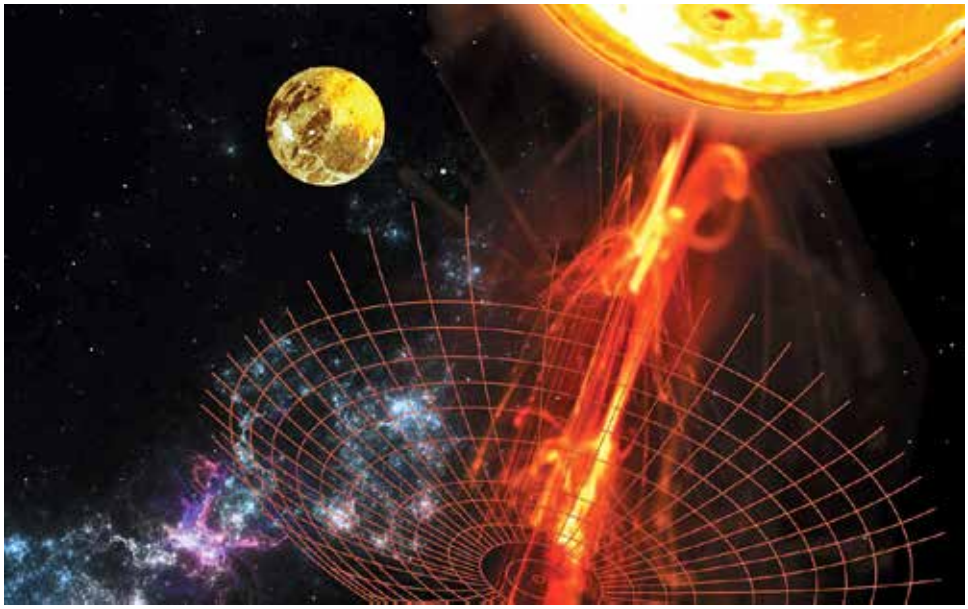
Panelists

Major General Randy S. Taylor, USA
Commanding General, U.S. Army Communications-Electronics Command & Senior Commander, Aberdeen Proving Ground

Peter W. Schuck, Ph.D.
Space Weather Laboratory, Heliophysics Science Division, NASA Goddard Space Flight Center

Michael Simone Ph.D.
Professor and Director of the Nexus Laboratory for Transdisciplinary Informatics, Arizona State University

Captain John Ross
Space Weather Operations Center, USAF 2nd Weather Squadron, Offutt AFB



Continuing our Black Swan series of panel discussions, we propose the scenario of a Coronal Mass Ejection (CME) and its solar geomagnetic storm hitting the earth and affecting our space and terrestrial communication systems. It is predicted that once the CME is detected we will have between one and four days to prepare for the electro-magnetic pulse (EMP) effects created by this solar event. Based on the similar Carrington event in 1859, it is estimated that this EMP would cause widespread electrical outages as well as damage to electrical circuitry on most communications devices and satellites.

We have brought together a panel of military and academic experts to discuss the broad technical and societal challenges in dealing with this type of event. Their modeling techniques and outcomes will be discussed as well as their plans to make our infrastructure and society more resilient to these effects.

If you are new to this special event, the term Black Swan is used to describe a low probability/high impact event which could profoundly affect our future. The term comes from the 2007 book, *The Black Swan: The Impact of the Highly Improbable* by Nassim Nicholas Taleb, where he presents various world changing events and advocates anti-fragility as a means to be resilient to future events. We believe that modeling and simulation can play a major part in exploring these events in a very cost effective manner.

Please join us for this engaging session!

Session Chair:
Fred Fleury, ZedaSoft

SIGNATURE EVENT

FOCUS EVENT

Small Business Senior Executive Leadership Panel

SMALL BUSINESS BIGWIGS – INITIATIVES AND INSIGHTS

MONDAY, 27 NOVEMBER
1400 – 1530 • ROOM S329
FE1

Moderator

Leslie Faircloth
Deputy Associate Director, NAWCTSD Office of Small Business Programs

Panelists

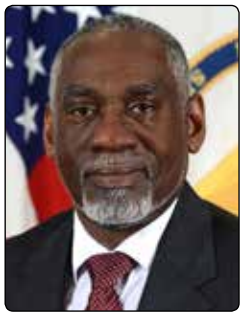
Emily D. Harman, SES
Director, Office of Small Business Programs, Department of Navy

Tommy Marks, SES
Director of the Department of the Army Office of Small Business Programs

Valerie L. Muck, SES
Director of Air Force Small Business Programs

Joyce L. Thurmond
Deputy Area Director and Atlanta Metro Area Senior Procurement Representative (PCR), U.S. Small Business Administration

Ms. Harman, SES


Mr. Marks, SES

Ms. Muck, SES

Ms. Thurmond

The U.S. Government offers small businesses a variety programs to help them succeed. For small businesses considering doing business with the government, this panel offers a rare opportunity to interact directly with senior small business leaders from Army, Navy, Air Force and the U.S. Small Business Administration.

The panelists will highlight their strategic initiatives, recommendations and insights into how small businesses can best bring their technologies to bear in support of the various DoD agencies. The speakers will each provide their perspectives and answer questions on the utilization of small business technologies as it applies to their respective organizational missions. Attendees are encouraged to engage directly with the panel members to maximize this information rich event.

Relevant topics include:

- How small business inclusion can lead to better, faster, innovative and affordable solutions for our warfighters
- How to leverage Small Business Innovative Research (SBIR)/Small Business Technology Transfer (STTR), Rapid Innovation Fund (RIF) and Other Transaction Authority (OTA) tools to deliver technology gap solutions
- How to utilitze various mentor-protégé programs as a mechanism to boost small business capabilities
- How to implement subcontracting improvements and more

This panel is open to anyone who wants to learn more about how small businesses can thrive while doing business with the government.

Session Chair:
Carly Galloway, NAWCTSD

Open Source Software: A Debate

INFORMATION WANTS TO BE FREE...BUT SHOULD IT BE!?

TUESDAY, 28 NOVEMBER
1400 – 1530 • ROOM S320GH
FE2

Moderator

Sae Schatz, Ph.D.
Director, Advanced Distributed Learning Initiative, Office of the Deputy Assistant Secretary of Defense for Force Education and Training

Panelists

CAPT David Herschel, USN
Director, Program and Budget, Office of the Assistant Secretary of Defense (Readiness), Readiness Programming and Resources

Laura Gerhardt
Innovation Specialist, Technology Transformation Service Office of Acquisitions, U.S. General Services Administration

Jeffrey A. Raver
Vice President and Director of Education and Training Services, SAIC

Mike van Lent, Ph.D.
CEO and President, Soar Technology, Inc.

Open-source software* is growing at a profound rate. The most recent Open Source 360° Survey found that nearly 60% of businesses use it, and open-source code makes up 80–90% of most software applications developed.

On the positive side, open-source frees organizations from the costs of licensed software and helps prevent "vendor-lock." Healthy open-source communities also ensure software is continuously updated, and organizations using open software can initiate their own, personal modifications as needed. Despite these benefits, open source remains controversial. Is this model sustainable? How cyber-secure is open source? Should military and government encourage, tolerate, or limit their use of open-source?

This exciting special event uses a debate format to explore the utility, sustainability, security, and role of open-source software, and its cousin open content (e.g., shared instructional materials), within military and government contexts. Two teams will argue for or against open source, providing a unique exploration of this important topic.

**"Open-source software" is developed in the open, with the source code available for anyone to inspect, modify, and use. This is in contrast to "proprietary" or "closed source" software, which is legally owned, maintained, and sold by an individual or corporation.*

Session Chair:
Phil Brown, D.M., NORAD-USNORTHCOM

FOCUS EVENT

Augmented Reality/Virtual Reality (AR/VR) in Navy Training

HERE TO STAY: USES OF VIRTUAL AND AUGMENTED REALITY FOR FUTURE NAVAL TRAINING

TUESDAY, 28 NOVEMBER
1600 – 1730 • ROOM S330BCD
FE3

Moderator

CDR Henry Phillips, USN, Ph.D.
Military Director for Research & Engineering, NAWCTSD

Panelists

Courtney McNamara
Senior Computer Scientist, Principle Investigator and Advanced Gaming Interactive Learning Environment (AGILE) Team Lead, NAWCTSD

Heather Priest, Ph.D.
Senior Research Psychologist and Multi-Integrated Systems and Teams Lab Lead, NAWCTSD

David Wieselthier
Senior Visual Engineer, NAWCTSD

Roger McPherson
Program Manager 07TR, NAVSEA

CDR Chris Foster, USN, PhD.
Aviation Warfare Training Development (AWTD) Integrated Product Team Lead, PMA-205 Aviation Training Systems

Session Chair:
Aerial Kreiner, Ph.D., Air Force Research Laboratory

This year's conference theme, "Harnessing New Technologies to Win in a Complex World" shines a spotlight on the potential represented by emerging AR/VR capabilities.

The burgeoning commercial market of VR and AR technologies and their applications is changing the discussion about how, when, and where we can affordably and effectively train warfighters. There is a consistent stream of new developments, improvements, tools, and practical use cases that indicate these technologies are likely here to stay, and will continue to evolve becoming part of peoples' mainstream lives. The current cycle of technology roll-out has not been without its problems, but the speed of its evolution, expanding quantity of market players, and significantly reduced cost buy-in relative to past false starts is markedly improved.

The technologies without question have the potential for lasting, profound impacts on naval training, enabling and enhancing training that might otherwise be unavailable or unaffordable—but only if the technology is implemented in the right places, and in the right ways, informed by science, with the ultimate goal of optimizing the human performance of Sailors and Marines. We must be mindful and not rush to use AR and VR everywhere simply because we think we can. Navy stakeholders and labs across the DoD are investigating the training requirements that can be met or enhanced using these capabilities, the challenges of their deployment, and even more importantly, what their current limitations are. Traditional technologies will continue to play a role as the naval training community adopts these new, rapidly evolving delivery methods, but what important lessons must we avoid relearning with the advent of these new tools?

The new, lower cost tools of VR and AR have tremendous potential to help improve how we train and support warfighters and teammates throughout the Fleet. There will be sprints, leaps, and inevitably some less than ideal outcomes with new lessons learned. The good news is that we can minimize the occurrence of negative outcomes by always asking and answering the right questions upfront before incorporating these technologies into training so that they yield meaningful benefits in improving human performance. This panel will highlight and explore the opportunities and limitations of VR and AR training delivery.

Cloud-Based Simulation: Hype or Reality?

OPERATIONAL READINESS OF MODELING & SIMULATION AS A SERVICE

WEDNESDAY, 29 NOVEMBER
0830 – 1000 • ROOM S320GH
FE4

Moderator

Robert Siegfried, Ph.D.
Managing Director, aditerna GmbH

Panelists

Brigadier General Henrik Sommer, Denmark
Assistant Chief of Staff Capability Engineering & Innovation, Headquarters Supreme Allied Commander Transformation (SACT)

Colonel Joseph Nolan, USA
Deputy Director, U.S. Army Modeling and Simulation Office (AMSO)

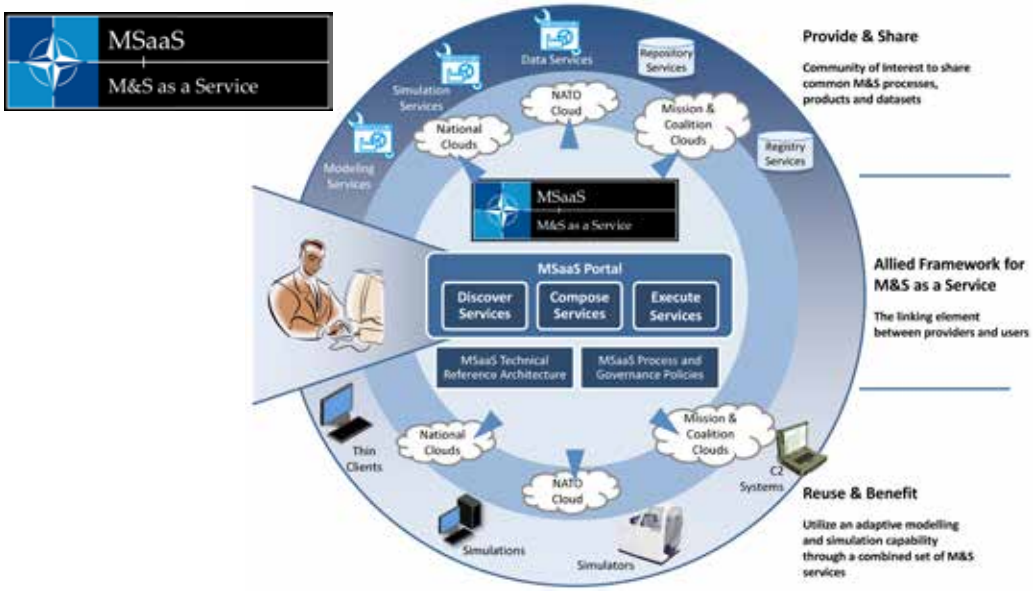
Lieutenant Colonel Marco Biagini, Italy
CD&E Branch Chief, NATO Modelling and Simulation Centre of Excellence (M&S COE)

Thomas Lasch
Chief, Models & Simulations Division, U.S. Joint Multinational Simulation Center (JMSC)

Jon Lloyd
Enabling Training Education and Simulation Team, UK Defence Science and Technology Laboratory (DSTL)

Robbie Phillips
Senior Technical Manager, Lockheed Martin

Session Chair:
Jan Drabczuk, Eagle Systems



Modeling and Simulation (M&S) is the key technology to deliver a great amount of military training, analysis, and decision making capabilities. Two main barriers limiting the use of M&S are cost and accessibility.

M&S products are highly valuable resources and it is essential that M&S products, data and processes are conveniently accessible to a large number of users as often as possible. Therefore it is required that M&S products can be accessed simultaneously and spontaneously by a large number of users for their individual purposes.

Modeling & Simulation as a Service

Modeling & Simulation as a Service (MSaaS) is the combination of service-based approaches with ideas taken from cloud computing. As MSaaS has technological and organizational impacts, it is best defined as an enterprise-level approach for discovery, composition, execution and management of M&S services.

This "as a Service" paradigm has to support stand-alone use as well as integration of multiple simulated and real systems into a unified environment whenever the need arises. Leveraging commercial developments MSaaS is a very promising approach for realizing future simulation environments.

Allied Framework for MSaaS

The Allied Framework for MSaaS is the common approach of NATO and nations towards implementing MSaaS. The joint effort is undertaken to share resources and to ensure maximum interoperability.

Under the umbrella of the NATO Science & Technology Organization 16 nations, 6 NATO bodies and 100+ subject matter experts are currently working together to improve MSaaS capabilities and to realize jointly the next generation of simulation environments. The key objective is a flexible, cloud-based services environment to provide M&S products, data and processes conveniently and on-demand available to all users in order to enhance operational effectiveness.

MSaaS is real!

If you ever wondered if M&S for military training, analysis, and decision making will be cloud-based in future, the answer is Yes. But this transition will not happen in the future, it is happening right now. This Special Event gives every simulation engineer, project manager, and leadership a true view on the current state of MSaaS, including its potential and the remaining challenges.

Ignite I/ITSEC

ENLIGHTEN US, BUT MAKE IT QUICK!

WEDNESDAY, 29 NOVEMBER
1030 – 1200 • ROOM S320GH

FE5

Moderator
John Aughey
The Boeing Company

Come and hear industry experts speak on topics such as micro-learning, entrepreneurship, and more. Have you ever sat through a long presentation and lamented that there were only five minutes of content? Imagine if you could hear only that five minutes of targeted, compelling, and maybe even provocative content... that's Ignite! Ignite is a presentation format that allows dynamic, high octane speakers a platform to share their passion and ideas. I/ITSEC's version of Ignite focuses on topics that are relevant and thought-provoking, so bring your short attention span and prepare to be inspired, entertained, educated and amazed by an array of talented speakers! These presenters have been selected from over 30 nominations, and each talk is jam-packed with inspiration and information using 20 slides that auto-advance every 15 seconds, creating a fun and dynamic event.

Participants

Anne Little, Ph.D.
SAIC
Microlearning: Little Bits of Engagement, Big Rewards

Robby Robson, Ph.D.
Eduworks
So you want to be an entrepreneur…

Commander Henry Phillips, USN, Ph.D.,
NAWCTSD
Navy Enterprise Data Analytics: Big Data in Plain English

Commander Brent Olde, USN, Ph.D.
Office of Naval Research
Mobile Training and Job Performance: Tying it All Together

Jennifer Vogel-Walcutt, Ph.D.
ADL Initiative
ADL Ignite!

Scott Harris
University of Central Florida
Combat Readiness Through Scientific Training Effectiveness Assessments

David Metcalf, Ph.D.
University of Central Florida
3D/VR/AR – Advanced Visualization for Learning Simulations

Eileen Smith
University of Central Florida
Designing for Operational Environments: Engineering Comprehensive Cognitive Ecosystems

Session Chair:
Michele Harrison, Naval Education and Training Command

Army Synthetic Environment: Standard, Sharable, Geospatial Foundation for the Army M&S Enterprise

CLOUD DELIVERED TERRAIN SERVICES TO TRANSFORM M&S

WEDNESDAY, 29 NOVEMBER
1400 – 1530 • ROOM S330EF
FE6

Moderator

Colonel Joseph Nolan, USA
Deputy Director, U.S. Army Modeling and Simulation Office (AMSO)

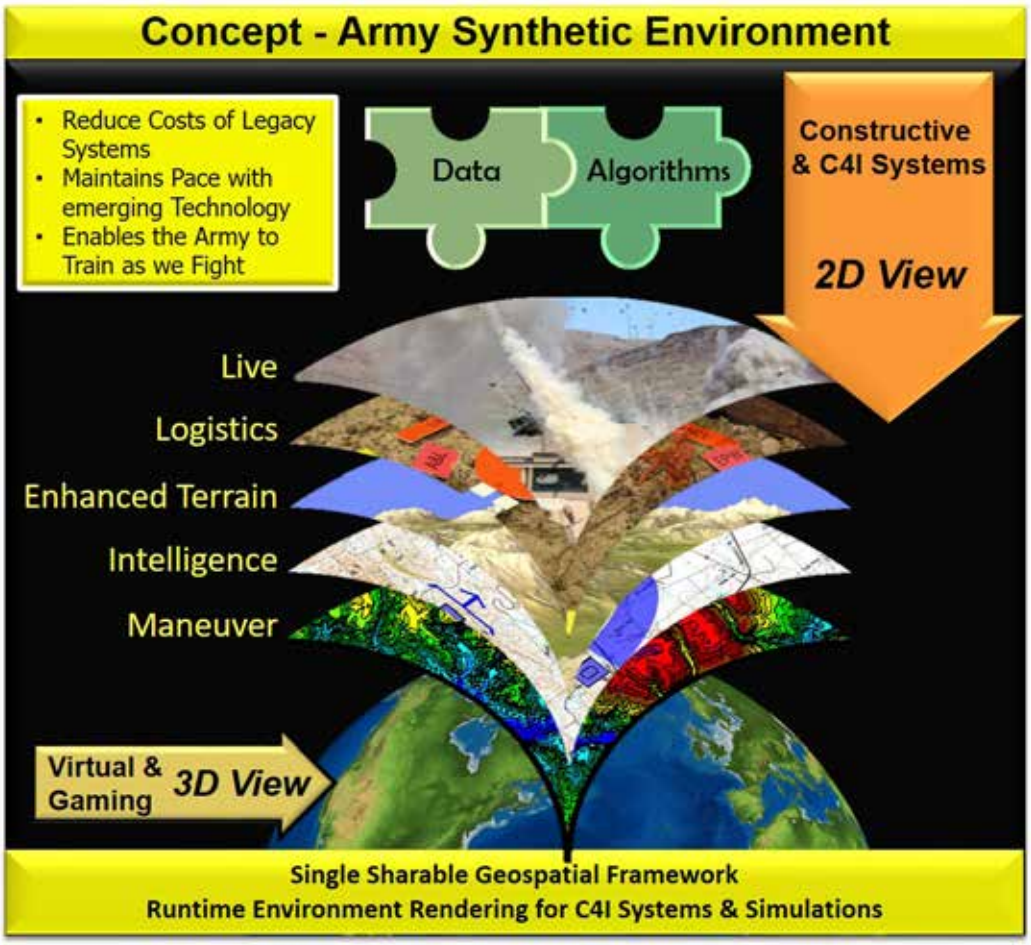
Panelists

Glen Quesenberry
M&S PM, Army Geospatial Information Office, Army Geospatial Command

Ryan McAlinden
Director for Modeling, Simulation & Training, Institute for Creative Technologies

Michael Enloe
Chief Engineer, TCM ITE, U.S. Army Combined Arms Center-Training

John Diem
Acting Executive Director, U. S. Army Operational Test Command



Panelists from across the Geospatial M&S Community will describe the Single Sharable Geospatial Foundation and its implications for DoD modeling and simulation. Exploring the commercial industry's success at leveraging a single cloud-delivered terrain Service into disparate applications, the panel will discuss this emerging terrain technology and how it could be applied to our M&S and Mission Command System C4I communities. The panel will address two key considerations:

1. Is the technology readiness level for cloud delivered terrain ready for DoD applications?
2. What considerations does the DoD need to consider to ensure success and avoid pitfalls?

Following the panel discussion, AMSO will conduct a technical demonstration of a cloud delivered terrain rendering capability at its booth with participation from PEO STRI, U.S. Army National Simulation Center, and University of Southern California's Institute for Creative Technology. The demonstration will use a single terrain service to render in real time terrain using three different game engines and OneSAF.

Session Chair:
Michael Truelove, AMSO

FOCUS EVENT

Agents from the Future

INTELLIGENT AGENTS BUILD INTELLIGENT WARFIGHTERS

THURSDAY, 30 NOVEMBER
0830 – 1000 • ROOM S320GH
FE7

Moderator

Winston "Wink" Bennett, Jr., Ph.D.
Division Technical Advisor, Warfighter Readiness Research Division, AFRL

Panelists

Webb Stacy, Ph.D.
Corporate Fellow, Aptima, Inc.

Drew Rosoff
Chief Executive Officer, CHI Systems, Inc.

Sean Guarino
Principal Scientist, Human Effectiveness, Charles River Analytics Inc.

Todd W. Griffith, Ph.D.
Chief Technology Officer & Co-founder, Discovery Machine, Inc.

Benjamin Bell, Ph.D.
President, Eduworks Government Solutions

J.T. Folsom-Kovarik, Ph.D.
Lead Scientist, Soar Technology, Inc.

Randy Jensen
Group Manager, Stottler Henke Associates, Inc.

Walter Warwick, Ph.D.
Principal Consultant, TiER1 Performance Solutions

Session Chair:
Ingrid Mellone, Huntington Ingalls

Simulation is a key asset for efficient, effective training. Simulation science and technology have made great strides to improve training; however, DoD needs radical advances in at least two areas of simulation:

- Costs must drop — Most current simulations require a white cell operator, controller, or pucksters. This raises the cost of ownership. It restricts the use and distribution of simulators to the times and places that simulation operators are available.
- Cognitive fidelity must rise — Most simulations present constructive or non-player characters that cannot smartly exercise and advance the tactical decision skills of trainees.

Intelligent agents can help lower cost of ownership by reducing the demand for human operators. They can help raise cognitive fidelity by delivering dangerously smart behaviors in training.

AFRL is sponsoring a multi-year project to develop and test these agents. This special event will present the challenge, and the responses by eight leading developers of intelligent agents. Their presentations will address advances in tactical responsiveness and intelligence; use of simulator data to drive agents and even learn them; and tools for building and testing agents.

Big Data & M&S

LEARN. LEND A HAND. HELP OUR COMMUNITY LAUNCH!

THURSDAY, 30 NOVEMBER
1030 – 1500 • ROOM S320GH
FE8

Moderator

Tony Cerri
Director Data Science, Models, Simulations, TRADOC G2

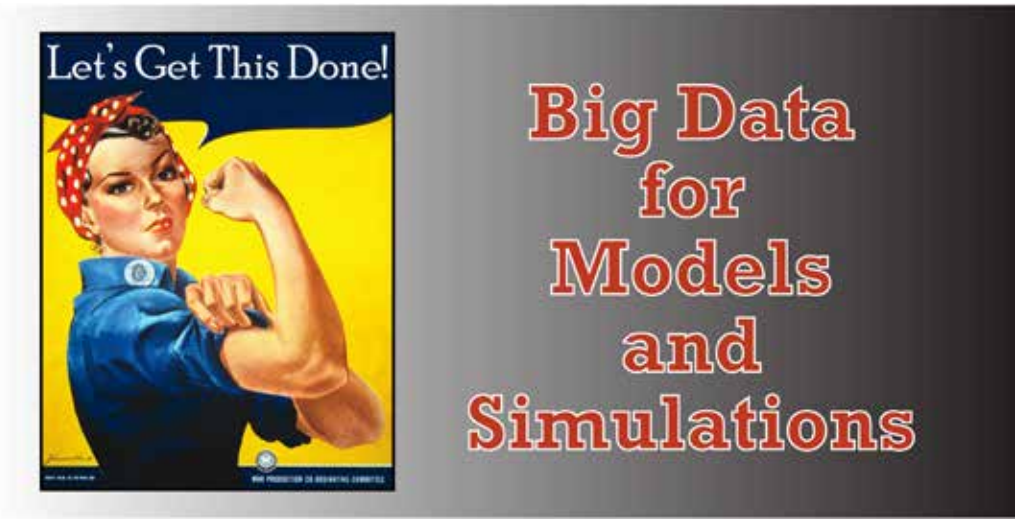
Panelists

Brigadier General (P) James Mingus, USA
Director, Mission Command Center of Excellence

Kristen Summers
Technical Delivery Lead, IBM

Chris Balcik
Vice President, SAMSUNG

Young Bang
Senior Vice President, Booz Allen Hamilton



M&S implementation of Big Data gets serious — now! Join with Military and Industry thought leaders and Big Data practitioners to create a two-year implementation vision. The event begins with a 'traditional' panel discussion followed by an open-microphone Q&A. Then you will be invited to one of two work groups where the panelists will join with the audience and raconteurs for 30 minutes to brainstorm and create a high-level, 2 year implementation plan.

"Wait! What? What's this about 'join' and 'create'? You mean me? As in do, like, work?" Yes, your individual ideas ARE being solicited. It's a two-fer. You learn about Big Data from folks who are actually implementing it and then you get to add your voice to how our community can get going. We will also be looking for volunteers who are willing to 'own' a piece of the vision and add some elbow grease to its initiation. The thought at this moment is to then continue the coordination during MODSIM 2018 with a status report at next year's I/ITSEC. Don't let the last piece scare you off; it's a volunteer thing. If you know a lot about Big Data — come. Lend a hand. If you know nothing about Big Data other than the buzz — come. Learn. Lend a hand. Help our community launch!

At the end of the plenary session, there will be an award presentation to the winners of the Data Science Futures Hackathon conducted during the week at I/ITSEC.

Session Chair:
Roy Scrudder, The University of Texas at Austin, Applied Research Laboratories

TUESDAY, 28 NOVEMBER • 1600-1730 • ROOM S329 • COI1

Buying Innovation in Military Training: How Do We Foster, Exploit and Deliver Innovation in Military Simulation and Training?

This session will address the Armed Forces desire to foster and deliver training innovation internally and how to share the output and best practice. We will discuss how industry innovates against current and future training requirements in concert with the Military and Government.

- How do we get Industry to invest their R&D budgets against customer need?
- How to reward innovation in training? – both internally and to industry
- What examples are there of innovation that can be reproduced in other areas to good effect?
- How do we engage smaller, more agile (and often naturally innovative) companies – especially those outside of the current defence delivery network?

Finally we will explore the bigger picture of how do we exploit technology from other industries into Military Training and the exploitation of excellent training/education practice from providers outside of defence.

Moderator

Tess Butler
CEO, Ruddy Nice

Participants

Lieutenant Colonel Jason Jones
Deputy Director NATO M&S Centre of Excellence, Italy

Emmanuel Chiva
Chief Strategy Officer at AGUERIS and Reserve Commander (Deputy for the French Navy Chief Digital Officer), France

Adam Easton, Ph.D.
CEO SimCentric, UK

Session Chair:
Luis Velazquez, MARCORSYSCOM PM TRASYS

WEDNESDAY, 29 NOVEMBER • 1600 – 1730 • ROOM S329 • COI2

Geospatial Standards

This event provides an opportunity for the major geospatial data producers, users and standardization organizations to update the community on their products, standards, and processes, and to share their plans and challenges with interested parties.

The transition to open consensus-based standards for geospatial data creates opportunities for modeling and simulation systems to:

- **Reduce technology risk by:**
  - » Improving interoperability through convergence on data standards
  - » Broadening choice of solutions to a growing list of commercial products
- **Increase efficiency and effectiveness through:**
  - » Rapid integration of information, technology and authoritative data
  - » Taking advantage of advancements in data storage, computing, and visualization capabilities

This group is fostering data sharing and reuse across the M&S Enterprise and converging on common standards. The result is reduced data production and preparation times to empower the agile force.

Moderator

Bill Hopkinson, Ph.D.
M&S Analyst, Defense Modeling and Simulation Coordination Office

Participants

Thomas F. Creel, Ph.D.
Technical Executive, Office of Geomatics, National Geospatial Intelligence Agency (NGA)

Daniel T. Maxwell, Ph.D.
Chair, Modeling and Simulation Working Group, United States Geospatial Intelligence Foundation (USGIF)

Samuel D. Chambers
M&S Data Services Lead, Environment Architecture Division, Joint Staff J7

Jean-Louis Gougeat
Project Manger at Sogitec and Chairman, Reuse and Interoperation of Environmental Data and Processes (RIEDP) Product Development Group, Simulation Interoperability Standards Organization (SISO)

Session Chair:
Steve Parrish, Laerdal Medical & Simulations

THURSDAY, 30 NOVEMBER • 0830 – 1000 • ROOM S329 • COI3

Research Challenges in M&S in the Era of Big Data and the Internet of Things

Big data and the Internet of Things (IoT) are disruptive technologies having large impacts in society today. These impacts will only accelerate in the future. Modeling & simulation has not yet fully realized the potential and opportunities afforded by these emerging technologies. A panel of experts will discuss key research challenges and opportunities facing the modeling and simulation community in the era of big data and IoT. The panel will discuss important synergies and opportunities both in the development of new technologies as well as their exploitation in critical application areas such as smart cities, cybersecurity, and defense.

Each panelist will give a brief position statement, followed by Q&A.

Moderator

Warren Bizub
Chief Technology Officer, SimIS

Participants

Richard Fujimoto, Ph.D.
Regents' Professor, School of Computational Science & Engineering, Georgia Institute of Technology

Margaret Loper, Ph.D.
Chief Scientist, Information & Communications Laboratory, Georgia Tech Research Institute

David Nicol, Ph.D.
Director, Information Trust Institute, Franklin W. Woeltge Professor of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign

Richard Boyd
Founder and CEO, Tanjo, Inc.

Session Chair:
Matthew Hackett, Ph.D., Army Research Lab Simulation and Training Technology Center (ARL STTC)

MONDAY – WEDNESDAY • S310AB • COI4

Data Science Futures Hackathon

Want to fundamentally change the way we train and execute missions using data? The Data Science Futures hackathon provides the opportunity to discover insights into military data and use these insights to save lives and improve mission operations.

What:
Under a tight timeline, participants will band together to arrive at new discoveries and ways in which our military can make better decisions with the Mad Scientist data provided by the U.S. Army Training and Doctrine Command (TRADOC).

The Mad Scientist initiative focuses on **disruptive technologies** (sentient data, internet of sustainable energy, platform mergers, autonomous vs. unmanned, etc.), **human dimension** (cognitive potential, man-machine interface, genome sequencing, wearables, continuous diagnostics, performance enhancers), and **megacities and dense urban areas** (population-centric intelligence, invisible geography, hot zone robotics, avatars in the field, and the role of augmented and virtual reality in training).

When:
The hackathon will occur throughout I/ITSEC culminating in an awards presentation during the "Big Data & M&S" special event on Thursday.

Who:
We invite everyone – whether you've participated in a hackathon or not – to join in on the action and be a part of the solution to some of our biggest challenges.

Why:
The Army uses key findings and recommendations to advance understanding of the future and innovate more rapidly. As the Army faces unparalleled complexities in the future operating environment, such initiatives can ensure the future readiness of the Army and also of the entire joint force.

*Now the only question is, how can **YOU** help solve DoD's most challenging problems?*

Session Chair:
Jennifer Arnold, Booz Allen Hamilton

TUESDAY, 28 NOVEMBER
1600 – 1730 • S330EF
PB1

U.S. Air Force Acquisition Update

This Special Event will provide the latest information from the Air Force regarding acquisition policy and upcoming training system acquisition actions. It will feature remarks by Ms. Rutledge, the Air Force Program Executive Officer for Agile Combat Support, who will share her perspective on the current state of the Air Force acquisition process and ongoing initiatives, as they apply to the I/ITSEC community. This will be followed by a presentation by Col Carpenter, the Chief of the Simulators Program Office. He will provide an update on Air Force simulator business opportunities, as a follow-on to the Simulation and Training Community Forum (STCF) held earlier this year.

Session Chair:
Marcus Boyd, L3 Technologies

Moderator

Tony DalSasso
Chief Engineer, Simulators Program Office

Participants

Lynda Rutledge, SES
Program Executive Officer and Director for the Agile Combat Support Directorate, Air Force Materiel Command

Colonel Philip Carpenter, USAF
Chief, Simulators Program Office

WEDNESDAY, 29 NOVEMBER
0830 – 1000 AND
1600 – 1730
S330EF
PB2

U.S. Army PEO STRI TSIS Update

The U.S. Army Program Executive for Simulation, Training and Instrumentation (PEO STRI) Training and Simulation Industry Symposium (TSIS) update at I/ITSEC will provide the latest information regarding the current and future PEO STRI business opportunities. This will be an update from the June 2017 TSIS and will include presentations from the Project Managers, International Programs Office (IPO) and the Army Contracting Command-Orlando.

Session Chair: Riannon Dolletski-Lazar, ECS Federal

Moderator

Traci Jones
PEO STRI G5 Plans and Strategy

WEDNESDAY, 29 NOVEMBER • 0830-1000

0830-0900 Colonel Rich Haggerty, USA
Project Manager Instrumentation, Targets, Threat Simulators and SOF Training Systems (PM ITTS)

0900-0930 Scott Pulford
Acting Project Manager Training Devices (PM TRADE)

0930-1000 Colonel Scott McIntosh, USA
Joint Project Manager, Medical Modeling and Simulation (JPMO MMS)

WEDNESDAY, 29 NOVEMBER • 1600-1730

1600-1625 Colonel Marcus Varnadore, USA
Project Manager Integrated Training Environment (PM ITE)

1625-1650 Dale Whittaker
International Programs Office (IPO)

1650-1715 Colonel Bill Canaley, USA
Project Lead Field Operations

1715-1730 Joe Giunta
Army Contracting Command-Orlando

THURSDAY, 30 NOVEMBER
0830 – 1000 • S330EF
PB3

Navy Vision from the Training System's Program Managers

Each year at I/ITSEC, a panel of Navy captains and senior civilian leaders representing the Navy's training acquisition organizations convenes to discuss the year's highlights and share their strategic vision. I/ITSEC participants are welcome and encouraged to attend to hear about the state of the Navy's Training Systems.

Session Chair: Tara Kilcullen, Aptima, Inc.

Moderator

Michael Merritt
Deputy Technical Director, NAWCTSD

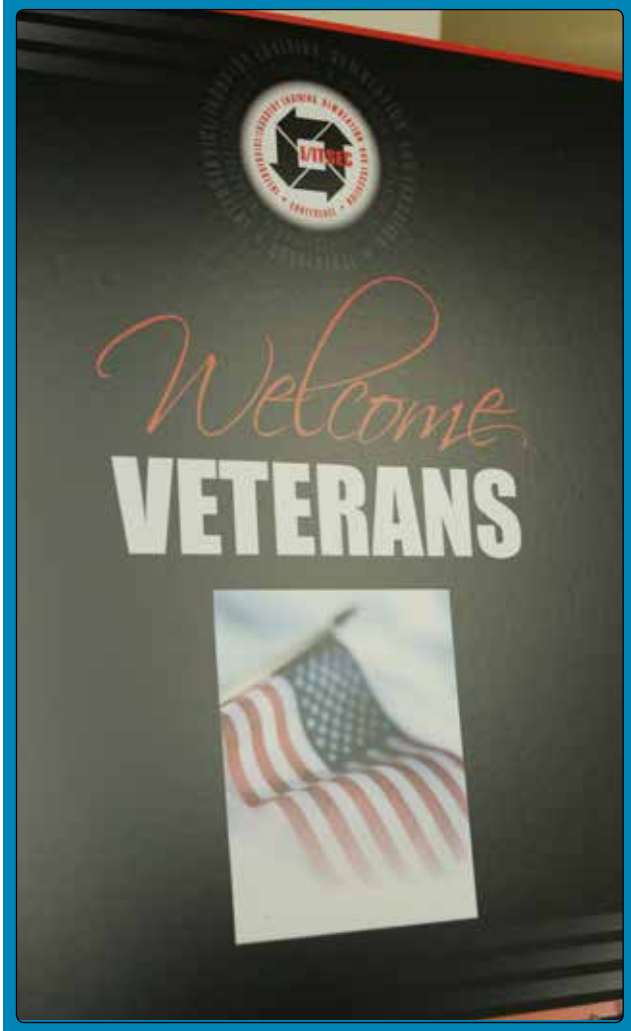
Panelists

Captain Erik Etz, USN
Commanding Officer, Naval Air Warfare Center (NAWCTSD)

Captain Jason Lopez, USN
Program Manager, Naval Aviation Training Systems (PMA-205)

Captain Samuel Pennington, USN
Program Manager, Naval Surface Training Systems (PMS-339)

Jimmy Lee
Program Manager, Undersea Training Systems (07TR)



Central Florida Veterans Organizations

The citizens of the United States are more supportive of today's men and women in Military Service than they have been since WWII. The Overseas Contingency Operations continue to be of great concern to all, whether in uniform or not. This I/ITSEC effort is to especially inform U.S. Veterans about the dramatic changes in training methodologies and systems since their time in Service. Since 2006, I/ITSEC has had the pleasure and honor to have select members of Central Florida Veterans Organizations visit the exhibit floor on Wednesday. The successful experiences in broadening the Veterans' understanding of today's training transformation as well as the appreciation of the other I/ITSEC attendees in seeing the Veterans, some in their uniforms and with their decorations, have made this an annual event for I/ITSEC. When you see these Veterans, thank them for their service to the Nation.

A veteran…is someone who, at one point in his or her life, wrote a blank check made payable to The United States of America for an amount of "up to and including my life."

INTERNATIONAL ATTENDEES - INTERNATIONALE TEILNEHMER - LES PARTICIPANTS INTERNATIONAL INTERNATIONAL DELTAKERE - INTERNATIONELL DELTAGARE - INTERNATIONAL DEELNEMERS

International Pavilion

Room S310E-H

International attendees can meet and connect with counterparts from around the world. Limited private meeting space is available on a first-come, first-served basis to our international participants and may be scheduled at the International Pavilion's Welcome Desk. Additional information about the many international activities throughout I/ITSEC is readily available in the International Pavilion. *Sponsored by AVT Simulation.*

International Registrants should register at the dedicated **International Check-in** station positioned near the Main Registration Desk in West Concourse. International Conference Attendees' Meeting Bags will be available for pick-up at the Welcome Desk in the International Pavilion. More information specific to international attendees will be available at that location.

International Pavilion Hours of Operation

Sunday, 26 November	1400-1800
Monday, 27 November	0800-1800
Tuesday, 28 November	1030-1800
Wednesday, 29 November	0800-1500
Thursday, 30 November	0800-1500

Program Notes of Special Interest for International Attendees

Papers

Explore your Program for the ✈ indicating Papers from International Authors.

Tutorials

Monday, 27 November • Room S320A • 0830 – 1000
Introduction to HLA

Monday, 27 November • Room S330G • 0830 – 1000
Team Training Environment Specification and Selection

Monday, 27 November • Room S320E • 1245 – 1415
Spoken-dialogue Interaction for Serious Games and Virtual Training Simulators

INTERNATIONAL ATTENDEES - INTERNATIONALE TEILNEHMER - LES PARTICIPANTS INTERNATIONAL INTERNATIONAL DELTAKERE - INTERNATIONELL DELTAGARE - INTERNATIONAL DEELNEMERS

COMMUNITY OF INTEREST

Buying Innovation in Military Technology

Tuesday, 28 November • 1600 • Room S329

(See page 34 for more information)

This panel will look at how to foster, exploit, and deliver innovation in military simulation and training from the European perspective.

SIGNATURE EVENT

GLOBAL GO/FO PERSPECTIVES IN LEARNING

Wednesday, 29 November • 0830 • Room S330BCD

(See page 20 for more information)

This panel will discuss how learning technologies need to be paired with learning science to best realize the benefits of these advanced systems.

SIGNATURE EVENT

International Collaboration 2017

Wednesday, 29 November • 1400 • Room S330BCD

(See page 22 for more information)

This senior-level panel of international participants will explore the challenge of finding a comprehensive solution to achieving collaboration on M&S tools and technologies.

FOCUS EVENT

Cloud-Based Simulation: Hype or Reality?

Wednesday, 29 November • 0830 • Room S320GH

(See page 29 for more information)

This Focus Event brings together a distinctive panel of experts from around the globe who will explore Modeling and Simulation as a Service (MSaaS).

SPECIAL SESSION

International Future Authors Session

Wednesday, 29 November • 1630 • Room S310C

This special session for our international attendees will be led by the I/ITSEC 2018 Program Chair, Bob Kleinhample. Bob will review the process of successfully authoring a paper for I/ITSEC. In a casual forum setting, Bob will outline the Call for Abstracts and considerations on which subcommittee is the best choice for abstract submittal. Bob will review the process of authoring both a successful abstract and paper for acceptance for presentation at the conference. Come participate in this informal exchange of ideas on successfully authoring a paper for I/ITSEC!

Topics include:

- Call for Abstracts (Subcommittee structure)
- Abstract Review and Acceptance (Role of the "bird dog")
- Paper Review and Acceptance
- Presentation Development and Approval

NOTES

Professional Development

Tutorials • Papers • Workshops

ARMY
NAVY
USMC
AIR FORCE
INDUSTRY
'17

HARNESSING NEW TECHNOLOGIES
TO WIN IN A COMPLEX WORLD

Continuing Education Units: An I/ITSEC Opportunity

"CEUs are a convenient and efficient way to keep track of my participation in professional development activities."

Continuing Education Units (CEU) were established in 1970 to create a unit of measurement to quantify continuing education and training activities. CEUs apply to technical and educational settings such as I/ITSEC. The primary focus of I/ITSEC is to highlight innovative implementation of simulation and education technologies as tools to achieve cost efficient training and increased military readiness. Therefore, CEUs are offered for **all Tutorials, Paper Sessions, and the Professional Development Workshops**. CEUs are being sponsored and maintained by the University of Central Florida, Division of Continuing Education.

Why should I earn CEUs at I/ITSEC?

- Participation in the tutorials, papers and/or Professional Development Workshops for CEU credit reinforces your commitment to remain current in the evolving technologies relating to training and simulation.
- The CEU transcript indicates your active participation in the technical program of the conference to your employer.
- Previous attendees have indicated that CEUs have assisted them in securing approval to attend the conference.

What sessions are CEU Eligible?

- All Tutorials, Papers, and Professional Development Workshops are CEU eligible.
- Who may attend these events? Tutorials and Professional Development Workshops are open to everyone. The Paper Sessions are limited to registered conference attendees.
- Does attending mean I automatically receive CEU credits? No. You have to let us know, via your registration, that you are interested in the credits. There is no charge for Paid Conference Attendees. However, if you are in an unpaid category (i.e. Exhibitor Personnel) there is a $45 charge, payable during registration. You may also register separately for the CEUs if you missed this step in your conference registration process.
- We also ask that you be sure to mark your registration if you wish to attend the Professional Development Workshops held on Friday so that appropriate rooms/seating are in place.

How do I receive CEUs at I/ITSEC?

1. Be sure you are appropriately registered (you can confirm when you check in onsite) for CEU credits.
2. Follow directions provided at each session to answer a few basic questions about the presentation.
3. Your CEU transcript will come to you via the University of Central Florida, Division of Continuing Education. Ten contact hours equate to one CEU credit.

Contact Maria Cherjovsky at (407) 882-0247 or mariac@mail.ucf.edu for additional information

Continuous Learning Points (CLPs)

The U.S. Department of Defense (DoD) acquisition workforce members are expected to earn Continuous Learning Points (CLPs) to stay current in leadership and functional acquisition skills that augment the minimum education, training and experience standards established for certification purposes within their acquisition career fields. It is each acquisition member's responsibility to meet the goal of 40 CLPs each year and to meet the mandatory requirement of 80 CLPs every two years. Acquisition Professional Activities are allowed to count toward CLPs. CLPs are awarded in accordance with DoD-wide guidelines as augmented by Service-specific policies. I/ITSEC provides an excellent opportunity for the DoD acquisition workforce members to earn mandatory CLPs.

The completion of CEUs has long been used to demonstrate dedication and career interest to supervisors, employers or rating officers. CEUs earned at I/ITSEC can be applied towards CMSP Recertification.

EARNING THE CMSP DESIGNATION WILL:

- Demonstrate expertise in the field of M&S to your employer and the larger M&S community
- Provide opportunities for professional advancement

Requirements include 3-8 years of work experience (depending on level of highest collegiate degree), 3 professional letters of reference, and successful completion of an online examination.

CMSP Applicants now have a choice between CMSP-Technical and CMSP-Management exams.

TO LEARN MORE ABOUT THE REQUIREMENTS AND TO APPLY, PLEASE VISIT **WWW.SIMPROFESSIONAL.ORG** OR CONTACT PATRICK ROWE AT **PROWE@NDIA.ORG**.

OPEN TO ALL ATTENDEES

I/ITSEC Tutorials are designed to serve three purposes:

- Provide foundational educational material, including material essential in preparation as a Certified Modeling & Simulation Professional (CMSP).
- Serve as a refresher and more advanced learning opportunity for those seeking to maintain their certification.
- Bring topics of special interest in Training, Simulation and Education to I/ITSEC attendees.

FOR YOUR CONVENIENCE, FOOD STATIONS ARE OPEN DURING MONDAY SESSIONS.

TUTORIALS SCHEDULE

ROOM	TRACK/CHAIR	0830 – 1000	1245 – 1415	1430 – 1600
S320A	Track 1: Architectures Robert Lutz	Introduction to HLA (1729)	TENA/JMETC: Live-Virtual-Constructive Integration for Test and Training (1716)	Distributed Interactive Simulation (DIS) 101 (1731)
S320B	Track 2: The ABCs of LVC Leah Rowe, Ph.D.	Planning and Execution of a LVC Multi-Architecture Distributed Event (1705)	Distributed LVC Event Integration and Execution (1706)	The Modern Data Center & Hybrid Cloud: Shaping the Future of Distributed Simulation (1737)
S320C	Track 3: Be Safe Don Sine, Ph.D.	Cybersecurity Trends: Protecting LVC Networks, Training and Simulation Systems (1711)	Trade Compliance in Uncertain Times—Simulation and Export Controls 2017 (1709)	The Essential Guide to Cyberspace Training (1732)
S320D	Track 4: How Good Is It? Michael Freeman, Ed.D.	Effective Face Validation Methodology to Evaluate Simulation Fidelity for Training (1722)	Addressing the Challenges of Rigorous Simulation Validation (1733)	Demystifying xAPI and Learning Analytics (1728)
S320E	Track 5: Think First L. Miguel Encarnação, Ph.D.	An Introduction to Cognitive Systems for Modeling & Simulation (1715)	Spoken-dialogue Interaction for Serious Games and Virtual Training Simulators (1735)	Simulation Conceptual Modeling Theory and Application (1703)
S320F	Track 6: The DoD Way Thomas Mastaglio, Ph.D.	Introduction to DoD Modeling and Simulation (1718)	Enterprise Solutions for M&S Asset Discovery and Reuse (1720)	
S320GH	Track 7: Fun by Design Robert Richbourg, Ph.D.	Fundamentals of Modeling and Simulation (1710)	M&S by Example: Understanding Modeling & Simulation Applications by Design (1704)	
S330G	Track 8: Age of Discovery Elaine Raybourn, Ph.D.	Team Training Environment Specification and Selection (1740)	Discovery Experimentation: What, Why, How (1744)	

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Tutorial Title is the ID tracking number.**
Nominated for Best Tutorial Award · International Author · Live Virtual Constructive · Black Swan · Cyber

TRACK 1: ARCHITECTURES
0830-1000 • ROOM S320A

Introduction to HLA

(1729)

The High-Level Architecture (HLA) is the leading international standard for simulation interoperability. It originated in the defense communities but is increasingly used in other domains. This tutorial gives an introduction to the HLA standard. It describes the requirements for interoperability, flexibility, composability and reuse and how HLA meets them. It also describes the new features of the most recent version: HLA Evolved (IEEE-1516-2010) and the upcoming HLA version (HLA 4). Finally, it provides some recent experiences of the use of HLA in NATO M&S groups as well as an overview of recent evolution of Federation Object Models for military platform simulation. This tutorial is intended for all audiences; however, some familiarity with basic principles of distributed computing is recommended.

Presenters:

BJÖRN MÖLLER is the vice president and co-founder of Pitch Technologies, the leading supplier of tools for HLA and other simulation standards. He received an M.S. in computer science and technology after studying at Linkoping University and Imperial College, London. Mr. Möller has more than thirty years of experience in high-tech R&D companies, with an international profile in modeling and simulation. His experience includes positions in SISO and IEEE standards development groups such as vice chair for HLA, chair of the Real-time Platform Reference FOM and chair of the Space Reference FOM. Mr. Möller also served as secretary in the NATO MSG-080 group for Security in Collective Mission Training.

ROBERT LUTZ is a principal staff scientist at The Johns Hopkins University Applied Physics Laboratory in Laurel, MD. His background includes 35 years of practical experience in the development, use, and management of models and simulations across all phases of the DoD systems acquisition process. He currently serves as the Airspace Integration Modeling and Simulation (M&S) lead for the Navy's Triton program and as an advisor on several LVC development projects. Mr. Lutz also served as the technical editor for IEEE 1516.2 (HLA Object Model Template) and as the product development group (PDG) chair for IEEE 1730 (DSEEP). Mr. Lutz is presently the chair of the Simulation Interoperability Standards Organization (SISO) Board of Directors, serves on the Tutorial Board and Fellows Committee at the Interservice/Industry Training, Simulation and Education Conference (I/ITSEC), and is a guest lecturer on M&S-related topics in The Johns Hopkins University Whiting School of Engineering.

TRACK 2: THE ABCs OF LVC
0830-1000 • ROOM S320B

Planning and Execution of a Large LVC Multi-Architecture Distributed Event

(1705)

Distributed simulation technologies have changed the way the DoD does RD&E, training, analysis, and testing. These technologies and associated standards have been in use for 20 years and have been documented in many forums. However a critical element that has not been widely documented is the processes and tools required to execute a large multi-architecture distributed event. There are organizations that do these types of events very well, but the only way for the new practitioner to lean these skills is to be a member of one of these teams.

This tutorial provides a guide to the planning and execution of a large multi-architecture distributed event. This guide will include the steps to planning and executing an event including design of the simulation architecture, planning integration spirals, scenario development and rehearsal, conduct of the event, data collection and analysis. While the steps described in this tutorial are applicable to all large distributed events, special emphasis will be placed on multi-architecture based events. An example will be provided showing how to select architectures and object models. This tutorial is applicable to anyone involved in the development a large test event. The material will be applicable to simulation architects, analysts, scenario developers, simulation users, and managers.

Presenter

MICHAEL J. O'CONNOR is Chief Technologist at Trideum Corporation. Mr. O'Connor has more than 25 years' experience in modeling and simulation (M&S). He has been a key participant in the development of distributed modeling and simulation standards, including IEEE 1278 and IEEE 1516. He has held many positions in the community, including chairman of the SISO Standards Activities Committee and chairman of the SISO Executive Committee. He served as the chair of the I/ITSEC Simulation Subcommittee and is the current chair of the I/ITSEC Training Subcommittee. He has led the development of multiple simulations using DIS, HLA, and TENA. Mr O'Connor has led the technical integration of several large multi-architecture distributed events that used DIS, HLA, and TENA. He holds a bachelor's degree in computer engineering from Auburn University, and a master of science in computer science from the University of Alabama in Huntsville. Mr. O'Connor is a CMSP.

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Tutorial Title is the ID tracking number.**
Nominated for Best Tutorial Award | International Author | Live Virtual Constructive | Black Swan | Cyber

TRACK 3: BE SAFE
0830 – 1000 • ROOM S320C

Cybersecurity Trends: Protecting LVC Networks, Training and Simulation Systems

(1711)

Cyber adversaries have a vast array or tools and a keen sense of when to use each one for maximum effect. You may not be able to stop all attacks but, you can minimize risk and impact of threats by constraining adversaries' operational space. Given LVC's inherently connected nature and the increasing dependence on commercial technologies, cybersecurity is critical to training and simulation.

Network flow data provides a wealth of behavioral information that is useful in understanding normal operation and detecting abnormalities. The ability to collect flow data and contextual information about users, applications and devices enables the network to serve as a powerful security resource. New technology and techniques allow today's network infrastructure to leverage embedded security capabilities to enable the entire network to serve as an invaluable security resource that can sense abnormalities and threats and automatically enforce security policies in response. Integration and communication between network control and security are absolutely essential.

Presenters

ANDREW BENHASE is the federal architect for Cyber Defense at Cisco Systems, Inc. He works across the entire Federal Government, but focuses primarily on the Department of Defense and the U.S. intelligence community. He has been with Cisco for over 18 years, focused the entire time on information assurance architectures and has spent the last 25 years working in the U.S. public sector space. His current technical focus covers Next Generation Advanced Encryption techniques for government customers and the ever-expanding area of data analytics for defensive cyber operations.

KURT KOLLMANSBERGER is a consulting systems engineer for the federal-defense area at Cisco Systems, Inc. He works with all services to identify requirements, provide technical guidance on the future direction of networking technologies and assists in implementation, testing and validation of proposed solutions. His main focus is on ISR collection and weapon systems and also works with test and training ranges across the country. He served almost 14 years in the U.S. Air Force as a communications and network engineer and over 18 years at Cisco supporting a number of different customers in the Telco, cable (MSO), satellite and U.S. defense sectors.

JOE BEEL is a strategic programs manager at Cisco Systems, Inc. He develops and implements strategies to support the U.S. public sector focusing on defense. He is a retired naval officer and served as a helicopter pilot and acquisition professional in both the Naval Air Systems Command and Space and Naval Warfare Systems Command.

TRACK 4: HOW GOOD IS IT?
0830 – 1000 • ROOM S320D

Effective Face Validation Methodology to Evaluate Simulation Fidelity for Training

(1722)

Simulation credibility is measured by verification and validation (V&V) and formally approved as adequate for use in a particular application by accreditation. Validation ensures that a simulation conforms to a specified level of accuracy when its outputs are compared to some aspect of the real world in the perspective of the intended uses of the model. The goal of this tutorial is to assist the DoD and industry partners to develop an informed, thorough, and independent judgment about how credible training simulations are for their intended audiences to ensure training solutions meet their training needs. V&V methods vary greatly throughout the DoD and industry. Some are performed better than others. Seldom are the validations directly connected to training front end analyses. This tutorial will present a method implemented and improved upon over several years by USMC Training and Education Command (TECOM) and Program Manager Training Systems (PM TRASYS) to accredit training simulations systems. The methodology provides a thorough evaluation that can be used for training simulation in DoD and any industry to reduce V&V costs and prioritize simulation development.

Presenters

NATHAN JONES is the Functional Lead for Instructional Systems at MARCORSYSCOM PM TRASYS. Mr. Jones has 15 years of experience in human performance, human-systems integration, assessments, and acquisition program support. He is responsible for overseeing PM TRASYS' training front end analyses, training effectiveness evaluations (TEEs), and serves as M&S Proponent lead for VV&A efforts.

ALEX ARRIETA is the accrediation agent for USMC Training and Education Command, Training and Education Capabilities Division. Alex is responsible for organizing, coordinating, and executing a comprehensive VV&A program for Marine Corps training systems to guarantee the credibility of USMC training solutions as the accrediting agent defines accrediting criteria.

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Tutorial Title is the ID tracking number.**
Nominated for Best Tutorial Award | International Author | Live Virtual Constructive | Black Swan | Cyber

TRACK 5: THINK FIRST
0830 – 1000 • ROOM S320E

An Introduction to Cognitive Systems for Modeling and Simulation

(1715)

There are increasing requirements for automated reasoning abilities across the broad spectrum of modeling and simulation, as well as in battlefield information and control systems. Additionally, the cognitive capabilities that have been developed and tested in simulation are migrating to real-world systems. Cognitive systems represent a maturing computational approach to intelligence that can provide robust, scalable, and adaptive decision making. This tutorial provides an introduction to cognitive systems, concentrating on production system computation and high-level design of human-like reasoning systems. We draw examples and comparisons from existing cognitive systems, focusing on the tradeoffs between cognitive and non-cognitive modeling approaches. The tutorial content does not require any specialized knowledge, but some experience with software engineering or behavior modeling can be helpful. Attendees will learn to recognize problems that suggest cognitively-based solutions, and they will be better able to assess risks, costs, and benefits of different approaches. This tutorial is targeted toward developers interested in cognitive approaches to software engineering, as well as customers who have problems that may be amenable to a cognitive approach.

Presenters

RANDOLPH M. JONES, Ph.D., Senior Artificial Intelligence Engineer at Soar Technology, Inc. is a leading developer of knowledge-rich intelligent agent software. He has been principal investigator for a variety of advanced R&D projects for ONR, ARI, DMSO, DARPA and other agencies. He has previously held positions at Colby College, the University of Michigan, the University of Pittsburgh, and Carnegie Mellon University. His areas of research include computational models of human learning and problem solving, executable psychological models, and full-spectrum intelligent behavior models. He earned a BS in Mathematics and Computer Science at UCLA, and MS and Ph.D. degrees from the University of California, Irvine.

DYLAN SCHMORROW, Ph.D., Chief Scientist at Soar Technology, Inc. leads the effort to build intelligent systems for defense, government, and commercial applications that emulate human decision making. He also serves as a Potomac Institute for Policy Studies Senior Fellow, Editor of the Theoretical Issues in Ergonomics Journal, and the Technical Advisor for the Applied Human Factors and Ergonomics Conference Series. He is a leading expert on national security research, technology, and policy related to information technology, medical research and human performance applications. Past service includes OSD, DARPA, NAWC, NRL, ONR, NPS as well as MS degrees in Psychology and Philosophy. He retired from the US Navy as a Captain in 2013.

TRACK 6: THE DOD WAY
0830 – 1000 • ROOM S320F

Introduction to DoD Modeling and Simulation

(1718)

This tutorial will describe the fundamental technologies, terms and concepts associated with Modeling and Simulation (M&S); and describe M&S development and application in the Department of Defense (DoD). It will discuss various aspects of M&S use and interoperability, presenting their role in enabling DoD functions and enhancing reuse.

This tutorial will identify key policies and procedures for DoD M&S, and present the Verification, Validation and Accreditation (VV&A) process that ensures that models and simulations meet the needs of their users. It will present the role of DoD M&S standards in DoD M&S tools and functional use; and the relationship to the Joint Information Enterprise (JIE) and cloud-based DoD IT. It will describe the characteristics and associated challenges of M&S and applications within the DoD functional areas of: Training, Analysis, Acquisition, Test and Evaluation, Experimentation, Medical, Planning and Intelligence. This tutorial will also identify accessible DoD M&S information resources.

Presenter

JOHN DALY is a senior engineer with Booz Allen Hamilton. He currently leads a team providing modeling and simulation technical and policy support to the Defense Modeling and Simulation Coordination Office. He has worked with OSD, Joint Staff, COCOM, Service, and DISA clients in the development of simulation systems for training, operational decision support, visualization of complex phenomena, test and evaluation, and performing acquisition functions. John also worked as a research engineer at the Naval Research Laboratory; specializing in advanced simulation-based C2 training, WMD analysis applications, and EW technologies.

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Tutorial Title is the ID tracking number.**
Nominated for Best Tutorial Award | International Author | Live Virtual Constructive | Black Swan | Cyber

TRACK 7: FUN BY DESIGN
0830 – 1000 • ROOM S320GH

Fundamentals of Modeling and Simulation

(1710)

This tutorial has been designed by a team of subject matter experts to prepare attendees to understand the scope of I/ITSEC presentations and demonstrations. It provides definitions of widely-used technical terms, while explaining the range and types of models and simulations that are commonly applied in the M&S domain. The tutorial reviews fundamental simulation support technologies, major simulation architectures (HLA, TENA, DIS), the basics of instructional design, a description of the major standards and best practices available for use across the M&S problem space, and a brief presentation of resources that can provide further information. The tutorial introduces several topics that are examined more extensively in other tutorials.

The tutorial is designed to be technically focused and is not intended to overview management or governance of M&S within the U.S. DoD.

Presenters

JAMES E. COOLAHAN, Ph.D., is the Chief Technology Officer of Coolahan Associates, LLC, having retired from full-time employment at the Johns Hopkins University Applied Physics Laboratory (JHU/APL) in December 2012 after 40 years of service. He has chaired the conference committee of the Simulation Interoperability Standards Organization, and teaches courses in M&S for systems engineering in the JHU Engineering for Professionals M.S. program. He holds B.S. and M.S. degrees in aerospace engineering from the University of Notre Dame and the Catholic University of America, respectively, and M.S. and Ph.D. degrees in computer science from JHU and the University of Maryland, respectively.

S. K. NUMRICH, Ph.D., CMSP, holds an A.B., M.A. and Ph.D. in physics and worked as a research physicist at the Naval Research Laboratory plying her trade in a variety of fields including underwater sound in the Arctic (yes, aboard ship), fluid-structure interactions, parallel processing, modeling and simulation and virtual reality. She served as technical director at the Defense Modeling and Simulation Office before leaving government service and joining IDA.

ROBERT RICHBOURG, Ph.D., is a member of the research staff at the Institute for Defense Analyses. He is a retired Army officer who holds a B.S. in Mathematics, and M.S. and Ph.D. degrees in computer science. In his last active duty assignment, he was an academy professor and director of the Artificial Intelligence Center at the United States Military Academy, West Point. He is a past chair of the I/ITSEC Tutorial Board, the I/ITSEC Simulation Subcommittee and multiple SISO committees.

TRACK 8: AGE OF DISCOVERY
0830 – 1000 • ROOM S330G

Team Training Environment Specification and Selection

(1740)

Delivering effective military capability to counter increasingly diverse threats has never been more challenging, with fiscal constraints driving the need for ever greater efficiency in training provision. The aim of this tutorial is to show how the training environment model can be used to provide a structured framework for developing training environment specifications which facilitate the development and evaluation of effective training environments. The training environment model guides the identification of the key attributes of the physical and information environments within which our war-fighters operate, the means with which they interact with these environments, and the other significant actors in the environment. It also facilitates the identification of the key training environment features required to support training delivery (such as setting up and controlling the environment, monitoring performance and after action review). By identifying the key attributes of each of these elements that have to be specified, it becomes possible to explore how Live, Synthetic and Constructive substitutions can best be made to deliver training environments which challenge war-fighters in credible, demanding and engaging scenarios, whilst providing assurance of the capability that is being developed.

Presenter

JOHN HUDDLESTONE, Ph.D., is a senior research fellow in the Human Systems Integration Group within the Mobility and Transport Faculty Research Centre of the Engineering, Environment and Computing Faculty at Coventry University in England. A former Royal Air Force Officer, he has extensive experience of training analysis, design and delivery in both aviation and engineering domains. During his subsequent academic career he has led research into a broad spectrum of military training issues, spanning individual, team, collective and joint levels. A co-author of the Team and Collective Training Needs Analysis Methodology, his research interests include team training, human factors methods and aviation human factors. He holds a Ph.D. in applied psychology from Cranfield University, a Masters degree in computing science from Imperial College, London and Bachelors degree in education from Notting Trent University. He is a chartered IT professional and member of the British Computer Society.

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Tutorial Title is the ID tracking number.**
Nominated for Best Tutorial Award | International Author | Live Virtual Constructive | Black Swan | Cyber

TRACK 1: ARCHITECTURES
1245 – 1415 • ROOM S320A

TENA/JMETC: Live-Virtual-Constructive Integration for Test and Training

(1716)

The Test and Training Enabling Architecture (TENA) and the Joint Mission Environment Test Capability (JMETC) program provide an advanced set of interoperability software, interfaces, and connectivity for use in joint distributed testing and training. This tutorial will provide information about the how TENA works and why it is important to the test and training communities, with some comparison to other interoperability architectures. TENA provides testers and trainers software such as the TENA Middleware—a high-performance, real-time, low-latency communication infrastructure that is used by training range instrumentation software and tools during execution of a range training event. The standard TENA Object Models provide data definitions for common range entities and thus enables semantic interoperability among training range applications. The TENA tools, utilities, adapters and gateways assist in creating and managing an integration of range resources. The current version of the TENA Middleware, Release 6.0.5, is being used by the range community for testing, training, evaluation, and feedback and is be used in major exercises in the present.

JMETC is a persistent test and evaluation capability throughout the U.S. DoD, connecting many test ranges together, including a bridge to the JTEN training network; a set of TENA-compliant software middleware, interfaces, tools, and databases; and a process for creating large distributed test events. The combination of TENA and JMETC gives testers and trainers unprecedented power to craft a joint distributed mission environment that forges the future for innovative testing and training.

Presenter

ED POWELL, Ph.D., is a lead architect for the Test and Training Enabling Architecture. After receiving his Ph.D. in astrophysics from Princeton University, he worked for the Lawrence Livermore National Laboratory performing simulation-based analysis. He moved to SAIC (now Leidos) in 1994, and participated as lead architect in some of the most complex distributed simulation programs in DoD, including the Joint Precision Strike Demonstration (JPSD), the Synthetic Theater of War (STOW), the Joint Simulation System (JSIMS). He then worked in the intelligence community on architectures for integrating large-scale diverse ISR systems. He has been the lead architect for TENA for fifteen years, and is currently working on expanding the applicability of TENA, and integrating TENA with broader DoD-wide data management and big data analysis systems. Currently, he owns his own consulting company specializing in simulation and systems architecture and engineering.

TRACK 2: THE ABCs OF LVC
1245 – 1415 • ROOM S320B

Distributed LVC Event Integration and Execution

(1706)

Integration and execution of large distributed Live, Virtual, Constructive (LVC) events consume substantial time and resources. While the underlying distributed LVC technologies are mature, the processes for integrating events are not. The IEEE Std 1730-2010 Distributed Simulation Engineering and Execution Process (DSEEP) standard presents a process model for the development of an event. However, the user still has to instantiate the process and develop artifact templates.

Based on the experience of the integration and execution of many distributed LVC events, an instantiation of two of the seven DSEEP steps has been developed. This tutorial provides a detailed set of processes, templates, and guidance on how to perform step 5 Integration and Test Simulation Environment and step 6 Execute Simulation steps. The tutorial also describes how the products produced in the first 4 steps are used the subsequent steps. The process covers the integration of simulations and tactical systems to meet the objectives of the LVC event.

This tutorial is beneficial for anyone involved in the integration and execution of large distributed events. The tutorial is particularly beneficial for engineers tasked with planning and executing distributed events. The tutorial does not require knowledge of the DSEEP standard.

Presenter

MICHAEL J. O'CONNOR is Chief Technologist at Trideum Corporation. Mr. O'Connor has more than 25 years' experience in modeling and simulation (M&S). He has been a key participant in the development of distributed modeling and simulation standards, including IEEE 1278 and IEEE 1516. He has held many positions in the community, including chairman of the SISO Standards Activities Committee and chairman of the SISO Executive Committee. He served as the chair of the I/ITSEC Simulation Subcommittee and is the current chair of the I/ITSEC Training Subcommittee. He has led the development of multiple simulations using DIS, HLA, and TENA. Mr O'Connor has led the technical integration of several large multi-architecture distributed events that used DIS, HLA, and TENA. He holds a bachelor's degree in computer engineering from Auburn University, and a master of science in computer science from the University of Alabama in Huntsville. Mr. O'Connor is a CMSP.

KENNETH G. LESUEUR, Ph.D., serves as the chief technologist in the Subsystems Test Division at the U.S. Army Redstone Test Center. His work and research have been concentrated in HWIL testing, distributed testing, modeling and simulation, and high performance computing. He received his master's degree and doctorate in computer engineering at the University of Alabama in Huntsville.

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Tutorial Title is the ID tracking number.**
Nominated for Best Tutorial Award | International Author | Live Virtual Constructive | Black Swan | Cyber

TUTORIALS

TRACK 3: BE SAFE
1245 – 1415 • ROOM S320C

Trade Compliance in Uncertain Times – Simulation and U.S. Export Controls 2017

(1709)

As 2017 dawned, a new administration brought additional uncertainty to the ongoing Export Control Reform process as well as the foreign policy and national security issues that serve as the foundation of the ITAR and the EAR. This tutorial will focus on understanding the application of the ITAR and the EAR as well as the potential changes associated with new leadership in Washington D.C. Proposed revisions to key definitions such as "defense services", "technical data", "public domain" and "export" and questions concerning ITAR U.S. Munitions List coverage and sanctions remain on the horizon and counsel continuing vigilance and education in this area. The tutorial will examine the scope of the U.S. export laws, how the U.S. Government applies them to the simulation industry, including controls on software, hardware, services and activities at trade shows such as I/ITSEC, as well as discuss examples of products and services, and associated licensing strategies, in this shifting regulatory environment.

Presenter

JEREMY K. HUFFMAN, J.D., is a founding member and partner of Huffman Riley PLLC. Mr. Huffman concentrates his practice advising U.S. and foreign clients concerning all aspects of the U.S. export control laws, including the International Traffic in Arms Regulations (ITAR); Export Administration Regulations (EAR); and the Office of Foreign Assets Control (OFAC) regulations. Mr. Huffman has extensive experience assisting high technology, defense industry and other clients to navigate applicable U.S. export statutes and regulations. Mr. Huffman earned his Juris Doctorate from the University of Virginia School of Law in 1997.

TRACK 4: HOW GOOD IS IT?
1245 – 1415 • ROOM S320D

Addressing the Challenges of Rigorous Simulation Validation

(1733)

The process of validation is essential to the credible and reliable use of any simulation. Although Department of Defense policy and guidance increasingly emphasizes the importance of rigorous validation founded in the application of strong statistical analysis, implementation of rigorous validation continues to face multiple challenges. This tutorial will address several of those challenges:

- How to identify, collect, and combine validation referent data (against what will the simulation results be compared)
- How to identify the simulation measures and metrics to use as the basis of comparison (the aspects of the results that will be compared to the referent)
- Methods for performing the results/referent comparison
- How to quantify risk and residual uncertainty associate with the application of the simulation

The tutorial will enhance the learning experience by incorporating lessons learned derived from the many VV&A applications with which the authors have been involved.

Presenters

SIMONE M. YOUNGBLOOD is a member of the Johns Hopkins Applied Physic Laboratory's principal professional staff. Leveraging an extensive background in simulation development and credibility assessment, Simone Youngblood has served as the DoD VV&A focal point for the past 20 years. Ms. Youngblood was the editor of the DoD VV&A Recommended Practices Guide and chaired the development of several VV&A related standards including: IEEE Standard 1278.4, IEEE Standard 1516.4 and MIL-STD 3022. Ms. Youngblood has served as the V&V and/or Accreditation agent for numerous M&S efforts that span a broad organizational spectrum to include: DTRA, DNDO, and NAVAIR. Ms. Youngblood has a B.A.in mathematics as well as B.S. and M.S. degrees in computer science.

MIKEL D. PETTY, Ph.D., is currently a senior scientist for modeling and simulation at the University of Alabama in Huntsville's Information Technology and Systems Center and an associate professor of computer science. Prior to joining UAH, he was chief scientist at Old Dominion University's Virginia Modeling, Analysis, and Simulation Center and assistant director at the University of Central Florida's Institute for Simulation and Training. He received a Ph.D. in Computer Science from the University of Central Florida in 1997. Dr. Petty has worked in modeling and simulation research and education since 1990 in areas that include verification and validation methods, simulation interoperability and composability, and human behavior modeling. He has published over 200 research papers and has been awarded over $16 million in research funding. He is a Certified Modeling and Simulation Professional and is editor-in-chief of the journal SIMULATION: Transactions of the Society for Modeling and Simulation International.

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Tutorial Title is the ID tracking number.**
Nominated for Best Tutorial Award | International Author | Live Virtual Constructive | Black Swan | Cyber

TRACK 5: THINK FIRST
1245 – 1415 • ROOM S320E

Spoken-dialogue Interaction for Serious Games and Virtual Training Simulators

(1735)

Recent advances in deep learning have opened people's minds to new levels of interaction within many Virtual Training Environments (VTEs)/Serious Games. Unfortunately, allowing users to fully interact through speech is a challenge for computers, particularly when the task is unconstrained or performed under adverse conditions. Speech is therefore often neglected as a modality, in spite of its naturalness. Furthermore, user-based evaluations of speech interfaces are intrinsically difficult. The recent AI revolution brings hope that, despite these shortcomings, there will at least be some areas of R&D that will lead to real improvements in both the design and implementation of spoken interactions in training systems.

Presenters

COSMIN MUNTEANU is an assistant professor at the Institute for Communication, Culture, Information, and Technology (University of Toronto at Mississauga). Until 2014 he was a research officer with the National Research Council of Canada. His area of expertise is at the intersection of automatic speech recognition (ASR) and human-computer interaction (HCI), having extensively studied the human factors of using imperfect speech recognition systems, and having designed and evaluated systems that improve humans' interaction with immersive technologies through speech and natural language (such as advanced learning systems and mixed reality training simulators). His multidisciplinary interests include speech and natural language interaction for mobile devices, mixed reality systems, learning technologies for marginalized users, and assistive technologies. He has authored numerous publications in HCI, ASR, and computational linguistics.

GERALD PENN is a professor of computer science at the University of Toronto, and a visiting research scientist at the International Computer Science Institute at the University of California, Berkeley. His research interests are spoken language processing and mathematical linguistics. He is a past recipient of the Ontario Early Researcher Award, a senior member of IEEE, a senior member of AAAI, and has led numerous research projects funded by Avaya, Bell Canada, CAE, the Connaught Fund, Microsoft, Natural Sciences and Engineering Research Council of Canada, the German Ministry for Training and Research, SMART Technologies, the U.S. Army and the Office of the Director of National Intelligence.

TRACK 6: THE DOD WAY
1245 – 1415 • ROOM S320F

Enterprise Solutions for M&S Asset Discovery and Reuse

(1720)

Reuse of M&S assets, such as models, simulations, data, and related items, is critical to providing cost-effective M&S solutions for mission needs. The first step in reuse is to gain visibility into what assets exist, and then to have mechanisms to access them. However, most M&S practitioners and managers are largely unaware of the wealth of M&S assets that exist, and they don't know where to go to find them.

The U.S. DoD and allied militaries have made significant advances recently to more effectively support discovery and reuse of assets across the M&S enterprise. Following sound industry practices and official guidance, a set of federated discovery and access mechanisms have been developed, allowing unprecedented national and international collaboration while respecting distribution limitations. Those attending this tutorial will learn the state of the art and future plans of current discovery and reuse tools, how to use them, and how to access M&S assets found in them. Attendees will also learn how they can make their own assets available to others for reuse. The tutorial will begin with the motivation and business case for M&S asset reuse, and then through descriptions and demonstrations, show how M&S assets can be discovered and accessed.

Presenters

ROY SCRUDDER is the Program Manager for the M&S Engineering Group at the Applied Research Laboratories, The University of Texas at Austin (ARL:UT). He has over 30 years' experience in information systems analysis and development, concentrating the last 20 years in information management for M&S. Mr. Scrudder's professional experiences are in the areas of system engineering, data management, and data engineering. Recent projects with which he has provided expertise include Enterprise Data Services, Integrated LVC Test Environment, and Integrated Training Environment Product Line Data Management. Mr. Scrudder holds a Bachelor of Science degree in Applied Mathematics from the University of Tennessee.

HART RUTHERFORD is the Director of the Technology Solutions Group at SimVentions Inc., which delivers analysis, engineering, and modeling and simulation (M&S) products and services. He has over 25 years of defense combat systems engineering and program management experience. In support of the Defense Modeling and Simulation Coordination Office (DMSCO), his team is the co-developer of the Defense M&S Catalog and provides ongoing research and development of new operational concepts, web-based tools, and metadata standards to improve the discovery, sharing, and reuse of M&S resources. He holds a Master's degree in Systems Engineering from Old Dominion University (ODU) and is currently a Ph.D. student at ODU researching the performance and governance of complex systems.

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Tutorial Title is the ID tracking number.**
Nominated for Best Tutorial Award | International Author | Live Virtual Constructive | Black Swan | Cyber

TUTORIALS

TRACK 7: FUN BY DESIGN
1245 – 1415 • ROOM S320GH

M&S by Example: Understanding Modeling & Simulation Applications by Design

(1704)

A Model is the representation of an actual system and is used to predict a future state, often for purposes of decision-making; Simulation is the imitation of the operation of a system over time. This "Yin-Yang" relationship underscores the inherent complexity of successfully employing M&S in application domains for training, analysis and engineering. Real-world examples serve as effective instructional mechanisms to improve comprehension by reducing cognitive load during skill acquisition. Accordingly, a high-level overview of M&S "by Example" serves as the primary impetus for this tutorial. Introductory material will be presented using examples from traditional M&S application domains. An intermediate example will provide a regional connection by demonstrating core M&S principles that underlie thrill ride (entertainment) design technologies. Finally, an advanced "Black Swan" weather event scenario will be surmised, and elements of the associated M&S analysis will be suggested. The "Understanding by Design" (UbD) framework establishes learning outcomes to design effective training curricula, and will be leveraged for the construction and delivery of this tutorial. Overall, this presentation will serve as a broad introduction to many fundamental techniques critical to M&S, and accordingly, will closely adhere to the current CMSP curriculum.

Presenter

KEVIN F. HULME, Ph.D, CMSP, received his degree from the Department of Mechanical and Aerospace Engineering at the University at Buffalo (UB), specializing in multidisciplinary analysis and optimization of complex systems. Kevin currently serves as the Director of the School of Engineering and Applied Sciences Motion Simulation Laboratory at UB. Research and training focus areas include: applied modeling and simulation, standardization of simulation in teen driver safety, fidelity requirements in simulation system specification, multi-participant civilian driving simulation, transportation safety and human factors research, autonomous and connected vehicles, M&S approaches in STEM and experiential learning, Gamification and wearable device technologies for simulation-based training and education, and multi-measure assessment of distractions on driver performance. In November of 2015, Kevin became a Certified Modeling and Simulation Professional (CMSP).

TRACK 8: AGE OF DISCOVERY
1245 – 1415 • ROOM S330G

Discovery Experimentation: What, Why, How

(1744)

Discovery experimentation is a process for using simulation to place emerging technologies in the hands of warfighters engaged in virtual battlefields to explore the military utility of new concepts for using emerging systems. Discovery experimentation is designed to allow learning and modification from trial to trial and in that way differs significantly for both traditional scientific experimentation and technology demonstrations. It can be used to explore military utility of new technologies, development of new tactics, techniques and procedures for emerging systems, definition of requirements for control devices for new systems, and consequent needs for new training. This tutorial will define the notion, utility and implementation of discovery experimentation by walking through a multi-trial discovery experiment completed in 2016 to test a new concept in close air support. The tutorial will demonstrate how the learning from one trial to another was used to refine both the initial concept and the requirements for an interface device to be used with actual, emerging systems. The discovery experimentation is important for exploring joint warfighting capabilities as individual service technologies are being developed and should be considered as a key component in the overall acquisition process for emerging technology.

Presenters

S. K. NUMRICH, Ph.D., CMSP, has been a member of the research staff at the Institute for Defense Analyses since 2005. She is a research physicist with a background in underwater acoustics, environmental factors and modeling, and computer simulation. A former technical director at the Defense Modeling and Simulation Office, she has a strong background in distributed simulation and issues in VV&A. She managed the development of mine warfare components for Maritime JSAF and has served on simulation committees for The Technical Cooperation Program, NATO's Research and Technology Board and I/ITSEC.

KEVIN WOODS, Ph.D., has been a member of IDA's research staff since his separation from the U.S. Army in 2005. His initial degree from Auburn is in Organizational Management followed by an M.A. in National Security and Strategic Studies and Ph.D. in history from the University of Leeds, UK. He served as concept developer for Experimentation at JFCOM and led the discovery experimentation team on novel concepts in close air support completed by IDA for the Air Force in 2016. He is a frequent speaker and lecturer on strategic studies.

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Tutorial Title is the ID tracking number.**
Nominated for Best Tutorial Award | International Author | Live Virtual Constructive | Black Swan | Cyber

TRACK 1: ARCHITECTURES
1430 – 1600 • ROOM S320A

Distributed Interactive Simulation (DIS) 101

(1731)

This Distributed Interactive Simulation (DIS) protocol is an IEEE standard for packet-level exchange of information between military simulations. DIS facilitates simulation interoperability through a consistent over-the-wire format for information, widely agreed upon constant enumeration values, and community consensus semantics. Anyone can obtain the IEEE-1278 standard and implement their own compliant, interoperable, DIS application. A large variety of tools and codebases simplify this effort, and enable multi-architecture integration of simulations using the DIS stand baseline. DIS focus begins with real-time, physics-based, entity-scale simulations, providing state update and interaction mechanisms which can scale to large virtual environments.

This tutorial is a "DIS 101" introduction for software implementers and an introduction to the DIS philosophy for simulation systems integrators.

Presenter

RANDY SAUNDERS is a member of the Principal Professional Staff at the Johns Hopkins University Applied Physics Laboratory. He is a research analyst and assistant group supervisor specializing on information technology efficiencies and simulation architectures across the DoD and intelligence community. Technical experience with software aspects of sonar acoustics, electronic flight controls, information security (both computer assurance and application of cryptography), geographic data analysis/visualization, human interfaces, and Internet development/delivery/security. Industry experience in building/managing teams of many companies and almost 30 year's experience with development of standards through IEEE and SISO to facilitate collaboration. Instructor of Software Systems Engineering course in JHU Whiting School of Engineering, graduate school Engineering for Professionals for the past 13 years, and course manager responsible for the course content for the past 7 years.

TRACK 2: THE ABCs OF LVC
1430 – 1600 • ROOM S320B

The Modern Data Center & Hybrid Cloud: Shaping the Future of Distributed Simulation

(1737)

Modern network architectures are changing the way highly interactive applications are designed, deployed, and delivered. The three fundamental functions of networking – compute, store, and transport are converging and are now device agnostic. Further, virtual machine technology allows a single device to perform multiple roles within the architecture including supervisory functions, operations, and security.

Within the modern simulation architecture, software defined networking efficiently utilizes architecture resources as workload assignment is dynamically adjusted ensuring delivery of the quality of service required to achieve the realism demanded as thousands; tens of thousands; or hundreds of thousands of entities interact via physics-based models.

In large-scale simulation environments, assuring the moment-by-moment integrity of the architecture and authenticity of participants through dynamic multi-epoch interaction cycles is a must. Both are possible with technologies that continuously monitor application performance and connection authenticity. These rationalization and telemetry functions act as checks and balances verifying that interactive engagement pairings are accurate validating the integrity of the simulation.

Data center and hybrid cloud architectures capable of supporting these highly distributed operations efficiently, effectively and securely are available for implementation will be presented.

Presenters

CHUCK LOUISELL, Ph.D., is a strategic programs manager at Cisco Systems, Inc. Chuck served as a USAF Weapons School instructor and in squadron and training group command positions. At Cisco, Chuck works across multiple product lines including data center and cloud.

CHUCK OTTS is a data center specialist for the Federal-Defense Area at Cisco Systems, Inc. He primarily works with the Air Force and System Integrators providing technical guidance on the future of data center architectures, orchestration, and security products.

TRACK 3: BE SAFE
1430 – 1600 • ROOM S320C

The Essential Guide to Cyberspace Training

(1732)

U.S. and international defense leaders continue to emphasize the importance of representing realistic cyberspace conditions and conducting integrated cyberspace operations during exercises. Concurrently, governments, industry, and academia are rapidly developing potential solutions to these requirements. How well do trainers and exercise planners understand these solutions, leverage them to meet overarching mandates and their specific requirements, and incorporate them into legacy plans, processes, and procedures? What are the challenges to successfully deploying these environments? What is the future of cyberspace operations training? This tutorial explains the basics of cyber training environments and how to integrate cyber ranges, simulations, and emulations into exercises. It provides a foundation to help organizations define, plan, and execute cyber training events. It identifies best practices of cyberspace training as well as methods of integrating cyber range events into battle staff training exercises. This tutorial will aid anyone involved with designing and executing cyber training events – leaders, planners, cyber warriors, service providers, and general users – who provide or rely on cyberspace capabilities to accomplish their mission.

Presenters

DAVID "FUZZY" WELLS, Ph.D., is the director of U.S. Pacific Command's Cyber War Innovation Center (CWIC) and lead for the Cyber Operational Architecture Training System (COATS). A retired Air Force (AF) officer, his past assignments include: Chief Scientist for Research and Development at the Joint Warfare Analysis Center; Chief of Ops Assessment at AF Central Command's Combined Air & Space Ops Center; Chair of Ops Research Group, Director of Modeling & Simulation (M&S) Education and Assistant Professor of Computer Science at the USAF Academy; and AF M&S lead for U.S. Joint Forces Command's Millennium Challenge experiment while at the AF Agency for M&S. He has served as exercise designer and senior controller for battle staff training exercises worldwide. He was the first AF officer to obtain a Ph.D. in Modeling, Virtual Environments and Simulation from the Naval Postgraduate School. He earned the first M.S. in M&S from the AF Institute of Technology. He is a Certified M&S Professional Charter Member and a National M&S Coalition Plankholder.

DEREK BRYAN has provided direct support to the USPACOM J81 – Joint Innovation and Experimentation program since 2005. In this role he is responsible for the research, testing, and assessment of innovative solutions to USPACOM capability gaps. Mr. Bryan is currently providing project management and engineering support to the CWIC and the COATS project. Mr. Bryan has a B.S. in Computer Science from James Madison University and an M.E. in Modeling and Simulation from Old Dominion University.

TRACK 4: HOW GOOD IS IT?
1430 – 1600 • ROOM S320D

Demystifying xAPI and Learning Analytics

(1728)

Learning happens everywhere: in classrooms and training ranges, web-browsers and videos, on smartphones and their many apps, in VR and AR, and a dozen new technologies released each year. Ideally, learning assessment also occurs across these numerous platforms—but what happens to those data? Too often little-to-no learning assessment occurs; instead, learners may get a "check box" for completion. Even when meaningful evaluation takes place, those data are often locked into silos—trapped in a thousand different spreadsheets, simulators, learning management systems, and databases. If we could enable better learning assessment, and integrate people's assessment data from across their formal, informal, and on-the-job learning experiences, we could gain powerful insights for training, education, and human capital management.

This tutorial discusses capabilities related to these goals. Specifically, the tutorial will introduce (non-technical) participants to learning analytics and the associated Experience Application Programming Interface (xAPI) technical data specification. xAPI lets applications capture and share (big) data on human performance, along with associated instructional content and performance context information. Combined with learning analytics, these tools promise to revolutionize the way training and education is conducted, managed, and measured.

More precisely the tutorial will include an introduction to xAPI, a comparison between xAPI and SCORM, an introduction to learning analytics, and a preview about the future Total Learning Architecture.

Presenter

SAE SCHATZ, Ph.D., serves as the Director of the Advanced Distributed Learning (ADL) Initiative, a program under the Deputy Assistant Secretary of Defense for Force Education and Training. This session's co-presenters also work for the ADL Initiative.

JASON HAAG and **JONO POLTRACK** are long-time members of its contractor-support staff, and both have played instrumental roles in the development and governance of xAPI.

JENNIFER VOGEL-WALCUTT, Ph.D., is the Director of Innovation at the ADL Initiative. She has over 15 years of experience in research and development for training and education with specific interests in applying instructional techniques to improve cognition and educational development.

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Tutorial Title is the ID tracking number.**
Nominated for Best Tutorial Award | International Author | Live Virtual Constructive | Black Swan | Cyber

TRACK 5: THINK FIRST
1430 – 1600 • ROOM S320E

Simulation Conceptual Modeling Theory and Application

(1703)

Simulation conceptual modeling is a critical step in simulation development frequently overlooked in the rush to demonstrate program progress. A simulation conceptual model is an abstraction from either the existing or a notional physical world that serves as a frame of reference for further simulation development by documenting simulation-independent views of important entities and their key actions and interactions. A simulation conceptual model describes what the simulation will represent, the assumptions limiting those representations, and other capabilities needed to satisfy the stakeholder's requirements. It bridges between these requirements, and simulation design.

This tutorial will present the theory and application of simulation conceptual modeling as documented during the research done by the NATO MSG 058. In addition, Use Cases that have been drawn from previous conference presentations will be presented to illustrate how conceptual modeling has been performed. Additional work is necessary to mature the state-of-the-art of simulation conceptual modeling before a recommended practices guide could be standardized. This tutorial has been created to continue the maturation of the simulation conceptual modeling best practices.

Presenter

JAKE BORAH is the co-owner of Borah Enterprises LLC. He is a master interoperability engineer for Navy Air Warfare Center Training Systems Division (NAWCTSD) Synthetic Training and Inoperability Integrated Product Team. Jake has frequently supported U.S. and Canadian government sponsored military simulation projects because of his mastery of the M&S technology, and expertise in High Level Architecture federation development. He has a B.S. from the United States Air Force Academy and a Master of Aeronautical Science degree from Embry-Riddle Aeronautical University.

TUESDAY, 28 NOVEMBER

ALL PAPERS ARE ELIGIBLE FOR CEU/CLP CREDITS (SEE PAGE 39)

ROOM	SESSION/CHAIR	1400	1430	1500
S320A	H1 Hear, See and Sense No Evil J. Robert Bois, Ph.D.	Auditory Performance of Individuals with Reduced Hearing Capability in Virtual Reality Environment (17039)	Eye Tracking Feedback to Enhance Visual Search Training (17275)	Multimodal Assessment of Pilots' Affective States using Psycho Physiological Sensor Signals and Facial Recognition Analysis (17008)
S320B	S1 Augmented Reality Alyssa Tanaka, Ph.D.	Analyzing SLAM Algorithm Performance for Tracking in Augmented Reality Systems (17161)	Most Effective Capabilities of Head Mounted Displays for Dismounted Soldier Training Using Augmented Reality (17055)	Expert-Assisted Field Maintenance using Augmented Reality (17262)
S320C	EC1 Trouble with Data Harry Sotomayor	GeoPackage: Unifying Modeling and Simulation with Mission Command Geospatial Data (17065)	3D Scanning and Navy Ships: An Immediate and Outward Look at Utilization (17052)	Marine Forensics: The Art and Science of Simulating Ships in Storms (17086)
S320E	T1 Optimizing Team Performance Thomas Yanoschik	Increasing Cognitive Readiness in Joint Command Battle Staffs (17048)	Assessment Instruments in Support of Marine Instructor Development (17180)	Systematic Team Assessment Readiness Training: Live, Virtual, Constructive Distributed Missions (17229)
S320F	P1 Data and Delivery: Addressing the Challenges Emilie Reitz	Achieving Actionable Information in a Complex Operational Environment (17153)	Considering Training as a Service within the Acquisition Strategy (17156)	A Cloud Computing Business Case Analysis for Existing Training Systems (17053)

ROOM	SESSION/CHAIR	1600	1630	1700
S320A	H2 Build, Test and Perform Adelle Lynch	Comparing Visual Assembly Aids for Augmented Reality Work Instructions (17208)	A Multi-method Approach to Evaluating Human-system Interactions during Operational Testing (17267)	Reprocessability and Engagement: Comparing Text to Human Forms for Information Conveyance (17187)
S320B	S2 Radar Simulation Craig Siefert	GPU Ray Tracing-based Method for Real-time ISAR simulation (17237)	Enhanced Aerial Radar Line of Sight Performance (17051)	
S320C	EC2 Discovering Transformative Architectures Richard Blum	IDE-Forward: A Persistent Force-On-Force Training Field Test Environment (17184)	Emerging Network and Architecture Technology Enhancements to Support Future Training Environments (17033)	Innovation through Discovery Experimentation (17317)
S320D	ED2 Obstacles and Surprises: Overcoming Rhianon Dolletski-Lazar	Overcoming Educational Obstacles to the Achievement of the Future Special Operator Concept (17063)	Black Swans: Disruption of Power (17174)	Leading Learning in the Workplace: Who's in Charge? (17011)
S320F	P2 Standards and Policy: Setting the Bar John Dzenutis	Exploration of Next Generation Technology Application to Modeling and Simulation Study Group (17045)	Standardizing Human Performance Measurement for Ease of Data Analytics (17223)	Measuring Display System Resolution Precisely (17016)

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**

- Nominated for Best Paper Award
- Black Swan
- Honorable Mention for Best Paper Award
- Cyber
- International Author
- Medical-related Subject Matter
- Live Virtual Constructive

ROOM	SESSION/CHAIR	0830	0900	0930
S320A	H3 Is It Live or Is It Memorex? Liz Gehr, Ph.D.	Live-Virtual Laboratory Assessment of Behaviors in Occupational Roles (LABOR) (17006)	Performance Measurement Considerations for Live, Virtual, and Constructive (LVC) Training (17091)	Modeling Operator Performance through Task-oriented Machine Learning (17038)
S320B	S3 Cyber Simulation and Training Paul Cummings	Cyber Effects within a Kinetic Model (17181)	A Cyber Warfare Prototype for Live, Virtual, & Constructive Simulations (17015)	The DARPA CODE White Force Network (17018)
S320C	EC3 Big Data: Size Matters Diane Justice	Deep Learning for Training with Noise in Expert Systems (17034)	Human Activity Synthetic Data Generation (17059)	A Genetic Model of the Development of Modeling and Simulation (17077)
S320D	ED3 Fostering Workplace Competencies Robert Sottilare, Ph.D.	Validating Competencies Using a Quantitative Data-based Approach (17105)	A Dynamic Learning Approach to Training Digital Acquisition Professionals (17264)	A Mobile Strategy for Self-directed Learning in the Workplace (17265)
S320E	T2 Training Optimization Gary Bauleke	Holistic Environment Generation and Multi-domain C2 Training (17165)	Optimized Pilot Training for Combat Aircraft (17199)	Using Innovative Systems Thinking to Optimize Royal Navy Training (17084)
S320F	P3 Technology and Workforce: Tying it all Together Eric Weisel, Ph.D.	Developing U.S. Service M&S Professionals: Inter-Service Differences in the Education, Training, and Management of Uniform and Government M&S Personnel (17178)	Patent Law and Defense Technology: Original Intent and Current Practice (17035)	A National Approach to achieve International Distributed Simulation Interoperability Certification (17044)

ROOM	SESSION/CHAIR	1030	1100	1130
S320A	BP1 Best Papers Karen Williams	**ECIT –** Creating Effective LVC Training with Augmented Reality (17119)	**Training –** Perceptual-cognitive & Physiological Assessment of Training Effectiveness (17013)	**Education –** Human Systems and Instructional System Design for a Simulator of a Robotic Surgical System (17213)
S320B	S4 3D Modeling and Virtualization Paul Bogard	Full 3D Visuals for Advanced Training in Single-seat Fighters (17050)	3D Visualization for Point of Need and Cloud Based Training (17067)	Optimization of Computer Generated Three Dimensional Models for Decreased Latency in Virtual Environments (17170)
S320C	EC4 Realistic and Effective Action: How Do We Decide? Lisa Jean Bair	Modeling Environmental Impacts on Cognitive Performance for Artificially Intelligent Entities (17176)	Optimizing Cooperative Games for Cognitive Communication UAVs with Q-Learning (17132)	Controlling CGF-Generated Entities Using a Fuzzy Logic-based System (17040)
S320E	T3 Measures Developed for Team Performance Kerri Chik	JTAC/JFO Team Training Effectiveness in a Simulation-based Environment (17036)	Using IoT Sensors to Enhance Simulation and Training in Multiteam Systems (17064)	Measuring Team Performance and Coordination in a Mixed Human-Synthetic Team Training Environment (17301)
S320F	S5 Terrain Modeling Ron Moore	Large Area High Resolution Geotypical Terrain Decoration (17285)	Unearthing the Modeling and Simulation Underground with Voxels (17100)	Terrain Database Correlation Assessment Using an Open Source Tool (17004)

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**

Nominated for Best Paper Award · Honorable Mention for Best Paper Award · International Author · Live Virtual Constructive

Black Swan · Cyber · Medical-related Subject Matter

WEDNESDAY, 29 NOVEMBER

ALL PAPERS ARE ELIGIBLE FOR CEU/CLP CREDITS (SEE PAGE 39)

ROOM	SESSION/CHAIR	1400	1430	1500
S320A	BP2 Best Papers Robert Wallace	**HPAE –** Assessing Submariners' Intuitive Decision-making Skills using Neurocognitive Methods (17090)	**Simulation –** Dynamic Occlusion using Fixed Infrastructure for Augmented Reality (17054)	**PSMA –** At the Tipping Point: Learning Science and Technology as Key Strategic Enablers for the Future of Defense and Security (17109)
S320B	S6 Non-Traditional Aspects of Military Simulation Eliot Winer, Ph.D.	Modeling Underwater Communications in Live, Virtual and Constructive Environments (17295)	A Study on the Effectiveness of Virtual and Constructive Interface Simulation (17114)	A Large Scale Correlated Dynamic Weather Simulation Service (17308)
S320C	EC5 Super Smarts: The Power of Processing Carla Cropper	Mind Flight: Brain-Computer Interface-Driven Design of Simulated Aircraft Control Frameworks (17150)	Operational Learning: Leveraging Mission Data to Optimize Skill Development (17226)	Acceleration of Digital Radar Landmass Simulation on Multi-core CPU and GPGPU Computer (17235)
S320D	ED4 STEM – Innovated Tools Ed Degnan, Ph.D.	Enhanced STEM Subject Outcomes from the Use of Intelligent Tutors (17236)	Implementing Innovative Constructivism: An Architected Approach to Enhancing STEM Education (17017)	Mathematical Simulations – Students No Longer Lost in Two-dimensional Space (17127)
S320F	S7 LVC in a Distributed Environment James Dennis	Virtualization: Navy Continuous Training Environment Approach to Cloud Enabling Technologies (17289)	Performance Measurement in LVC Distributed Simulations: Lessons from OBW (17207)	NATO Initiative in Multi-national Mission Training through Distributed Simulation (17200)

ROOM	SESSION/CHAIR	1600	1630	1700
S320A	H4 Learning Interoperability: All Together Now W. Lewis Johnson, Ph.D.	Interoperable Assessments using HPML: A Novice Conning Skills Acquisition Use Case (17072)	Total Learning Architecture Development: A Design-based Research Approach (17117)	Using Competencies to Map Performance Across Multiple Activities (17139)
S320B	S8 Threats and Scenarios LTC Brian Vogt, USA	Generative Representation of Synthetic Threat Actors for Simulation and Training (17140)	Simulation of Non-Combatant Population Movement in the Battlespace (17214)	Testing and Training Convergence – Common Scenario Generation Requirements and Solutions (17129)
S320C	EC6 Making Smart Decisions Sally Carter	Developing a Financial Readiness Mobile Personal Assistant for Learning (17252)	MentorPal: Interactive Virtual Mentors Based on Real-life STEM Professionals (17263)	Developing a Naturalistic Categorization Task for Testing Intuitive Decision Making (17146)
S320D	ED5 Future Leaders Claudia Clark, Ed.D.	Students from around the country present papers on the projects demonstrated in the Future Leaders Pavilion (FLP). Visit them in Booth #2681 and stand by to be overwhelmed by the depth of their research papers during this session.		
S320E	T4 Life in the Big Sim Rob Lechner	Creating Data Driven Training Scenarios (17203)	Advanced Readiness 2025: Balanced Investments Across Live, Virtual and Constructive (17241)	Toward Augmenting Army Aviation Collective Training with Game-based Environments (17282)
S320F	S9 Applying Simulation for Readiness Teresita Sotomayor, Ph.D.	High-fidelity Surgical Fasciotomy Simulator for Training Special Operations Medics (17087)	Modeling Combat Aircraft Training and Readiness (17149)	Leverage the Training Effect in Staff Training by Automated Reporting (17133)

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**

- Nominated for Best Paper Award
- Black Swan
- Honorable Mention for Best Paper Award
- Cyber
- International Author
- Medical-related Subject Matter
- Live Virtual Constructive

ALL PAPERS ARE ELIGIBLE FOR CEU/CLP CREDITS (SEE PAGE 39)

ROOM	SESSION/CHAIR	0830	0900	0930
S320B	S10 Information and Data Management Mike Flanagan	Army Training Data Management Using a Product Line Approach (17093)	Information Management: A Core Enabler of the MSaaS Ecosystem (17061)	Operational Data to Stimulate Simulation Systems and Enhance Training (17107)
S320C	EC7 Audio, Aptitude and Areas Nick Giannias	3D Spatial Audio Extraction and Demonstration System for Augmented/Mixed Reality Simulations (17009)	Predicting Manufacturing Aptitude using Augmented Reality Work Instructions (17224)	Real-time Coverage Area and Danger Zones Estimation (17185)
S320D	ED6 Courseware Creativity: Delivering a Better Experience Chuck Breed	How Video Lectures Can Free Up Time for Other Learning Activities (17201)	Teaching and Learning Differently: Personalized E-Books for Learning (PEBL) (17272)	Adapting Online Courseware to Decrease Time, Engage and Improve Performance (17284)
S320E	T5 What Works in VR? Jeffery Beaubien, Ph.D.	Enhancing Maintenance Simulation Training Devices and Their Application Through Verification and Validation (17056)	Using Virtual Reality for Training Maintenance Procedures (17108)	Rapid Prototyping Innovative Virtual Worlds that Include the WOW Factor (17123)
ROOM	**SESSION/CHAIR**	**1030**	**1100**	**1130**
S320B	S11 Test and Analysis Jan Drabczuk	Discrete Event Logistics System Model: Calculating Simulator Remaining Useful Life (17154)	Using Business Technologies to Cut Simulation Support Costs (17031)	LVC Environment to Support System-of-System Cyber Testing (17094)
S320C	EC8 Virtually Forging Foreign Ties Luis Velazquez	Modeling and Simulation as a Service from End User Perspective (17209)	Communications, Networking and Cyber Modelling and Simulation Support Defence (17120)	Web-Based GUI System for Controlling Entities in Constructive Simulations (17043)
S320D	ED7 Virtualizing the Schoolhouse Around the Globe Jim Threlfall	U.S. Navy Virtual World Schoolhouse Case Study (17118)	Using Virtual Simulation for Training the Brazilian Armored Tactics, Techniques and Procedures (17143)	Virtual Learning Spaces at the Royal Danish Defence College: Emerging Practices (17172)
S320E	T6 VR the World! John Aughey	Collaborative Helmet and Weapon Tracking for Augmented Reality based Training (17163)	Development and Analysis of Virtual Reality Technician-Training Platform and Methods (17211)	Developing an Immersive Virtual Reality Aircrew Training Capability (17319)
ROOM	**SESSION/CHAIR**	**1330**	**1400**	**1430**
S320A	H5 Team Up and Decide Robert Wallace	Training and Performance of Multi-team Systems in Naval Warfare Environments (17234)	Cockpit Team Coordination Skills: The Role of Monitoring and Backup (17012)	Assessing Military Perceptual Expertise with Drift Diffusion Modeling (17202)
S320B	S12 Standards and Networks Brian Stensrud	Quality of Service for Distributed Simulation Environments (17278)	Compressed DIS (17074)	Establishing a HLA Certification Process in NATO (17058)
S320C	EC9 Waiting to Exhale with My Imaginary Friends Richard Copeland	Increased System Fidelity for Navy Aviation Hypoxia Training (17225)	Crew Role-players Enabled by Automated Technology Enhancements (17219)	Expanding the Use of Simulators in Robotic Surgery Training (17060)
S320D	ED8 Targeting Learning: Developing Behaviors Klainie Nedoroscick	Improving Assessment with Text Mining (17191)	Adaptive Facilitation Skills for Army Instructors (17125)	
S320E	T7 Team Readiness Michael Truelove	Enhancing Strategic Thinking in Army Leaders through Skill-building Exercises (17167)	Military Team Training Utilizing GIFT (17286)	Point of Injury Training with Two and Three Dimensional Wounds (17270)

THURSDAY EVENING
Reception & Awards BANQUET

HYATT REGENCY GRAND BALLROOM
RECEPTION at 1800 • DINNER at 1900
We will not provide shuttle service to/from the Closing Banquet.
If you have a special need please contact bmcdaniel@ndia.org.
BANQUET TICKET REQUIRED

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**

- Nominated for Best Paper Award
- Honorable Mention for Best Paper Award
- International Author
- Live Virtual Constructive
- Black Swan
- Cyber
- Medical-related Subject Matter

Best Papers

BP1 WEDNESDAY, NOVEMBER 29 • 1030 • ROOM S320A

Session Chair: Karen Williams, U.S. Army PEO STRI
Session Deputy: Robert Wallace, USAF 29th Training Systems Squadron

ECIT – Creating Effective LVC Training with Augmented Reality (17119)
Nathan Jones, Koren Odermann, MARCORSYSCOM PM TRASYS; Peter Squire, ONR; Adrienne Read, Natalie Steinhauser, NAWCTSD

Training – Perceptual-cognitive & Physiological Assessment of Training Effectiveness (17013)
Jaclyn Hoke, Ph.D., Rockwell Collins, Inc.; Christopher Reuter, Maxime Mantariol, Thomas Schnell, Ph.D., University of Iowa Operator Performance Lab; Thomas Romeas Ph.D., École de Technologie Supérieure; Jocelyn Faubert, Ph.D., University of Montreal School of Optometry

Education – Human Systems and Instructional System Design for a Simulator of a Robotic Surgical System (17213)
Danielle Julian, Roger Smith, Ph.D., Alyssa D.S. Tanaka, Ph.D., Ariel Dubin, M.D., Florida Hospital Nicholson Center

BP2 WEDNESDAY, NOVEMBER 29 • 1400 • ROOM S320A

Session Chair: Robert Wallace, USAF 29th Training Systems Squadron
Session Deputy: Karen Williams, U.S. Army PEO STRI

HPAE – Assessing Submariners' Intuitive Decision-making Skills using Neurocognitive Methods (17090)
Lisa C. Lucia, Ph.D., Jeffrey M. Beaubien, Ph.D., Aptima, Inc.; Natalie Steinhauser, NAWCTSD; Ronald Steed, UpScope Consulting Group LLC

Simulation – Dynamic Occlusion using Fixed Infrastructure for Augmented Reality (17054)
Scott Johnson, John Baker, Jaime Cisneros, Juan Castillo, Chosen Realities LLC; Pat Garrity, ARL STTC

PSMA – At the Tipping Point: Learning Science and Technology as Key Strategic Enablers for the Future of Defense and Security (17109)
Elaine M. Raybourn, Ph.D., Sae Schatz, Ph.D., Jennifer Vogel-Walcutt, Ph.D., ADL Initiative; Kendy Vierling, Ph.D., USMC TECOM

Education

ED2 TUESDAY, NOVEMBER 28 • 1600 • ROOM S320D

Obstacles and Surprises: Overcoming

Session Chair: Rhianon Dolletski-Lazar, ECS Federal
Session Deputy: Wendy Johnson, Ed.D., AETC

Overcoming Educational Obstacles to the Achievement of the Future Special Operator Concept (17063)
Debra K. Abbott, Ph.D., Homer Harkins, Ed.D., Joint Special Operations University

Black Swans: Disruption of Power (17174)
Julian Stodd, Sea Salt Learning; Emilie A. Reitz, Leidos

Leading Learning in the Workplace: Who's in Charge? (17011)
Daisy Mundy, Edif ERA

ED3 WEDNESDAY, NOVEMBER 29 • 0830 • ROOM S320D

Fostering Workplace Competencies

Session Chair: Robert Sottilare, Ph.D., ARL STTC
Session Deputy: Randy Jensen, Stottler Henke

Validating Competencies Using a Quantitative Data-based Approach (17105)
Joseph M. Thompson, Gayatri Pandit Ph.D., Laurie Buchanan, Sarah Scholl, Booz Allen Hamilton

A Dynamic Learning Approach to Training Digital Acquisition Professionals (17264)
Faith Powers, Lauren Tindall, ICF

A Mobile Strategy for Self-directed Learning in the Workplace (17265)
Michael Freed, Louise Yarnall, Ph.D., Aaron Spaulding, Melinda Gervasio, SRI International

ED4 WEDNESDAY, NOVEMBER 29 • 1400 • ROOM S320D

STEM – Innovated Tools

Session Chair: Ed Degnan, Ph.D., Air Force Agency for Modeling and Simulation
Session Deputy: Christina Welch, NAWCTSD

Enhanced STEM Subject Outcomes from the Use of Intelligent Tutors (17236)
Edward Harvey, Advanced Training & Learning Technology LLC; Emilie A. Reitz, Leidos

Implementing Innovative Constructivism: An Architected Approach to Enhancing STEM Education (17017)
Erik C. Elstad, Bellflower (CA) USD; Dan M. Davis, USC Information Sciences Institute

Mathematical Simulations – Students No Longer Lost in Two-dimensional Space (17127)
Stephen Chapman, Matthew Mason; Lindsey Spalding, Paul J. Hagerty High School, Oviedo FL

ED5 WEDNESDAY, NOVEMBER 29 • 1600 • ROOM S320D

Future Leaders

Session Chair: Claudia Clark, Ed.D., U.S. Surface Warfare Officer School
Session Deputy: Kelly Hale, Ph.D., Design Interactive, Inc.

Students from around the country present papers on the projects demonstrated in the Future Leaders Pavilion (FLP). Visit them in Booth #2681 and stand by to be overwhelmed by the depth of their research papers during this session.

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**

- Nominated for Best Paper Award
- Black Swan
- Honorable Mention for Best Paper Award
- Cyber
- International Author
- Medical-related Subject Matter
- Live Virtual Constructive

ED6 THURSDAY, NOVEMBER 30 • 0830 • ROOM S320D

Courseware Creativity: Delivering a Better Experience

Session Chair: Chuck Breed, Zenetex
Session Deputy: Jan Bierfalk, Quantum 3D, Inc.

How Video Lectures Can Free Up Time for Other Learning Activities (17201)
Commander Geir Isaksen, Norwegian Defense University College, ADL

Teaching and Learning Differently: Personalized E-Books for Learning (PEBL) (17272)
Elliot Robson, Peter Berking, Eduworks Corporation

Adapting Online Courseware to Decrease Time, Engage and Improve Performance (17284)
Julia Campbell, Ryan McAlinden, David Cobbins, Raymond New, Anthony DeCapite University of Southern California; Catherine Neubauer; Stephen L. Goldberg, ARL STTC; Chad Cardwell, Jeramy Cook, Army Management Staff College

ED7 THURSDAY, NOVEMBER 30 • 1030 • ROOM S320D

Virtualizing the Schoolhouse Around the Globe

Session Chair: Jim Threlfall, C2 Technologies, Inc.
Session Deputy: Anastacia MacAllister, Iowa State University

U.S. Navy Virtual World Schoolhouse Case Study (17118)
Leslie A. L. Mazzone, Ph.D., Submarine Learning Center; Steven Aguiar, Naval Undersea Warfare Center

Using Virtual Simulation for Training the Brazilian Armored Tactics, Techniques and Procedures (17143)
Andrei Piccinini Legg, Ph.D., Osmar Marchi dos Santos, Ph.D., Federal University of Santa Maria; Pedro Procopio de Castro, Victor Emanuel Neves, Cristiano de Souza Dorneles, Rodrigo Dias Neto, Brazilian Army

Virtual Learning Spaces at the Royal Danish Defence College: Emerging Practices (17172)
Gro Frolund, Ph.D., Royal Danish Defence College

ED8 THURSDAY, NOVEMBER 30 • 1330 • ROOM S320D

Targeting Learning: Developing Behaviors

Session Chair: Klainie Nedoroscick, American Systems
Session Deputy: Martin Bink, ARL STTC

Improving Assessment with Text Mining (17191)
Hillary Fleenor, Rania Hodhod Ph.D., Columbus State Unversity; Randy Brou Ph.D., Army Research Institute

Adaptive Facilitation Skills for Army Instructors (17125)
Tatiana H. Toumbeva Ph.D., Krista L. Ratwani, Ph.D., Aptima, Inc.; Frederick J. Diedrich Ph.D., Scott M. Flanagan, Sophia Speira; Jennifer Murphy, Ph.D., Quantum Improvements Consulting; Louis C. Miller, Ph.D., Army Research Institute

Emerging Concepts & Innovative Technologies

EC1 TUESDAY, NOVEMBER 28 • 1400 • ROOM S320C

Trouble with Data

Session Chair: Harry Sotomayor, U.S. Army PEO STRI
Session Deputy: Michael Finnern, Engility

GeoPackage: Unifying Modeling and Simulation with Mission Command Geospatial Data (17065)
Kevin Bentley, Cognitics, Inc.; Michala Hill, Ronald Moore, Leidos; Mark Johnson, ECS Federal

3D Scanning and Navy Ships: An Immediate and Outward Look at Utilization (17052)
Larry Clay Greunke, Mark Bilinski, Ph.D., Jessica Fuller, SPAWAR

Marine Forensics: The Art and Science of Simulating Ships in Storms (17086)
Sean Kery, CSRA Conceptual Design Group

EC2 TUESDAY, NOVEMBER 28 • 1600 • ROOM S320C

Discovering Transformative Architectures

Session Chair: Richard Blum, Saab Defense and Security USA
Session Deputy: Paul Watson, U.S. Army PEO STRI

IDE-Forward: A Persistent Force-On-Force Training Field Test Environment (17184)
W. Cory Bogler, U.S. Army RDECOM ARDEC; Jose Rodriguez, Graham Fleener, U.S. Army PEO STRI; Gary Hall, General Dynamics Mission Systems

Emerging Network and Architecture Technology Enhancements to Support Future Training Environments (17033)
Bruce Caulkins, Ph.D., Brian Goldiez, Ph.D., Paul Wiegand, Ph.D., Glenn Martin, Ph.D., University of Central Florida Institute for Simulation & Training; Paul Dumanior, Tom Torres, U.S. Army PEO STRI

Innovation through Discovery Experimentation (17317)
S. K. Numrich, Ph.D., Kevin Woods, Ph.D., Joel Resnick, Ph.D., Jack Jackson, Institute for Defense Analyses

EC3 WEDNESDAY, NOVEMBER 29 • 0830 • ROOM S320C

Big Data: Size Matters

Session Chair: Diane Justice, USAF Training Program Office
Session Deputy: Tim Woodard, NVIDIA

Deep Learning for Training with Noise in Expert Systems (17034)
David A. Noever, J. Wesley Regian, PeopleTec Inc.,

Human Activity Synthetic Data Generation (17059)
Zhiqing Cheng, Timothy MtCastle, Todd Huster, Max Grattan, Infoscitex Corporation; John Camp, Huaining Cheng, Monique Brisson, AFRL

A Genetic Model of the Development of Modeling and Simulation (17077)
Morton Tavel, Ph.D., Devin Markovits, Innovation Business Partners

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**

Nominated for Best Paper Award | Honorable Mention for Best Paper Award | International Author | Live Virtual Constructive
Black Swan | Cyber | Medical-related Subject Matter

EC4 WEDNESDAY, NOVEMBER 29 • 1030 • 320C

Realistic and Effective Action: How Do We Decide?

Session Chair: Lisa Jean Bair, SAIC
Session Deputy: Keith Biggers, Texas A&M University

Modeling Environmental Impacts on Cognitive Performance for Artificially Intelligent Entities (17176)
Capt Pierce C. Guthrie, USMC, LCDR Lee Sciarini, Ph.D., Michael Guerrero, Perry McDowell, Naval Postgraduate School MOVES Institute

Optimizing Cooperative Games for Cognitive Communication UAVs with Q-Learning (17132)
Mark Rahmes, Ph.D., David Chester, Ph.D., Richard Clouse, Jodie Hunt, Harris Corporation

Controlling CGF-Generated Entities Using a Fuzzy Logic-based System (17040)
Hung Tran, Kasey Kolyno, Orlando Laboy, CAE USA Inc.

EC5 WEDNESDAY, NOVEMBER 29 • 1400 • 320C

Super Smarts: The Power of Processing

Session Chair: Carla Cropper, Rockwell Collins
Session Deputy: Denny Shockley, Motion Analysis Corporation

Mind Flight: Brain-Computer Interface-Driven Design of Simulated Aircraft Control Frameworks (17150)
Matthew Rich, Johnathan Pino, Zachary Koterba, David Handelman, Ph.D., Robert Ide, Matthew Fifer, Ph.D., Brendan John, Nathan Turner, Daniel Cybyk, Jonathan Ellsworth, Denise D'Angelo, Brock Wester, Ph.D., Eric Pohlmeyer, Ph.D., James Beaty, Ph.D., Francesco Tenore, Ph.D., Michael McLoughlin, Johns Hopkins Applied Physics Laboratory

Operational Learning: Leveraging Mission Data to Optimize Skill Development (17226)
Kent C. Halverson, Alan Carlin, Ph.D., Andonis Mitidis, Ph.D., Kristy Reynolds, David Perlaza, Evan Oster, Aptima, Inc.

Acceleration of Digital Radar Landmass Simulation on Multi-core CPU and GPGPU Computer (17235)
Taieb Lamine Ben Cheikh, Ph.D., École Polytechnique de Montréal; Pascal Guillemette, CAE Inc.; Gabriela Nicolescu, Ph.D., École Polytechnique de Montréal

EC6 WEDNESDAY, NOVEMBER 29 • 1600 • 320C

Making Smart Decisions

Session Chair: Sally Carter, Defense Language Institute
Session Deputy: John Burwell, Bohemia Interactive Simulation

Developing a Financial Readiness Mobile Personal Assistant for Learning (17252)
Frank Hannigan, Jennifer Murphy, Ph.D., Tarah Daly, Quantum Improvements Consulting LLC; Chad Udell, Dan Pfieffer, Float LLC; Sae Schatz, Ph.D., Marcus Birtwhistle, ADL Initiative

MentorPal: Interactive Virtual Mentors Based on Real-life STEM Professionals (17263)
Benjamin D. Nye, Ph.D., Nicholas J. Kaimakis, Madhusudhan Krishnamachari, William Swartout, Julia Campbell, Clinton Anderson, University of Southern California Institute for Creative Technologies

Developing a Naturalistic Categorization Task for Testing Intuitive Decision Making (17146)
Max Kailler Smith, Ph.D., Ben Reuveni, Ph.D., Michael S. Cohen, Ph.D., Marcia Grabowecky, Ph.D., Paul J. Reber, Ph.D., Northwestern University

EC7 THURSDAY, NOVEMBER 30 • 0830 • 320C

Audio, Aptitude and Areas

Session Chair: Nick Giannias, CAE, Inc.
Session Deputy: Aerial Kreiner, Air Force Research Laboratory

3D Spatial Audio Extraction and Demonstration System for Augmented/Mixed Reality Simulations (17009)
Jay Saffold, Tovar Shoaf, Research Network, Inc.; Pat Garrity, ARL STTC

Predicting Manufacturing Aptitude using Augmented Reality Work Instructions (17224)
Anastacia MacAllister, Eliot Winer, Ph.D., Jack Miller, Iowa State University

Real-time Coverage Area and Danger Zones Estimation (17185)
Yekta Kiliç, Gürkan Koldas, Ph.D., Turkish Naval Academy

EC8 THURSDAY, NOVEMBER 30 • 1030 • ROOM S320C

Virtually Forging Foreign Ties

Session Chair: Luis Velazquez, MARCORSYSCOM
Session Deputy: Gabe Diaz, Booz Allen Hamilton

Modeling and Simulation as a Service from End User Perspective (17209)
Lt. Col. Marco Biagini, Ph.D., Lt. Col. Jason Jones, Lt. Col. Michele La Grotta, Maj. Alfio Scaccianoce, Capt. Fabio Corona, NATO Modelling & Simulation Centre of Excellence; Dr. Dalibor Prochazka, Czech Republic University of Defence; Agatino Mursia, Marco Picollo, Christian Faillace, Leonardo Company

Communications, Networking and Cyber Modelling and Simulation Support Defence (17120)
Lt. Sonia Forconi, Ph.D., Lt. Col. Marco Biagini, Ph.D., NATO Modelling & Simulation Centre of Excellence

Web-Based GUI System for Controlling Entities in Constructive Simulations (17043)
Per-Idar Evensen, Kristian Selvaag, Dan Helge Bentsen, Hvard Stein, Norwegian Defence Research Establishment

EC9 THURSDAY, NOVEMBER 30 • 1330 • ROOM S320C

Waiting to Exhale with My Imaginary Friends

Session Chair: Richard Copeland, U.S. Army PEO STRI
Session Deputy: Jay Truitt, NECC

Increased System Fidelity for Navy Aviation Hypoxia Training (17225)
Beth F. Wheeler Atkinson, NAWCTSD; Janet K Marnane, Embry-Riddle Aeronautical University; LCDR Daniel L. Immeker, CNATRA; Jonathan Reeh, John Zbranek, Ashwin K. Balasubramanian, Lynntech Inc.; LCDR David M. McEttrick, Aviation Survival Training Center; CDR W. Tyler Scheeler, National Alliance on Mental Illness

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**
Nominated for Best Paper Award | Honorable Mention for Best Paper Award | International Author | Live Virtual Constructive
Black Swan | Cyber | Medical-related Subject Matter

Crew Role-players Enabled by Automated Technology Enhancements (17219)
Beth F. Wheeler Atkinson, Naval Air Warfare Center Training Systems Division; Brian Stensrud, Bob Marinier, Paul Schermerhorn, Chad Dettmering, Sohaib Saadat, Soar Technology, Inc.; John P. Killilea, Stracon Services Group; Emily C. Anania, Embry Riddle Aeronautical Unversity

Expanding the Use of Simulators in Robotic Surgery Training (17060)
Roger Smith Ph.D., Danielle Julian, Alyssa Tanaka, Ph.D., Ariel Dubin, Florida Hospital Nicholson Center

HPAE

H1 TUESDAY, NOVEMBER 28 • 1400 • ROOM S320A

Hear, See and Sense No Evil

Session Chair: J. Robert Bois, Ph.D., Lockheed Martin Corporation
Session Deputy: Scott Hooper, Kongsberg Geospatial

Auditory Performance of Individuals with Reduced Hearing Capability in Virtual Reality Environment (17039)
Hung Tran, CAE USA Inc.

Eye Tracking Feedback to Enhance Visual Search Training (17275)
Jesse D. Flint, Kelly S. Hale, Ph.D., Design Interactive, Inc.; Darren P. Wilson, DHS

Multimodal Assessment of Pilots' Affective States using Psycho Physiological Sensor Signals and Facial Recognition Analysis (17008)
Agata Lawrynczyk, Maher Chaouachi, Ph.D., CAE; Susanne P. Lajoie, McGill University

H2 TUESDAY, NOVEMBER 28 • 1600 • ROOM S320A

Build, Test and Perform

Session Chair: Adelle Lynch, Thales Cyber & Computing
Session Deputy: Scott Johnston, Booz Allen Hamilton

Comparing Visual Assembly Aids for Augmented Reality Work Instructions (17208)
Anastacia MacAllister, Melynda Hoover, Stephen Gilbert, Ph.D., James Oliver, Ph.D., Rafael Radkowski, Ph.D., Timothy Garrett, Joseph Holub, Ph.D., Elliot Winer, Ph.D., Iowa State University; Scott Terry, Paul Davies, The Boeing Company

A Multi-method Approach to Evaluating Human-system Interactions during Operational Testing (17267)
Heather Wojton, Ph.D., Chad Bieber, Ph.D., Jonathan Snavely, Institute for Defense Analyses

Reprocessability and Engagement: Comparing Text to Human Forms for Information Conveyance (17187)
Doug C. Derrick, Ph. D., Kerry W. Ward, Ph.D., Joseph A. Allen, Ph.D., University of Nebraska

H3 WEDNESDAY, NOVEMBER 29 • 0830 • ROOM S320A

Is It Live or Is It Memorex?

Session Chair: Liz Gehr, Ph.D., The Boeing Company
Session Deputy: Colleen Matthews, U.S. Army PEO STRI

Live-Virtual Laboratory Assessment of Behaviors in Occupational Roles (LABOR) (17006)
Kevin F. Hulme, Ph.D., Gregory A. Fabiano, Ph.D., Sandro M. Sodano, Ph.D., Rachel Su Ann Lim, Liam Homeyer, Karen L. Hulme, Gina Stephan, Abigail Caserta, Rachel Reitano, Allan LaFlore, University at Buffalo

Performance Measurement Considerations for Live, Virtual, and Constructive (LVC) Training (17091)
Jeffrey M. Beaubien, Ph.D., Michael Knapp, Alexander Wade, Eric Watz, E. Webb Stacy, Ph.D., Sterling L. Wiggins, Aptima, Inc.

Modeling Operator Performance through Task-oriented Machine Learning (17038)
Bryan Vandrovec, RED-INC; Robert Lutz, The John Hopkins University; Timothy Bagnall, Alion Science and Technology; Tracy Sanders, The MITRE Corporation

H4 WEDNESDAY, NOVEMBER 29 • 1600 • ROOM S320A

Learning Operability: All Together Now

Session Chair: W. Lewis Johnson, Ph.D., Alelo
Session Deputy: Paula Durlach, Ph.D., ARL STTC

Interoperable Assessments using HPML: A Novice Conning Skills Acquisition Use Case (17072)
Bruno Emond, Ph.D, National Research Council Canada

Total Learning Architecture Development: A Design-based Research Approach (17117)
P. Shane Gallagher, Ph.D, Avron Barr, Sarah Turkaly, Institute for Defense Analyses; J.T. Folsom-Kovarik, Ph.D., Soar Technologies, Inc.; Sae Schatz, Ph.D, ADL Initiative

Using Competencies to Map Performance Across Multiple Activities (17139)
Robby Robson, Ph.D., Eduworks Corporation; Jonathan Poltrack, ADL Initiative

H5 THURSDAY, NOVEMBER 30 • 1030 • ROOM S320A

Team Up and Decide

Session Chair: Robert Wallace, USAF 29th Training Systems Squadron
Session Deputy: Alexander Steiner, Trideum Corporation

Training and Performance of Multi-team Systems in Naval Warfare Environments (17234)
Leah Ellison, Jessica Wildman, Ph.D, Patrick Converse, Ph.D, Erin Richard, Ph.D, Trevor Fry, Shelby-Jo Ponto, Florida Institute of Technology; Jennifer Pagan, Alyssa Mercado, Melissa Walwanis, NAWCTSD; Andrea Postlewate, StraCon Group Services LLC; Amy Bolton, Ph.D, ONR

Cockpit Team Coordination Skills: The Role of Monitoring and Backup (17012)
Alan R. Martinez, Ph.D, Mary F. Hibberts, U.S. Coast Guard Aviation Training Center; Dale L. Lunsford, Ph.D, The University of Southern Mississippi

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**
Nominated for Best Paper Award | Honorable Mention for Best Paper Award | International Author | Live Virtual Constructive
Black Swan | Cyber | Medical-related Subject Matter

Assessing Military Perceptual Expertise with Drift Diffusion Modeling (17202)
Webb Stacy, Ph.D, Jeff Beaubien, Ph.D, Sterling Wiggins, Aptima, Inc.

PSMA

P1 TUESDAY, NOVEMBER 28 • 1400 • ROOM S320F

Data and Delivery: Addressing the Challenges

Session Chair: Emilie Reitz, Leidos
Session Deputy: Michelle Wright, Huntington Ingalls

Achieving Actionable Information in a Complex Operational Environment (17153)
Tony Cerri, TRADOC G27; Cynthia Harrison, U.S. Army PEO STRI; John Andrew Landmesser, PEO C3T; Ralph O'Connell, Joint Staff J6; Emilie Reitz, Leidos

Considering Training as a Service within the Acquisition Strategy (17156)
Joan H. Johnston, Ph.D, SGM Gino Fragomeni, USA (Ret.), Tamara Griffith, ARL STTC; Jeremy Lanman, Ph.D, U.S. Army PEO STRI

A Cloud Computing Business Case Analysis for Existing Training Systems (17053)
Paul Dumanoir, U.S. Army PEO STRI; Jeffery Bergenthal, Mark Hodgins, John Tamer, Rodney Yerger, JHU APL

P2 TUESDAY, NOVEMBER 28 • 1600 • ROOM S320F

Standards and Policy: Setting the Bar

Session Chair: John Dzenutis, The Boeing Company
Session Deputy: Richard Grohs, USAF Air Combat Command

Exploration of Next Generation Technology Application to Modeling and Simulation Study Group (17045)
Chris McGroarty, Christopher J. Metevier, ARL STTC; Joe McDonnell, Ph.D, Dynamic Animation Systems, Inc.; Scott Gallant, Effective Applications Corporation; Lana McGlynn, McGlynn Consulting Group

Standardizing Human Performance Measurement for Ease of Data Analytics (17223)
Beth F. Wheeler Atkinson, Mitchell J. Tindall Ph.D, NAWCTSD; John Killilea, Stracon Services; Michael Tolland, Courtney Dean, Aptima

Measuring Display System Resolution Precisely (17016)
Charles J. Lloyd, Visual Performance LLC

P3 WEDNESDAY, NOVEMBER 29 • 0830 • ROOM S320F

Technology and Workforce: Tying it all Together

Session Chair: Eric Weisel, Ph.D., ODU VMASC
Session Deputy: Julie Kent, Raytheon

Developing U.S. Service M&S Professionals: Inter-Service Differences in the Education, Training, and Management of Uniform and Government M&S Personnel (17178)
COL Joseph M. Nolan, USA, AMSO; Brett Telford, Marine Corps Modeling and Simulation Management Office; Imre Balogh, Ph.D., Perry McDowell, MOVES Institute, Naval Postgraduate School; Edward Degnan Ph.D., Air Force Agency for Modeling and Simulation; Ivar Oswalt, Ph.D., Alion Science and Technology Corporation

Patent Law and Defense Technology: Original Intent and Current Practice (17035)
Douglas W. Robinson, Lenovo Group Ltd; Mark C. Davis, Ph.D.; Nicholas J. Kaimakis, Dan M. Davis, University of South Carolina

A National Approach to achieve International Distributed Simulation Interoperability Certification (17044)
Grant Bailey, UK Ministry of Defense; Daran Crush, Ian Page, UK Defence Simulation Centre

Simulation

S1 TUESDAY, NOVEMBER 28 • 1400 • ROOM S320B

Augmented Reality

Session Chair: Alyssa Tanaka, Ph.D., Soar Technology, Inc.
Session Deputy: Luis Garcia, MARCORSYSCOM PM TRASYS

Analyzing SLAM Algorithm Performance for Tracking in Augmented Reality Systems (17161)
Joseph J. LaViola Jr., Ph.D., Brian M. Williamson, University of Central Florida; Robert Sottilare, Ph.D., Pat Garrity, ARL STTC

Most Effective Capabilities of Head Mounted Displays for Dismounted Soldier Training Using Augmented Reality (17055)
John Baker, Scott Johnson, Jaime Cisneros, Juan Castillo, Chosen Realities LLC; Pat Garrity, ARL STTC

Expert-Assisted Field Maintenance using Augmented Reality (17262)
Jonathan Schlueter, Eliot Winer, Ph.D., Iowa State University

S2 TUESDAY, NOVEMBER 28 • 1600 • ROOM S320B

Radar Simulation

Session Chair: Craig Siefert, USAF Simulators Program Office
Session Deputy: Lisa Tripp, Ph.D., Air Force Research Laboratory

GPU Ray Tracing-based Method for Real-time ISAR simulation (17237)
Taieb Lamine Ben Cheikh, Ph.D., École Polytechnique de Montréal; Pascal Guillemette, CAE Inc.

Enhanced Aerial Radar Line of Sight Performance (17051)
Oren Koler, Tal Shintel, Israel Aerospace Industries

S3 WEDNESDAY, NOVEMBER 29 • 0830 • ROOM S320B

Cyber Simulation and Training

Session Chair: Paul Cummings, ICF International
Session Deputy: Jimmy Moore, PeopleTec

Cyber Effects within a Kinetic Model (17181)
Christopher Daiello, Kyle Hancock, John Surdu, Ph.D., Daniel J. Lacks, Ph.D., Cole Engineering Services Inc.

A Cyber Warfare Prototype for Live, Virtual, & Constructive Simulations (17015)
Henry Marshall, Nathan Vey, ARL STTC; J. Allen Geddes, Lawrence Elliott, Dynamic Animation Systems

The DARPA CODE White Force Network (17018)
David Scheidt, Weather Gage Technology LLC.; Robert Lutz, The Johns Hopkins University Applied Physics Laboratory; Jean-Charles Ledé, DARPA; James Sturim, CENTRA Technology, Inc.

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**
Nominated for Best Paper Award | Honorable Mention for Best Paper Award | International Author | Live Virtual Constructive
Black Swan | Cyber | Medical-related Subject Matter

S4 WEDNESDAY, NOVEMBER 29 • 1030 • ROOM S320B

3D Modeling and Virtualization

Session Chair: Paul Bogard, USAF Simulators Program Office
Session Deputy: Thomas Kehr, U.S. Army PEO STRI

Full 3D Visuals for Advanced Training in Single-seat Fighters (17050)
C.E. Thomas, Ph.D., Steve L. Kelley, Paul G. Jones, Third Dimension Technologies; Leonard Kearl, Benjamin Orsua, Rickard Consulting Group; Greg Sidor, Air Force Research Laboratory; David A. Miller, CymSTAR

3D Visualization for Point of Need and Cloud Based Training (17067)
Greg Dukstein, Dignitas Technologies; Keith Nielsen, Paul Dumanoir, U.S. Army PEO STRI

Optimization of Computer Generated Three Dimensional Models for Decreased Latency in Virtual Environments (17170)
Varun Aggarwal, Denise Nicholson, Ph.D., Soar Technology

S5 WEDNESDAY, NOVEMBER 29 • 1030 • ROOM S320F

Terrain Modeling

Session Chair: Ron Moore, Leidos
Session Deputy: Todd Glenn, FAAC Incorporated

Large Area High Resolution Geotypical Terrain Decoration (17285)
Paul L. Isaacson, David F. Ottley, Rockwell Collins

Unearthing the Modeling and Simulation Underground with Voxels (17100)
Freddie Santiago, John Moran, Jon Watkins, Dignitas Technologies; Julio de la Cruz, ARL STTC

Terrain Database Correlation Assessment Using an Open Source Tool (17004)
Captain Leonardo Seiji Oyama, Brazilian Army; Carlo Kleber da Silva Rodrigues, D.Sc., University Center of Brasília; Sérgio Simas Lopes Perese, Prospectare Brasil; Brian Goldiez, Ph.D., University of Central Florida

S6 WEDNESDAY, NOVEMBER 29 • 1400 • ROOM S320B

Non-Traditional Aspects of Military Simulation

Session Chair: Eliot Winer, Ph.D., Iowa State University
Session Deputy: Tony Krogh, The AEgis Technologies Group, Inc.

Modeling Underwater Communications in Live, Virtual and Constructive Environments (17295)
Terry Whelan, Wei Liu, Ph.D., Jeff Weaver, Ph.D., Rajive Bagrodia, Scalable Network Technologies; Pedro A. Forero, Ph.D., Jose Chavez, SPAWAR Systems Center Pacific

A Study on the Effectiveness of Virtual and Constructive Interface Simulation (17114)
Captain Youn Choi Cho, Commander Jin Seok, Oh, Chan Ho, Jung, Korean Navy System Analysis Div

A Large Scale Correlated Dynamic Weather Simulation Service (17308)
Craig Pepper, The Boeing Company

S7 WEDNESDAY, NOVEMBER 29 • 1400 • ROOM S320F

LVC in a Distributed Environment

Session Chair: James Dennis, General Dynamics Information Technology
Session Deputy: LT Joe Mercado, USN, NAWCTSD

Virtualization: Navy Continuous Training Environment Approach to Cloud Enabling Technologies (17289)
Phillip N. Brazell, Kenneth Sahr, Michael A. White, Ph.D., Alion Science and Technology

Performance Measurement in LVC Distributed Simulations: Lessons from OBW (17207)
Jaclyn Hoke, Rockwell Collins; Lisa Townsend, Sam Giambarberee, NAWCTSD; Sae Schatz, Ph.D., ADL Initiative

NATO Initiative in Multi-national Mission Training through Distributed Simulation (17200)
Arjan Lemmers, Netherlands Aerospace Centre (NLR); Dr. Jean-Pierre Faye, Thales Air Operations; Ole Martin Mevassvik, FFI (Norwegian Defence Research Establishment); Detlef Stueter, German Air Force Command Simulation; M. Haluk Canberi, STM Savunma Teknolojileri Muhendislik ve Tic.; Dafna Demspey, Royal Netherlands Air Force

S8 WEDNESDAY, NOVEMBER 29 • 1600 • ROOM S320B

Threats and Scenarios

Session Chair: LTC Brian Vogt, USA, U.S. Army TRADOC
Session Deputy: Machelle Ferry, Veterans Health Administration

Generative Representation of Synthetic Threat Actors for Simulation and Training (17140)
J. Wesley Regian, Ph.D., David A. Noever, Ph.D., PeopleTec

Simulation of Non-Combatant Population Movement in the Battlespace (17214)
Tony Cerri, U.S. Army TRADOC; Neil F. Sleevi, Nicole Laster, Ph.D., CGI Federal; Andrew Johnson, Capstone Corporation; Alejandro Hernandez, Ph.D., Steven B. Hall, Ph.D., Naval Postgraduate School

Testing and Training Convergence – Common Scenario Generation Requirements and Solutions (17129)
Roy Scrudder, Kevin Gupton, Applied Research Laboratories, The University of Texas at Austin; John Diem, U.S. Army Operational Test Command

S9 WEDNESDAY, NOVEMBER 29 • 1600 • ROOM S320F

Applying Simulation for Readiness

Session Chair: Teresita Sotomayor, Ph.D., ARL STTC
Session Deputy: Angela M. Alban, SIMETRI Inc.

High-fidelity Surgical Fasciotomy Simulator for Training Special Operations Medics (17087)
Jordan Coulter, Angela M. Alban, SIMETRI Inc.; William Y. Pike, Jack Norfleet, ARL STTC; Richard Kelly, Joint Special Operations Medical Training Center

Modeling Combat Aircraft Training and Readiness (17149)
Justin Carlson, The Boeing Company

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**
Nominated for Best Paper Award | Honorable Mention for Best Paper Award | International Author | Live Virtual Constructive
Black Swan | Cyber | Medical-related Subject Matter

Leverage the Training Effect in Staff Training by Automated Reporting (17133)
Peter Hammer, Ph.D., Sinna Lindquist, Ph.D., Swedish Defense Research Agency; CPT Peter J. Lindskog, Swedish Armed Forces

S10 THURSDAY, NOVEMBER 30 • 0830 • ROOM S320B

Information and Data Management

Session Chair: Mike Flanagan, LMI
Session Deputy: Christina Bouwens, Ph.D., Cornerstone Software Solutions

Army Training Data Management Using a Product Line Approach (17093)
Roy Scrudder, Kevin Gupton, Applied Research Laboratories, The University of Texas at Austin; Rob Cox, Ph.D., Paul Dumanoir, U.S. Army PEO STRI

Information Management: A Core Enabler of the MSaaS Ecosystem (17061)
L. Stewart, Systems Engineering & Assessment Ltd; B. Mason, Envitia Ltd

Operational Data to Stimulate Simulation Systems and Enhance Training (17107)
MSG Jesper Noe Borg, Danish Army Simulation Center; Emilie A. Reitz, Leidos

S11 THURSDAY, NOVEMBER 30 • 1030 • ROOM S320B

Test and Analysis

Session Chair: Jan Drabczuk, Eagle Systems
Session Deputy: Sherry Steward, NAWCTSD

Discrete Event Logistics System Model: Calculating Simulator Remaining Useful Life (17154)
Corey T. Hendricks, Marilyn Zett, Raytheon

Using Business Technologies to Cut Simulation Support Costs (17031)
Richard Crutchfield, Adam Heeren, The MITRE Corporation; Paul Dumanoir, U.S. Army PEO STRI

LVC Environment to Support System-of-System Cyber Testing (17094)
Michael J. O'Connor, Trideum Corporation; Kenneth G. LeSueur, Ph.D., U.S. Army Redstone Test Center; Justin R. Novak, Space and Missile Defense Command; Carl N. Blair, Kratos Defense & Security Solutions, Inc.

S12 THURSDAY, NOVEMBER 30 • 1330 • ROOM S320B

Standards and Networks

Session Chair: Brian Stensrud, Soar Technology
Session Deputy: LT Joe Geeseman, USN, CNATRA

Quality of Service for Distributed Simulation Environments (17278)
Eberhard K. Kieslich, Diana Pineda, Trideum Corporation

Compressed DIS (17074)
Lance Call, Scott Swigert, Mitchell Zamba, L3 Technologies; David Noah, Air Force Research Laboratory

Establishing a HLA Certification Process in NATO (17058)
Horst Behner, Bundeswehr Joint Material Office; Björn Löfstrand, Pitch Technologies

Training

T1 TUESDAY, NOVEMBER 28 • 1400 • ROOM S320E

Optimizing Team Performance

Session Chair: Thomas Yanoschik, SAIC
Session Deputy: Jeff Frost, GaN Corporation

Increasing Cognitive Readiness in Joint Command Battle Staffs (17048)
Jacob D. Biever, Joint Staff, J7 CTR Support; Emilie A. Reitz, Leidos

Assessment Instruments in Support of Marine Instructor Development (17180)
Jennifer K. Phillips, Karol G. Ross Ph.D., Cognitive Performance Group; Patrick J. Rosopa Ph.D., Clemson University

Systematic Team Assessment Readiness Training: Live, Virtual, Constructive Distributed Missions (17229)
Robb Dunne, Ph.D., Zenetex LLC; Lt Col. Scott Harris, USMC (Ret.) UCF IST; Alexander Arrieta, TECOM; Scott Tanner, NAWCTSD; Jonathan Lalor, Shawn Muir, Brett Vonsik, Lockheed Martin

T2 WEDNESDAY, NOVEMBER 29 • 0830 • ROOM S320E

Training Optimization

Session Chair: Gary Bauleke, Defense Language and National Security Education Office
Session Deputy: Aaron Judy, NAWCTSD

Holistic Environment Generation and Multi-domain C2 Training (17165)
Lt Col Aaron Hatch, USAF, Maj Chris Bulla, USAF, Combined Air Operations Center

Optimized Pilot Training for Combat Aircraft (17199)
Guro K. Svendsen, Ph.D., Idar Ulvestad Haugstuen, Ole Martin Mevassvik, Major Henning Rorvik Norwegian Defence Research Establishment, Norwegian Defence Materiel Agency

Using Innovative Systems Thinking to Optimize Royal Navy Training (17084)
Lt Andrew Christie, Lt Cdr Rob Floyd, Commander Steve McLaughlin, Royal Navy

T3 WEDNESDAY, NOVEMBER 29 • 1030 • S320E

Measures Developed for Team Performance

Session Chair: Kerri Chik, TiER 1 Performance Solutions
Session Deputy: Nathan Jones, MARCORSYSCOM PM TRASYS

JTAC/JFO Team Training Effectiveness in a Simulation-based Environment (17036)
Chantale N Wilson, Lon Hopson, Air Force Research Laboratory; Ashley N. Wade, Leidos, Caitlan Rizzardo, Ph.D., Aptima

Using IoT Sensors to Enhance Simulation and Training in Multiteam Systems (17064)
Samantha Dubrow, Christian Dobbins, Brenda Bannan, Ph.D., Stephen Zaccaro, Ph.D., Nathalia Peixoto, Ph.D., Hemant Purohit Ph.D., Mohammad Rana, Michael Au, George Mason University; Jeff Segall, InFlow Interactive LLC

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**
Nominated for Best Paper Award | Honorable Mention for Best Paper Award | International Author | Live Virtual Constructive
Black Swan | Cyber | Medical-related Subject Matter

Measuring Team Performance and Coordination in a Mixed Human-Synthetic Team Training Environment (17301)
Robert K McCormack, Tara A. Brown, Kara L Orvis, Ph.D., Samantha Perry, Aptima Inc; Christopher Myers, AFRL

T4 WEDNESDAY, NOVEMBER 29 • 1600 • ROOM S320E

Life in the Big Sim

Session Chair: Rob Lechner, The Boeing Company
Session Deputy: Sam Fragapane, Air Force Agency for Modeling and Simulation

Creating Data Driven Training Scenarios (17203)
Webb Stacy, Ph.D., John Colonna-Romano, Georgiy Levchuk, Brent Fegley, Ph.D., J. T. Folsom-Kovarik, Ph.D., Charles Newton, Soar Tech, Inc.

Advanced Readiness 2025: Balanced Investments Across Live, Virtual and Constructive (17241)
Lt Col Jacob Hammons, USAF, 29th Training Systems Squadron

Toward Augmenting Army Aviation Collective Training with Game-based Environments (17282)
Lauren Reinerman-Jones, Ph.D., Martin S. Goodwin Ph.D., Andrew J. Wismer, Brian F. Goldiez Ph.D., University of Central Florida Institute for Simulation and Training; Maj Robert A. Crapanzano, USA, Ph.D., U.S. Army PEO STRI

T5 THURSDAY, NOVEMBER 30 • 0830 • ROOM S320E

What Works in VR?

Session Chair: Jeffery Beaubien, Ph.D., Aptima, Inc.
Session Deputy: Sowmya Ramachandran, Stottler Henke Associates, Inc.

Enhancing Maintenance Simulation Training Devices and Their Application Through Verification and Validation (17056)
Manfred Roza, Ph.D, Anneke Nabben, Netherland Aerospace Centre; Jeroen Voogd, Ph.D, TNO Defense, Safety and Security; Lt. Cdr. Frank Müller Netherlands MoD, NH90 Project Office

Using Virtual Reality for Training Maintenance Procedures (17108)
Shannon K. T. Bailey, Cheryl I. Johnson, Ph.D., Matthew D. Marraffino, Ph.D., NAWCTSD; Bradord L. Schroeder, 2StraCon Services Group LLC

Rapid Prototyping Innovative Virtual Worlds that Include the WOW Factor (17123)
Leslie A. L. Mazzone, Ed.D., Submarine Learning Center; Steven Aguiar Naval Undersea Warfare Center

T6 THURSDAY, NOVEMBER 30 • 1030 • ROOM S320E

VR the World!

Session Chair: John Aughey, The Boeing Company
Session Deputy: Jan Brown, CAE USA

Collaborative Helmet and Weapon Tracking for Augmented Reality based Training (17163)
Supun Samarasekera, Rakesh Kumar, Ph.D., Taragay Oskiper, Ph.D., Zhiwei Zhu, Ph.D., Glenn Murray, Kevin Kaighn, Nicholas Vitovitch, Andy Coppock, Aki Chaudhry, Ph.D., SRI International; Frank Dean, Pat Garrity, ARL STTC

Development and Analysis of Virtual Reality Technician-Training Platform and Methods (17211)
Jeffery W. Smith, John L Salmon, Ph.D., Brigham Young University

Developing an Immersive Virtual Reality Aircrew Training Capability (17319)
Eric Sikorski, Ph.D., Combating Terrorism Technical Support Office; Amanda Palla, Vertex Solutions; Linda Brent, Ed.D., The ASTA Group LLC

T7 THURSDAY, NOVEMBER 30 • 1330 • ROOM S320E

Team Readiness

Session Chair: Michael Truelove, Army Simulation Proponent and School
Session Deputy: Mike Robbs, FLETC

Enhancing Strategic Thinking in Army Leaders through Skill-building Exercises (17167)
Anna Grome, TiER1 Performance Solutions; Beth Crandall, Crandall Consulting; James K. Greer, ALIS, Inc; Angela Karrasch, Ph.D., U.S. Army Research Institute for the Behavioral and Social Sciences; Anna Sackett, Ph.D., MDA Leadership Consulting; Ellen Goldman, Ph.D., George Washington University

Military Team Training Utilizing GIFT (17286)
Desmond Bonner, Stephen Gilbert, Ph.D., Eliot Winer, Ph.D., Michael Dorneich, Ph.D., Anastacia MacAllister, Adam Kohl, Kaitlyn Ouverson, Anna Slavina, Iowa State University; Anne M. Sinatra Ph.D., ARL STTC

Point of Injury Training with Two and Three Dimensional Wounds (17270)
M. Beth H. Pettitt, ARL STTC

LEGEND *(one or more of the following may appear on this page).* **The number in parentheses following Paper Title is the ID tracking number.**
Nominated for Best Paper Award | Honorable Mention for Best Paper Award | International Author | Live Virtual Constructive
Black Swan | Cyber | Medical-related Subject Matter

Professional Development Workshops

Location:	Orange County Convention Center, South Concourse, Rooms 330 and 331
Date:	Friday, 1 December
Times:	0700 Breakfast and registration • AM Sessions 0800 – 1200 • PM Sessions 1300-1700
Who may attend?	All registrants of I/ITSEC are welcome to attend.
Fees:	There is no fee to attend or audit the sessions.
CEU/CLP:	Paid I/ITSEC Conference registrants are eligible to receive CEU/CLP credits. If not a paid attendee, a $45 fee will be charged only if you wish to receive the CEU credits.
Registration:	Preregister via https://secure3.rhq.com/iitsec/iitsec2017/public/index.cgi?track = attendeegoverack = workshoponly Registrations also accepted on-site during I/ITSEC registration hours.
Lunch:	On own.

UCF Continuing Education

Coordinated by University of Central Florida Division of Continuing Education. For additional information on these seminars including topical outline and instructor bios, please see: www.ce.ucf.edu/iitsec

UCF Continuing Education POC
Maria Cherjovsky, Assistant Director, Continuing Education & Regional Campuses
Phone Number: 407-882-0260

ALL PROFESSIONAL DEVELOPMENT WORKSHOPS ARE ELIGIBLE FOR CEU/CLP CREDITS (SEE PAGE 39)

PDW1 • Room S330H • 0800 – 1200

Modeling & Simulation for Acquisition

Presenter

Marco Estrada, Modeling, Simulation and Analysis Product Manager, Huntington Ingalls Industries

Modeling and Simulation (M&S) in Department of Defense (DoD) acquisition programs encompasses a wide variety of technologies, organizations, processes, and best practices. This workshop provides a practical overview of M&S for acquisition, created by professionals experienced in the largest DoD acquisition programs. The workshop begins with a high-level presentation of organizing principles, and then transitions to specific, real-world examples. A guidebook and slides will be provided as handouts for this course.

PDW2 • Room S330G • 0800 – 1200

Live-Virtual-Constructive (LVC) Interoperability Techniques

Presenters

Ed Powell, Ph.D., Principal at Edward Powell Consulting;
Randy Saunders, The Johns Hopkins University Applied Physics Lab

This workshop will provide an overview of the systems engineering issues with regard to integrating disparate military simulations for analysis, training, testing, and other purposes. We will discuss the three major interoperability techniques, the Distributed Interactive Simulation (DIS) standards, the High Level Architecture (HLA) for Modeling and Simulation, and the Test and Training Enabling Architecture (TENA), including descriptions of their architectures and some of their use cases. Recent and planned evolution of each architecture will be explained. A discussion of how these architectures are actually used in the real world and the process for integrating disparate systems in a multi-architecture environment will be discussed. The format of the workshop will be part lecture and part informal discussion/question answer. Participants are encouraged to raise specific topics any time during the workshop.

PDW3 • Room S331D • 0800 – 1200

Managing Innovations in Simulation: Incorporating Mobile, 3D, Gaming, Augmented Reality, AI and More Into Your Programs

Presenters

David Metcalf, Ph.D. Director, Mixed Emerging Technology Integration Lab, UCF Institute for Simulation and Training;
Vanessa Zabala, Partner Development Manager for GrowFL

Participants will discuss how to promote learning and performance within a mobile workforce that is separated by time, space, and context. The workshop will demonstrate and elaborate on the affordances of mobile simulation for promoting seamless formal and informal learning experiences and increasing human performance. Focus will be on best practices for design, development, and strategy. In addition to ubiquitous mobile content delivery and assessment channels (e-mail, voice, text messages, web, and mobile apps), emerging technologies and capabilities such as context-awareness, mobile 3D, and augmented reality are expanding the potential applications of mobile simulation. Participants will 1) see current government and military examples, 2) explore key technological features and design characteristics unique to mobile, and 3) develop their own mobile strategy capable of bridging formal and informal contexts. The workshop will cover information necessary to build and implement a cohesive design and development strategy for seamless mobile training and simulation and will also include a hands-on exercise. Participants will be exposed to innovation management through principals of lean startup methodology, also used by the National Science Foundation's I-Corps. The workshop will

focus on understanding the criteria for a viable new technology in the market.to build and implement a cohesive design and development strategy for seamless mobile training and simulation and will also include a hands-on exercise.

PDW4 • Room S331C • 0800 – 1200

Certified Modeling & Simulation Professional (CMSP)

Presenter

Mikel Petty, Ph.D.

This workshop will provide an overview of the Certified Modeling & Simulation Professional (CMSP) certification program, with a particular focus on preparing prospective applicants to take the CMSP exam. The workshop will cover the application and examination process (education/ work experience requirements, application fees, how the exam is administered, etc.), in addition to an in-depth review of the new CMSP Exam Topic Outline. The CMSP exam has been completely revised and refined over the past two years, and new applicants will now have a choice of two tracks — Technical and User/Manager — and will take an entirely new exam. The workshop will be taught by charter/pioneer CMSPs who have been involved in oversight of the CMSP program and/or creation/revision of the CMSP exam. The workshop will not by itself prepare applicants to take the exam, but will provide a thorough overview of exam content and a blueprint for further self-study.

PDW5 • Room S331B • 0800 – 1200

Big Data: Harnessing the Power of Data Analytics to Optimize Training

Presenters

Liz Gehr, Ph.D., Human Factors Psychologist, The Boeing Company; Ranjan Paul, Ph.D., Statistician and Associate Technical Fellow, The Boeing Company

The term "big data" is used in a variety of industries to refer to the vast amounts of data generated and available due to the prevalence of technology. Data analytics offers a principled approach to managing this unwieldy data and making it a valuable resource for understanding complex interactions and improving operations. With respect to the training community, technology enables the collection of data from a variety of sources and as well as a number of aspects of training such as student records, training device functioning and availability, student performance during training and student daily activities that are relevant to their current program of instruction. This workshop will provide an overview of "Big Data" and common and emerging data analytics methods. The workshop will also include examples of how data analytic methods can be applied to improve the planning, management, execution, debrief and re-planning of training activities. One main focus will be the challenges associated with applying standard data analytics methods in a military training environment. The format of the workshop will involve lecture, interactive question and answer sessions for each topic addressed. Participants are encouraged to bring up additional topics or examples of big data applications.

PDW6 • Room S330F • 0800 – 1200

Export Controls on the Technology and Software Transfers

Presenter

Ozkan Erdem, Ph.D., Vice Chair, National District Export Council, President, Intredex, Inc.

This training covers the basics of Export Administration Regulations (EAR) and International Traffic in Arms Regulations (ITAR) applicable to Technology and Software. Focus will be on reasons for controls, sanctions, licensing and license exceptions for the dual-use and defense articles, parts and programs related technology. Topics will include the General Prohibitions, Embargoes and Other Country Specific Controls, Technology Types, Publicly Available Technology and Fundamental Research, Hiring Foreign Persons (Deemed Export), Export classification for the Technology and Software, Export License Requirements, U.S. Munitions List, Registration Requirements for Defense Manufacturers and Exporters, Licensing under ITAR for Technology transfers, Agreement Types under ITAR, and DFARS Specific Requirements along with the Case Studies.

PDW7A • Room S331A • 0800 – 1200
PDW7B • Room S331A • 1300 – 1700

Measuring the ROI of Training, Simulation, and Education Programs

Presenter

Timothy R. Brock, PhD, CPT, CRP, ID(S&L+), Director of Consulting Services, ROI Institute.

Training, Simulation, and Education programs offer significant value to improve military preparedness and mission outcomes. Yet, it is now necessary to add bottom line and ROI funding justifications to support government mandates for decreased costs, higher value through improved efficiencies and outcomes, and expanded, sustainable capabilities to compensate for continuing funding decreases. This workshop introduces a ROI Methodology to show value in terms that government, military, and corporate executives understand and desire to make initial and ongoing funding decisions.

PDW8 • Room S330E • 0800 – 1700

Serious Game Design Workshop

Presenters

Vance Souders, Producer, Janus Research

Participants will be introduced to key concepts, steps and processes involved in designing a serious game for learning. Through hands-on activities and working together in groups, participants will design a learning game. Participants will experience each phase of the design process, including identifying the training requirements and learning objectives, creating an effective story, determining instructional and gaming strategies, and designing key game and instructional mechanics. Central to our approach will be ensuring that that any key design decision addresses both gaming and instructional considerations. During the workshop, participants will be introduced to key methods to use and issues to consider when designing a learning game. Groups will share their designs and discuss their decisions after each phase of design.

NOTES

Science, Technology, Engineering and Mathematics (STEM) Initiatives

ARMY
NAVY
USMC
AIR FORCE
INDUSTRY
'17

HARNESSING NEW TECHNOLOGIES
TO WIN IN A COMPLEX WORLD

STEM Workforce Initiative

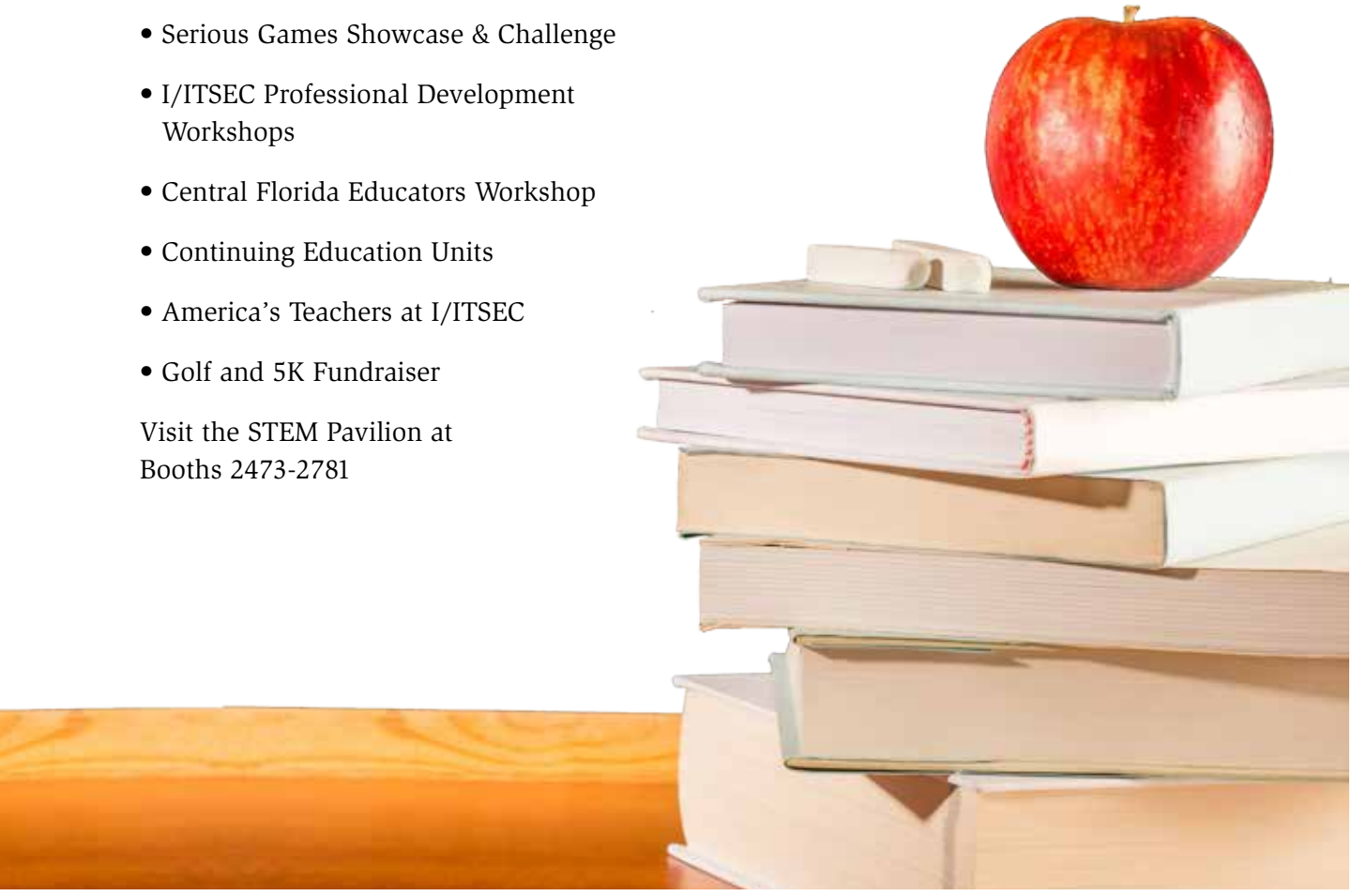
STEM supports and promotes activities encouraging students' interest and pursuit in Science, Technology, Engineering and Mathematics.

STEM Today = Prepared Workforce for Tomorrow

In support of STEM and Workforce Development, I/ITSEC sponsors the following programs:

- Future Leaders Pavilion
- Students at I/ITSEC
- Post Graduate Scholarships (Masters and Doctorate)
- Serious Games Showcase & Challenge
- I/ITSEC Professional Development Workshops
- Central Florida Educators Workshop
- Continuing Education Units
- America's Teachers at I/ITSEC
- Golf and 5K Fundraiser

Visit the STEM Pavilion at Booths 2473-2781



STOP!
SEE THE FUTURE

Future Leaders Pavilion

Booth 2681

Tuesday, 28 November
1200 – 1730

Wednesday, 29 November
0930 – 1730

PRESENTATION SESSION
1600 – 1730 • S320D

Thursday, 30 November
0930 – 1500

AWARDS CEREMONY
1345 • Booth 2389
Innovation Showcase

Learning and *Leadership* are indispensable to each other.

The National Training and Simulation Association and the members of I/ITSEC take great pleasure in welcoming you to the Ninth Annual Future Leaders Pavilion and Special Session.

We are delighted to host secondary students from such diverse areas as:

- Albany, NY
- Dayton, OH
- Hampton, VA
- Orlando, FL
- Philadelphia, PA
- Sanford, FL

The students who participate in the Future Leaders Pavilion (FLP) are committed to excellence and are enrolled in engineering, computer sciences, mathematics, or modeling and simulation tracks. Projects presented this year will continue the legacy of excellence built by previous Future Leaders.

Please remember to stop by FLP, located in Booth 2681, during your visits to the exhibit floor.

On Thursday at 1030, please lend support to our Future Leaders as they present their projects during their Special Session – "The Future is Now!"

Join us again at 1345 at the Innovation Showcase, Booth 2389 for an award ceremony acknowledging the work of our Future Leaders.

Students at I/ITSEC

Thursday, 30 November • 0900 – 1400

Over the years, thousands of Central Florida high school students have participated in a unique learning experience by visiting the Exhibitors/Exhibits. The purpose of the I/ITSEC Student Tours is to allow students to experience first-hand, real-world Training, Simulation, and Education solutions that will help bridge the gap between classroom theory and the applied use of Science, Technology, Engineering, and Mathematics (STEM) subjects. Annually, over 600 students, along with 200 school chaperones and volunteer I/ITSEC member escorts, are exposed to special demonstrations and static displays of the Simulation, Training, and Education Industry. Students are able to learn about the basic building blocks required to deliver high fidelity modeling and simulation products across a broad range of training environments. Participating in the I/ITSEC Student Tours on Thursday, 30 November, 2017, will give students a complete understanding of how they can apply the STEM related skills they learn in the classroom to highly successful careers in our Industry. For the first time in 2016, through a

partnership of NTSA, the Florida High Tech Corridor Council and other "STEM-U-Lators," we are making it possible to bring I/ITSEC to the classroom through the STEMConnect program. To learn more about the I/ITSEC Conference and Student Tours, please contact Bill "Roto" Reuter, I/ITSEC Student Tours Coordinator at roto@r-squaredsolutions.net.

America's Teachers @ I/ITSEC

I/ITSEC has a long history of supporting the education of students and teachers through visits to the conference. Since the America's Teachers at I/ITSEC program began in 2008, we have hosted teachers from Arizona, California, Florida, Georgia, Maryland, Montana, New York, Ohio, Rhode Island, Tennessee, Texas, and Virginia. As part of I/ITSEC's efforts to further education in Science, Technology, Engineering, and Mathematics (STEM), teachers and administrators from across the country have been invited to attend the conference. The America's Teachers at I/ITSEC Program consists of an orientation session, attendance at the Modeling and Simulation techPATH, guided tours of the Exhibit Hall, and attendance at tutorials, paper sessions, and special events. The Teachers will be in sessions and visiting the Exhibit Floor on Monday through Wednesday. Please watch for their Red, White and Blue Ribbons and be ready to engage in conversations about STEM and Future Workforce initiatives. This program is supported by the National Training and Simulation Association and its industry members.

Educators

Workshop to Introduce Simulation into the Physics Classroom – I/ITSEC 2017

stemCONNECT

A program of the Florida High Tech Corridor

The Florida High Tech Corridor (The Corridor) is proud to partner with I/ITSEC once again to highlight the 23-county Corridor region's thriving Modeling, Simulation and Training (MS&T) sector.

The evolution of technology has enabled Corridor programs to transform in ways unimaginable more than 20 years ago, specifically stemCONNECT. This program truly does make the connection between academia and private industry by bringing together students and teachers in classrooms with experts in science, technology, engineering and math (STEM) for engaging presentations through video conferencing tools. Indeed, since the first virtual session in 2013, stemCONNECT has already introduced high tech careers in MS&T and other sectors to nearly 6,000 students and teachers.

The Corridor's stemCONNECT team is excited to host two programs during I/ITSEC – one for educators and one for students – to showcase MS&T technology and related career opportunities. Educators will join stemCONNECT for guided tours of industry exhibits and presentations from well-known experts in the field, including representatives from the Institute for Simulation and Training at the University of Central Florida, the National Center for Simulation and the Florida Advanced Technological Education Center (FLATE) – an initiative of the University of South Florida, Hillsborough Community College and St. Petersburg College funded by the National Science Foundation. Students will learn about the role of robotics in MS&T by programming a LEGO™ robot and interacting with an NAO™ robot. stemCONNECT will also guide students on a tour of industry exhibits with robotics demonstrations.

For those who cannot attend, stemCONNECT will be live streaming a tour of the I/ITSEC convention floor.

SERIOUS GAMES
SHOWCASE & CHALLENGE
Great excitement awaits you in **Booth #2481** at the 12th annual Serious Games Showcase & Challenge (SGS&C)!
The SGS&C provides a showcase of best-in-class learning games submitted by business, government and student developers, and awards noteworthy games to recognize their achievements. The true uniqueness of the SGS&C is that every I/ITSEC "player" has the chance to play the games, talk with the developers, and cast a vote for the coveted SGS&C People's Choice Award.
The SGS&C brings international award winning games to you through partnerships with the Simulation Australasia host of the Australasian Simulation Congress (ASC) SGS&C, and South America's Brazilian Independent Games (BIG) Festival. These international winners automatically earn spots as finalists in the SGS&C, are eligible for awards, and are featured at I/ITSEC on the exhibit floor. Come see the diverse approaches taken by these international participants and meet their developers.
This year will once again highlight games that employ characteristics or techniques that enhance the game in a new or different way through the competition for the Innovation Award. The innovative technique can be hardware integration, instructional design, game design, content topic, or a combination thereof. Drop by the booth to see these innovative technologies in action!
The seven categories of SGS&C winners are announced at the **Awards Ceremony on Thursday, November 30 at 1300 in the Innovation Showcase, Booth 2389**: *Best Business-Developed Serious Game; Best Government-Developed Serious Game; Best Student-Developed Serious Game; Best Mobile Serious Game; Innovation Award; Students' Choice Award;* and finally, what some might consider the most prestigious award, the *People's Choice Award*.
And remember, the People's Choice Award is based on votes from you! Your I/ITSEC badge includes a special SGS&C ballot that allows you to help determine the winner. **Be sure to vote before the deadline on Wednesday, November 29!**
Check out the Serious Games Showcase & Challenge.
For more information, contact Jenn McNamara:
jmcnamara@breakawayltd.com
7 Awards!
Students' Choice
Innovation
Business
Student
Government
Mobile
People's Choice
sgschallenge
@sgschallenge
sgschallenge.com
Booth #2481
2017 Interservice/Industry Training, Simulation & Education Conference

CENTRAL FLORIDA STEM EDUCATION COUNCIL

www.centralfloridaSTEM.org

STEM Tomorrow's Workforce, Today!

STEM Pavilion: Near the Exhibit Hall Lunch Entrance
Project Based Learning Exhibitors

STEM Pavilion

Keeping the workforce pipeline filled with students pursuing STEM degrees is vital to the MS&T industry. It takes all of us to accomplish that. Each year the STEM Pavilion showcases organizations and programs that are successfully inspiring students and are preparing educators to teach and motivate them to pursue STEM degrees. We invite you to visit the Pavilion to learn more about the organizations and agencies active in the local community and across the country that you can support as a business or parent or community leader. Learn about programs available for students and how you can en-gage, mentor and help prepare them for future careers. Engage with educators who want to learn from you about the MS&T industry. Find ways to volunteer. Get involved! Your experience is needed.

Visit www.centralfloridaSTEM.org/parents for more Parent resources

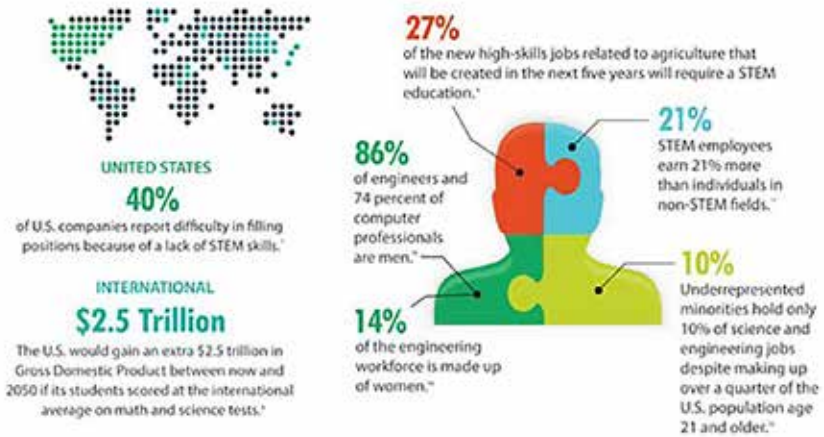
Visit www.centralfloridaSTEM.org/student for more Student resources

Teacher Workshop

The annual I/ITSEC Teacher Workshop gives teachers a chance to be students and engages teachers in hands-on learning by letting them try new ideas for their classroom. It facilitates dialogue between Project-Based Learning (PBL) and industry professionals, while providing a set of relevant and accessible resources for teachers to use throughout the year. Teachers representing counties throughout Florida participate. This year the educators will be on the exhibit floor with tour guides visiting key local MS&T exhibitors to learn about the industry, STEM skills needed and career opportunities available. If you see one of our Teacher Tour groups on Wednesday, stop and introduce yourself!

Visit www.centralfloridaSTEM.org/educators for more Educator resources

The State of America's Workforce



The Central Florida STEM Education Council mission is to collaboratively coordinate and plan STEM education efforts preparing and encouraging pre-college students to enter technical fields of study and to pursue employment in the Central Florida high-tech workforce.

Building a Brighter Future
TODAY!

Over $400,000 in scholarship awards distributed to date

RADM Fred Lewis, USN (Ret.)
President, NTSA • 1995 - 2012

These scholarships have been named the **RADM Fred Lewis Postgraduate I/ITSEC Scholarship** in honor of the former President of the National Training and Simulation Association (NTSA).

27th Annual RADM Fred Lewis I/ITSEC Postgraduate Scholarship Recipients

Lawrence Warren
Masters Student, Computer Science and Applications, Virginia Tech

Salam Daher
Doctoral Candidate, Modeling & Simulation, University of Central Florida

Thomas Kehr
Doctoral Candidate, Modeling & Simulation, University of Central Florida

Jennifer McArdle
Doctoral Candidate,War Studies, Kings College (London)

IMPORTANT DATES FOR 2018

When to Apply
Applications must be postmarked by 19 June 2018. (Don't Delay!)

How to Apply
See **http://www.iitsec.org/Community/Education/Pages/Scholarships.aspx** for complete application details.

Award Announcement
4 August 2018

Post Graduate Scholarships

Looking for Future Leaders in the Simulation, Training and Education Community. Learn more about the I/ITSEC community at **www.iitsec.org**.

Eligibility
U.S. Citizens • Full-time Masters or Doctoral students
(complete undergraduate work by Spring 2018)
See Study Disciplines at
http://www.iitsec.org/education/studentsandteachers/Pages/Scholarships.aspx

Award Amounts
$10,000 (Doctoral Candidates) • $5,000 (Masters Candidates)
Available for Fall 2017 • Be our guest at I/ITSEC November 26 – 30, 2018

Direct Further Inquiries and Provide Submissions
Lewis-I/ITSEC Scholarship Program
c/o The National Training and Simulation Association
2111 Wilson Boulevard Suite 400 • Arlington, VA 22201-3061
(703) 247-2569 or bmcdaniel@ndia.org

Bradford Schroeder
Doctoral Candidate in Psychology, University of Central Florida

NTSA is pleased to add the Leonard P. Gollobin Graduate Scholarship to the I/ITSEC collection of scholarships. This scholarship program was generously bequeathed by Mr. Gollobin to direct students developing their technical talents into the defense industry. Throughout his career, Mr. Gollobin led scientific initiatives that improved our defense systems and strategically shaped our military capabilities. NTSA administers this scholarship with the intent to provide financial support for those seeking advanced degrees and a path to leverage their commitment to strengthen our nation's security.

Exhibit Hall

Attendee Luncheon

Lunch will be served Tuesday – Thursday at 1200. You must enter & exit luncheon through the Exhibit Hall. Full Conference registrants will receive lunch tickets with their registration materials. Exhibitors and Visitors may purchase a ticket for $35.00 at the main Registration Station. Lunch tickets are dated; you must present the current day's lunch ticket for entry.

Connections Lounge & Grill

Stop by and relax in the Connections Lounge & Grill for a bite to eat or a refreshing drink and then connect to your email or review the I/ITSEC program online to plan your next move at the conference. Connections Lounge & Grill will be located in Booth 100, South Exhibit Hall.

Show Management Office

Room S220A • The Show Management Office will be staffed during show hours for all questions regarding booth space, rules, regulations, exhibitor locators, security and late/early passes. Registration will not be made available at the Show Management Office.

National Training & Simulation Association (NTSA)

Booth 2080 • The National Training and Simulation Association (NTSA) is America's premier organization representing the interests of the modeling and simulation community. As such, it serves as a constant point of contact for government, academia, industry, research organizations and the military to exchange information, share knowledge, align business interests, and in general stimulate the growth and overall dynamism of the industry.

Service Booths

PEO STRI	655/1539
PM TRASYS	1433
NAWCTSD	339/1439
USAF	349/1533

International Pavilions

Canada	1081
European	2082

Healthcare Pavilion

Society for Simulation in Healthcare	2172, 2372, 2374, 2375

Recognizing that simulation represents a paradigm shift in health care education, SSH promotes improvements in simulation technology, educational methods, practitioner assessment, and patient safety that promote better patient care and can improve patient outcome. Other participants in the Healthcare Pavilion: Laerdal Medical, TraumaFX, Pocket Nurse.

Innovation Showcase

Exhibit Hall – Booth 2389

Presentations within the Innovation Showcase are led by cutting-edge exhibiting companies that are knowledgeable on the various subject matter within the M&S industry. Mark your calendar to stop by one of the 30-minute sessions to hear what is new and exciting in M&S! Be sure to check out the official I/ITSEC website and onsite signage for updated participants.

(As of 12 October 2017)

Tuesday, 28 November		
1230		
1315	Training Management System: The Missing Link	BNH Expert Software Inc.
1400	Virtual Reality Training: Simulation Software for Healthcare Education	Pocket Nurse
1445		
1530		
1615		
Wednesday, 29 November		
1000	Application Intelligence using Cisco AppDynamics to Gain Deep Insight into IT Operations, End-user Experience and Mission Outcomes	Cisco Systems
1045	Ballistic Missile Defense International Simulation (BMD I-Sim) Tool Suite	Northrop Grumman
1130	Combining Procedural Terrain Techniques with Traditional Terrain Approaches to Meet Today's Multi-domain Visualization and Simulation Requirements	VT MÄK
1215		
1300		
1345	Managing Audio, Streaming Media and Simulation for Enhanced Training and AAR	Pitch Technologies
1430	DLP 8K Resolution with Pixel Shift Technology	Digital Projection International
1515		
1600		

Exhibitor Networking Event

Tuesday, 28 November • 1700 - 1830 • Exhibit Hall

Be sure to kick off I/ITSEC 2017 with a stop by one of the participating booths at the I/ITSEC Exhibitor Networking Event. What a great way to view the latest technology while networking with exhibitors and your fellow attendees. Be sure to check out the official I/ITSEC website and onsite signage for updated participants.

(As of 12 October 2017)

Booth #	Company
329	Soar Technology
835	Alion Science and Technology
1712	JVC Visual Systems
2038	Engineering Support Personnel, Inc, (ESP)
2080	NTSA
2200	Aptima, Inc.
2401	Krauss-Maffei Wegmann GmbH & Co. KG

Operation Blended Warrior

LEARN HOW AND WHY LVC TODAY IS NOT AS EASY AS "PLUG AND PLAY"

MONDAY, 27 NOVEMBER
1430 – 1600
Interoperability Data Management
TUESDAY, 28 NOVEMBER
1530 – 1700
Live Asset Integration
Cyber
WEDNESDAY, 29 NOVEMBER
1000 – 1130
Coalition Support Multi-Level Security
WEDNESDAY, 29 NOVEMBER
1500 – 1630
Dense Urban Areas
Performance Measurement
THURSDAY, 30 NOVEMBER
1000 – 1130
Gaming Solutions
Interoperability

BOOTH 449 AND OTHER FLOOR LOCATIONS

SE2

PERFORMANCE MEASUREMENT, DENSE URBAN AREAS, CENTRALIZED DISTRIBUTION

Blended Operation Warrior I/ITSEC

Readiness Through LVC

MULTI-LEVEL SECURITY, COMMERCIAL GAMING SOLUTIONS, LIVE ASSET INTEGRATION

LVC IS VITAL TO MISSION SUCCESS!

2017 marks the third year for the Special Event, Operation Blended Warrior (OBW). This year, we will create a unique Live-Virtual-Constructive (LVC) environment in order to showcase issues, challenges and solutions associated with implementing LVC capabilities into our training systems. LVC is a critical requirement for our Warfighters to meet operational requirements.

We have over 40 industry and government participants working together across a variety of operational mission sets in the following domains: air, cyber, ground, and maritime. The efforts from this year's event are critical to defining the standards and requirements for future development of LVC initiatives.

During each OBW time slot, you'll see industry showcase some of the latest LVC capabilities across a wide range of operational missions from Booth 449 (a Command Center perspective) – or visit industry members in their booths to talk to them and see the capability from the operator's perspective.

WHY OPERATION BLENDED WARRIOR?

Over the years there has been a lot of progress in the individual disciplines (Live, Virtual Constructive), but there hasn't been a lot of progress in the rapid integration of all three. Operation Blended Warrior aims to address this through a four year special event, each year adding scope and complexity while identifying big challenges and driving down planning time and costs.

Check your Meeting Bags or stop by Booth 449 for a full listing of the participants and the programs to be demonstrated.

3D Perception	1070
4C Strategies	1915
505th Command and Control Wing	529
5DT, Inc.	301
A. Harold & Associates, LLC	1969
AAFMAA Wealth Management and Trust	356
Acme Worldwide Enterprises, Inc.	1159
ACS Hydraulics, Inc.	1171
Adacel Systems, Inc.	1121
Adder Technology	515
Adobe Systems, Inc.	401
Advanced Distributed Learning (ADL) Initiative	2161
Advanced IT Concepts, Inc.	864
Advanced Simulation Technology, inc.	2109
Aechelon Technology, Inc.	1722
AECOM	821
AEgis Technologies	1901
Aero Simulation, Inc.	1900
Aerotronics	507
Aimereon, Inc.	248
Air Force Agency for Modeling and Simulation	349
Air National Guard Trainer Development	1469
Alion Science and Technology	835
Alpha Omega Change Engineering, Inc.	1517
Ameripack	982
Aptima, Inc.	2200
ARA Virtual Heroes Division	1207
Army Modeling & Simulation Office	862
Army Research Laboratory	321
Astronics Test Systems, Inc.	771
AT&T Global Public Sector	2619
Atlantic Laser Scanning Services, Inc.	350
Autocomp Management	403
Aviation Instrument Technologies Inc	2469
Bagira Systems Ltd.	2055
Barco	848
Battlespace Exploitation of Mixed Reality (BEMR) Lab–SSC Pacific	1086
Battlespace Simulations	1249
B-Design3D	2222
Bihrle Applied Research, Inc.	2641
Blue Marble Geographics	2734
BNH Expert Software Inc.	620
Boeing Company	2083
Bohemia Interactive Simulations	2235
Brain Vision, LLC	409
Bugeye Technologies	2471
C2 Technologies, Inc.	1064
CAE	1734
Calytrix	1020
Canada	1081
Canon USA, Inc.	2419
Cardionics	525
Carl Zeiss Corporation	429
CEVIANS LLC	1616
Charles River Analytics	2068
Chassis Plans, LLC	348
Chelsio Communications, Inc.	2385
Cisco Systems	533
Clear-Com LLC	624
Close Air Solutions	1249
CM Labs Simulations	1620
Computer Comforts	2712
Concord Aerospace	2728
Concurrent	2221
Control Products Corporation	2214
Cornerstone Software Solutions, Inc.	2773
Craig Technologies	1933
Cranfield Aerospace Ltd.	2073
Cruden B.V.	313
CSRA	727
Cubic Global Defense	1748
Cyber Security & Information Systems Information Analysis Center (CSIAC)	1612
Cybernet Systems Corporation	1972
David Clark Company Incorporated	622
D-BOX Technologies, Inc.	1149
Dedicated Computing	1729
Design Concepts	2220
Design Interactive, Inc.	1862
Diamond Visionics	1101
DIGINEXT	1927
Digital Projection	1914
Displays & Optical Technologies, Inc.	1909
DiSTI Corporation	1281
DMSCO	1980
domeprojection.com/project: syntropy	2765
Doron Precision Systems, Inc.	2701
Draper, Inc.	2722
Driven Technologies, Inc.	1254
DRS Technologies	801
E2M Technologies B.V.	2127
ECA Group	2735
EDM Ltd.	1287

NTSA Sustaining Member • NTSA Regular Member • NTSA Associate Member

Eduworks Corporation	2465	Institute of Marine Technology at Warner University	2665
EHS Technologies	2373	Integration Innovation, Inc.	561
Elbit Systems, Ltd.	2000	Inter-Coastal Electronics, Inc.	2216
Electro-Optical Imaging, Inc.	509	Israel Aerospace Industries Ltd.	2049
Engility	1238	ITEC	2726
Engineering & Computer Simulations, Inc.	1563	J.F. Taylor, Inc.	2459
Engineering & Manufacturing Services, Inc (EMS)	2659	JHT, Inc.	1234
ESG Elektroniksystem- und Logistik-GmbH	1165	JIRACOR	2775
ESP, Inc.	2038	JRM Technologies	1113
ESRI	357	JVC Professional Visual Systems	1712
Esterline	827	Katmai	2069
ETC	1920	KBRwyle	506
E-Tech Simulation	2757	Kentucky Trailer Technologies	1581
ETSA	2082	KGS-TraumaFX	870, 2375
EWA GSI	517	Knowledge Based Systems, Inc.	514
Explotrain LLC	770	Kongsberg Digital Simulation Inc.	1463
Extron Electronics	1135	Kratos Training Solutions	1000
F2Si	673	Krauss-Maffei Wegmann GmbH & Co. KG	2401
FAAC, Inc.	1481	L3 Technologies, Inc.	1449
Fain Models, Simulation Systems	2073	Laerdal Medical	2172
Fidelity Technologies	1937	Laser Shot	2224
FlightSafety International	1401	Leidos	1012
Frasca International, Inc.	621	Lockheed Martin	2248
Full Sail University	1788	Look Solutions USA, Ltd.	415
Future Leaders Pavilion	2681	LSI, Inc.	840
Gaumard Scientific	760	LuxCarta	2269
GBL Systems, Inc.	2664	Marathon Targets	501
GBvi Ltd.	2736	Marine Corps System Command (PM TRASYS)	1433
Gemstar Manufacturing	1187	MASA Group	2227
General Dynamics	639	Mass Virtual, Inc.	358
General Services Administration	251	MBX Systems	1513
George Mason University Serious Games Institute	2663	Medical-X	2170
Georgia Tech Research Institute	1009	Meggitt Training Systems	1223
Geoweb3d	706	Mercury Systems	774
GlobalSim, Inc.	711	MES Simulation & Training Corp.	970
Hampden Engineering Corporation	616	MetaVR	1249
Harris Corporation	2700	Metova Federal, LLC (CyberCENTS)	1963
HP, Inc.	2383	Mittler Report	2668
Huntington Ingalls Industries	1413	Moog	1127
Hutchinson Stop-choc	2753	Monch Publishing Group	257
Immersive Display Solutions, Inc.	1273	Motion Analysis Corporation	2718
Industrial Smoke & Mirrors	2449	Motion Workshop	355
Inert Products LLC	772	MS&T Magazine - Halldale Media	2062
Innovation Showcase	2389	MT2 Firing Range Services	2661
innovative Technology Projects Ltd.	1173	National Center for Simulation	2461
Inovex Simulation & Training	880	National Defense Industrial Association	2080

National Guard Association of the United States	872
National Training & Simulation Association	2080
NATO	2161
Neugart USA Corporation	2704
Northrop Grumman	1949
NSC	2635
Nusura	1158
Oakwood Controls	2653
Old Dominion University Online	2764
Operation Blended Warrior (OBW)	449
OptiTrack	1026
Orange Technical College – Launch Site	2261
Oshkosh Speciality Vehicles	2012
Panel Products, Inc.	1511
Paramount Panels, Inc.	249
Parsons	860
PatchPlus Consulting, Inc.	516
PATCO Electronics	2709
Pathfinder Systems, Inc.	2852
Patriot Products LLC	2649
PhaseSpace, Inc.	1588
Pinnacle Solutions, Inc.	1080
Pitch Technologies	2026
Planar, a Leyard Company	2759
PLEXSYS Interface Products, Inc.	1772
PLW Modelworks	960
Pocket Nurse	2374
Polhemus	721
Power Innovations Int'l, Inc.	153
Pragmatics, Inc.	627
Pratt & Miller Engineering	1201
Pratt & Whitney Customer Training	735
Presagis	1762
Pulau Corporation	601
Q4 Services	2435
Quadrant Simulation Systems, Inc.	2015
QuantaDyn Corporation	807
Quantum 3D, Inc.	1421
Questionmark	512
Rapid Prototyping Services	2221
RAVE Computer	2101
Ravenswood Solutions	1058
RAYDON Corporation	1048
Raytheon	1036
Real-Time Innovations	781
Red Lotus Technologies	773
REDCON Solutions Group	2771
RGB Spectrum	2208
Rheinmetall Defence	2213
Rockwell Collins	2201
RPA Electronic Solutions, Inc.	1008
RSI Visual Systems	1908
RUAG Defence	2411
Rustici Software LLC	413
SA Photonics	618
Saab Defense and Security	2149
Safety Training Systems, Inc.	964
SAIC	1780
SAVE Corporation	2749
Scalable Display Technologies	1489
SCALABLE Network Technologies	1109
Sea Box, Inc.	980
SecureStrux LLC	255
Senspex, Inc.	612
Serious Games Challenge	2481
SGB Enterprises, Inc.	2707
Shepard Media	2117
Shooting Range Industries LLC	675
SimBlocks LLC	454
SimCentric Technologies	2235
SimiGon, Inc.	2741
SIMmersion LLC	1132
SimPhonics, Inc.	2032
SimSTAFF Technical Services	1610
Simtek, Inc.	508
Simthetiq	1917
Simulation and Control Technologies	1926
Simulator Solutions	2729
SMART EYE AB	354
Soar Technology, Inc.	329
Society for Simulation in Healthcare	2372
Software Engineering Institute, Carnegie Mellon	2009
Sonalysts	606
Sony Electronics, Inc.	2139
Splunk, Inc.	407
SR Research	986
Starline	775
Stirling Dynamics	1162
Strategic Systems, Inc.	307
Symbolic Displays, Inc.	881
Tactical Communications Group	352
Talon Simulations	2122
TEC Simulation	149
Tech Wizards, Inc.	817

NTSA Sustaining Member • NTSA Regular Member • NTSA Associate Member

TerraSim Inc.	2235
Ternion Corporation	700
Thales	2427
Theissen Training Systems, Inc.	1973
Third Dimension Technologies	780
Tobii Pro	2760
Trailer Transit, Inc.	513
Transas Marine	1723
TrianGraphics	2008
Trideum Corporation	1032
TRU Simulation + Training	1700
UCF Foundation, Inc.	874
UFA, Inc.	2021
Unigine Corp.	1170
United Electronic Industries (UEI)	1932
University of Southern California's Institute for Creative Technologies (USC ICT)	460
U.S. Army Night Vision and Electronic Sensors Directorate	717
U.S. Army PEO STRI	1539
U.S. Army RDECOM	321
U.S. JACLEAN, Inc.	521
U.S. Navy	339
U.S. Navy / NAWCTSD	1439
USAF Training Systems Product Group	1533
V-Armed Inc.	613
Vencore	1153
Veraxx Engineering Corporation	1139
Vertex Solutions Group	2235
VirTra	2439
Virtual Motion Labs	1252
VT MÄK	1213
Westar Display Technologies, Inc.	2120
WILL Interactive	607
WITTENSTEIN Aerospace & Simulation	649
Yorktown Systems Group, Inc.	887
ZedaSoft, Inc.	1873

Committees

ARMY
NAVY
USMC
AIR FORCE
INDUSTRY
'17

HARNESSING NEW TECHNOLOGIES
TO WIN IN A COMPLEX WORLD

Conference Committee

Service Executives	BG William Cole, USA, Program Executive Officer for Simulation, Training and Instrumentation CAPT Erik Etz, USN, Commanding Officer, NAWCTSD Col Walt Yates, USMC, Program Manager, MARCORSYSCOM PM TRASYS Col Philip E. Carpenter, USAF, Chief, Program Office, Air Force Materiel Command
OSD/Joint Executive	Gregory Knapp, Senior Systems Engineer & Program Manager/ Acting OSD Executive
Service Principals	
Army	Traci Jones, U.S. Army PEO STRI
Navy	Diana Teel, NAWCTSD
Marine Corps	Martin Bushika, MARCORSYSCOM PM TRASYS
Air Force	Tony DalSasso, Simulators Program Office, Air Force Materiel Command (AFMC)
OSD Principal	Shep Barge, Ph.D., OSD (P&R) / JAEC
Conference Chair	David Hutchings, Raydon Corporation
Deputy Conference Chair	Elizabeth Biddle, Ph.D., The Boeing Company
Program Chair	Brian Holmes, Nova Technologies
Deputy Program Chair	Robert Kleinhample, SAIC
Subcommittee Chairs	
Education	Nina Deibler, Serco, Inc.
Emerging Concepts and Innovative Technologies	Jennifer Murphy, Ph.D., Quantum Improvements Consulting LLC
Human Performance, Analysis and Engineering	John Schlott, L-3 Link
Policy, Standards, Management and Acquisition	Tara Kilcullen, Aptima, Inc.
Simulation	Roy Scrudder, The University of Texas at Austin
Training	Michael O'Connor, Trideum Corporation
Best Paper Committee Chair	Cynthia Harrison, U.S. Army PEO STRI
Tutorial Board Chair	David Milewski, Alpha Omega Change Engineering (AOCE), Inc.
Best Tutorial Committee Chair	Lee Lacy, Ph.D., The DiSTI Corporation
Education and Training Advisor	VADM Al Harms, USN (Ret.)
Scholarship Committee Chair	Janet Spruill, Aptima, Inc.
Director for International Programs	K. Denise Threlfall, Ph.D., Agehya Global Business Solutions, Inc.
Strategic Planning and STEM Committee Chair	Linda Brent, Ed.D., The ASTA Group
Special Event Coordinator	Matt Spruill, Trideum Corporation
Website and Social Media Advisor	John Killilea, StraCom Services Group
Conference Sponsor	National Training and Simulation Association
President	RADM James Robb, USN (Ret.)
Coordinator	Debbie Langelier, CEM
Advisor	Barbara McDaniel
Media Relations/Communications	John Williams
Operations	Len Kravitz, LRK Associates, Inc.
Protocol Coordinator	Steve Detro, Detro Consulting LLC
Historian	Carol Denton
Veterans Coordinator	DeLloyd Voorhees, General Dynamics Information Technology

Council of Chairs

The Council of Chairs is a special advisory group to the NTSA Sponsor and to the I/ITSEC Committee organization. The exclusive membership comprises the previous I/ITSEC Conference chairs. Drawing on their cumulative experience, these leaders provide a unique perspective and advice for the ongoing mission of I/ITSEC.

1979	A.W. Herzog *(Deceased)* and G.V. (Vince) Amico *(Deceased)*	1987	David P. Crane *(Deceased)*	1997	Dennis Shockley	2007	Amy Henninger, Ph.D.
1980	Robert W. Layne *(Deceased)*	1988	Thomas E. Sitterley, Ph.D.	1998	Jim Cooksey	2008	Don Currie
1981	Kurt Merl	1989	Arthur L. Banman	1999	Stan Aronberg *(Deceased)*	2009	DeLloyd Voorhees, Jr.
1982	James A. Gardner, Ph.D.	1990	Steve Selcho	2000	Ron Johnson *(Deceased)*	2010	Jim Wall, Ph.D.
1983	John Todd *(Deceased)*	1991	Donald M. Campbell	2001	Debbie L. Berry	2011	Mike Genetti, Ph.D.
1984	Ralph T. Davis *(Deceased)*	1992	Jerry Jerome	2002	Paul Bernhardt	2012	Amy Motko
1985	John W. Hammond	1993	J.D. (Jack) Drewett	2003	Bill Walsh	2013	Cyndi Turner Krisan
1986	Rodney S. Rougelot	1994	G.P. (Pres) McGee	2004	Buck Leahy	2014	Ron Smits
		1995	Judith Riess, Ph.D.	2005	Steve Swaine	2015	Brent Smith
		1996	Ed Ward	2006	Steve Detro	2016	Janet Spruill

Education

Chair:
Nina Deibler
Serco Inc.

Deputy Chair:
Lewis Harris
Booz Allen Hamilton, Inc.

Thomas Archibald, Ph.D., Intelligent Decision Systems Inc.
Ryan Bair, Marine Corps University
Jan Biernfalk, Quantum3D
Martin Bink, Ph.D., U.S. Army Research Insititute
Ami Bolton, Ph.D., Office of Naval Research
Charles Breed, Zenetex LLC
Claudia Clark, Ed.D., U.S. Navy Surface Warfare Officers School
Amanda Davies, Ph.D., Charles Stuart University
Ed Degnan, Ph.D., Air Force Agency for Modeling and Simulation
Rhiannon Dolletski-Lazar, ECS Federal
David Fautua, Ph.D., Joint Staff J7
Jeremiah Folsom-Kovarik, Ph.D., Soar Technology
Matthew Hackett, Ph.D., ARL STTC
Kelly Hale, Ph.D., Design Interactive Inc.
Toni Hawkins-Scribner, USAF Air University
Randy Jensen, Stottler Henke Associates Inc.
Wendy Johnson, Ed.D., USAF Air Education & Training Command
Brent Kedzierski, Shell Oil Company
Stacy MacAllister, Iowa State University
James Murnan, MARCORSYSCOM PM TRASYS
Klainie Nedoroscik, American Systems
Kevin Oakes, Huntington Ingalls
Judith Riess, Ph.D., Education and Training Solutions
Oscar Solano, MARCORSYSCOM PM TRASYS
Robert Sottilare, Ph.D., ARL-Orlando
Jim Threlfall, C2 Technologies, Inc.
Christian Welch, NAWCTSD

Emerging Concepts & Innovative Technologies

Chair:
Jennifer Murphy, Ph.D.
Quantum Improvements Consulting LLC

Deputy Chair:
Brian Overy
Quantum3D

Jennifer Arnold, Booz Allen Hamilton
Maj. Jesse Attig, USMC, Battle Simulation Center, Twentynine Palms
Lisa Jean Bair, SAIC
Keith Biggers, Ph.D., Texas A&M Engineering Experiment Station
Richard Blum, SAAB Defense and Security USA LLC
John Burwell, Bohemia Interactive Simulations
Sally Carter, USAF Air Education & Training Command
Rick Copeland, U.S. Army PEO STRI
Carla Cropper, Rockwell Collins
Gabe Diaz, Problem Solutions
Leslie Dubow, Veterans Health Administration SimLEARN
Ba Duong, MARCORSYSCOM PM TRASYS
Michael Finnern, Engility Corporation
LCDR Chris Foster, NAVAIR 205
Nick Giannias, CAE
Paul Hungler, Ph.D., Canadian Defence Military Personnel Generation
Diane Justice, USAF Training Aircraft Division
Aerial Kreiner, Ph.D., Air Force Research Laboratory
Jennifer McNamara, Breakaway Games
Kara Orvis, Ph.D., Aptima, Inc.
Scott Schutzmeister, Institute of Defense Analysis
Dennis Shockley, Barco
Harry Sotomayor, U.S. Army PEO STRI
Jay Truitt, NETC
Luis E. Velazquez, MARCORSYSCOM SIAT
Paul Watson, U.S. Army PEO STRI
Tim Woodard, NVIDIA

Human Performance, Analysis and Engineering

Chair:
John Schlott
L3 Link

Deputy Chair:
Robert "Buddha" Snyder, Whitney, Bradley and Brown, Inc.

Meghan Berlingo, Ph.D., Air Force Research Laboratory
J. Robert Bois, Ph.D., Lockheed Martin
Bethany Brant, USAF Simulators Program Office
Paula Durlach, Ph.D., ARL STTC
Liz Gehr, Ph.D., The Boeing Company
Daniel Immeker, CNATRA
Lewis Johnson, Ph.D., Alelo
Scott Johnston, Booz Allen Hamilton
Mike Lokuta, CAE USA
Adelle Lynch, Rockwell Collins UK
Perry McDowell, MOVES Institute
Ingrid Mellone, Huntington Ingalls
Ellen Menaker, Ph.D., Intelligent Decision Systems Inc.
Connie Perry, U.S. Army PEO STRI
Jim Pharmer, Ph.D., NAWCTSD
Matt Phillips, Ph.D., Hughes Research Laboratories
Robby Robson, Ph.D., Eduworks
Jerry Stahl, Cypress International
Alexandra Steiner, Trideum Corporation
Phillip Thomas, Special Warfare Education Group
Kendy Vierling, Ph.D., USMC TECOM
Robert Wallace, USAF Air Combat Command
JoAnn Wesley, MARCORSYSCOM PM TRASYS

Policy, Standards, Management, and Acquisition

Chair:
Tara Kilcullen
Aptima, Inc.

Deputy Chair:
Jeffrey A. Raver, SAIC

Peter Baverso, MARCORSYSCOM AC ALPS
Charles Brink, USAF Simulators Program Office
Phil Brown, D.M., NORAD-USNORTHCOM J7
LtCol Jesus Claudio, USMC, MARCORSYSCOM PM TRASYS
Chris Davidson, CDSMA
Gregory Dougherty, NAWCTSD
John Dzenutis, The Boeing Company
Mike Genetti, Ph.D., Rockwell Collins
Steve Gordon, Ph.D., GTRI
Richard Grohs, USAF Air Combat Command
Susan Harkrider, Night Vision & Electronic Sensors Directorate
Cynthia Harrison, U.S. Army PEO STRI
Julie Kent, Raytheon
Craig Langhauser, Rockwell Collins
Anne Little, SAIC
Mike Merritt, NAWCTSD
Steve Parrish, Laerdol Medical and Simulations
Emilie Reitz, Leidos
Larry Rieger
Michael Sanders, Huntington Ingalls
Tiffany Sanders, JHT
Ramona Shires
Brett Telford, USMC MCMSMO
Hung Tran, CAE USA
Eric Weisel, Ph.D., Old Dominion University
Amanda Williams, USAF Simulators Division
Karen Williams, U.S. Army PEO STRI
Michelle Wright, Huntington Ingalls

Simulation

Chair:
Roy Scrudder, The University of Texas at Austin, Applied Research Laboratories

Deputy Chair:
Favio Lopez, Trideum Corporation

Angela Alban, SIMETRI Inc.
Randal Allen, Ph.D., Lone Star
Paul Bogard, USAF Simulators Program Office
Christina Bouwens, Ph.D., Cornerstone Software Solutions
Paul Cummings, ICF International
James Dennis, General Dynamics Information Technology
Steve Detro, Detro Consulting, LLC
Jan Drabczuk, Eagle Systems
Machelle Ferry, Veterans Health Administration
Mike Flanagan, LMI
Luis Garcia, MARCORSYSCOM PM TRASYS
LT Joe Geeseman, USN, CNATRA
Todd Glenn, FAAC Incorporated
Daniel Immeker, CNATRA
Eric Jarabak, MARCORSYSCOM PM TRASYS
Thomas Kehr, U.S. Army PEO STRI
Tony Krogh, The AEgis Technologies Group, Inc.
LT Joseph Mercado, USN, NAWCTSD
Jimmy Moore, PeopleTec
Ronald Moore, Leidos
Maj James Reynolds, USMC, PMA-201, Deputy PM Small Diameter Bomb II
Sae Schatz, Ph.D., Advanced Distributed Learning (ADL) Initiative
Craig Siefert, USAF Simulators Program Office
Teresita Sotomayor, Ph.D., ARL STTC
Brian Stensrud, Ph.D., Soar Technology
Sherry Steward, Ph.D., NAWCTSD
Alyssa Tanaka, Ph.D., Soar Technology
Lisa Tripp, Ph.D., Air Force Research Laboratory
LTC Brian Vogt, USA, U.S. Army TRADOC
Eliot Winer, Ph.D., Iowa State University

Training

Chair:
Michael O'Connor
Trideum Corporation

Deputy Chair:
Paul Lyon, Esterline Simulation Visual Systems

John Aughey, The Boeing Company
Gary Bauleke, Defense Language and National Security Education Office
Jeffrey Beaubien, Ph.D., Aptima, Inc.
Benjamin Bell, Ph.D., Eduworks Corporation
Marcus Boyd, L3 Technologies – Link Simulation & Training
Jan Brown, CAE USA
Sean Carey, USAF Air Mobility Command
Maj Travis Carlson, USMC, Office of Naval Research, Code 30
Thomas Casey, USAF Simulators Division
Kerri Chik, TiER 1 Performance Solutions
Jennifer Fowlkes, Ph.D., NAWCTSD
Sam Fragapane, Air Force Agency for Modeling and Simulation
Jeff Frost, GaN Corporation
Kevin Gupton, The University of Texas at Austin, Applied Research Laboratories
Michele Harrison, NETC
John Huddlestone, Coventry University
Nathan Jones, MARCORSYSCOM PM TRASYS
Aaron Judy, NAWCTSD
Jeremy Lanman, Ph.D., U.S. Army PEO STRI
Rob Lechner, The Boeing Company
Koren Odermann, MARCORSYSCOM PM TRASYS
Beth Pettitt, ARL STTC
Sowmya Ramachandran, Ph.D., Stottler Henke Associates, Inc.
Damon Regan, Ph.D.
Mike Robbs, Federal Law Enforcement Training Center
Karol Ross, Ph.D., Cognitive Performance Group
Ron Smits, Engility
Michael Truelove, U.S. Army Modeling and Simulation Office
Janet Weisenford, ICF
Thomas Yanoschik, SAIC

International Programs

Director
K. Denise Threlfall, Ph.D., Agehya Global Business Solutions, Inc.

Deputy Coordinators
Paul Thurkettle, NATO Allied Command Transformation
Michael Weber, Arorae Corporation

Member
Thomas Archibald, Ph.D., Intelligent Decision Systems Inc.
Benjamin Bell, Ph.D., Eduworks Corporation
Jan Drabczuk, Eagle Systems
Scott Hooper, Kongsberg Geospatial
Craig Langhauser, Rockwell Collins
Luis Velazquez, MARCORSYSCOM

Operations/Protocol

Chair
Len Kravitz, LRK Associates, Inc.

Deputy Chair Operations
Bruce Schwanda, B.A.S. Associates, LLC
Annie Patenaude, AMP Analytics

Deputy Chair Protocol
Steve Detro, Detro Consulting, LLC

Members
Mike Armstrong, Pulau Corporation
Lee Barnes
Richard Boyd, Metaversial
Carol Denton
Catherine Emerick, Raytheon
Charlie Frye, Huntington Ingalls
Jim Godwin, The Tolliver Group, Inc.
Bill Hornsby, A. Harold & Associates, LLC
Zach Johnson, Principled Leadership Consultants
Ed Kulakowski, OT Training Solutions, Inc.
Pete Marion, TMST Consultants
Mike Motko, Falcon Global Solutions
Kristy Murray, Summit Strategic Consulting
Mark Russell, Cole Engineering
Mary Trier, Capital Communications & Consulting
Sam Worrell

Serious Games Showcase & Challenge IPT

Chair
Vance Souders, Plas.md

Deputy Chair
Michael Woodman, Ph.D., SAIC

Government Chair
Colleen Matthews, PCTE PD/LE at U.S. Army

Director
Jennifer McNamara, BreakAway Games

Members
Jennie Ablanedo, University of Central Florida
Stu Armstrong, Cole Engineering Services, Inc.
Michelle Brauer, AOCE, Inc.
Michael Carney, Canon USA
Gardner Congdon, SAIC
Karen Cooper, Ph.D., NAWCAD
Seth Crofton, Gaming Consultant
Leslie Dubow, Veterans Health Administration SimLEARN
Sidney Fooshee, Ph.D., Associate Director for Human Systems, at Office of the Assistant Secretary of Defense for Research & Engineering
Mark Friedman, Vertex Solutions Group, Ltd.
Dolly Rairigh Glass, Capital Communications & Consulting
Alex Gilbert, Redqueen Gaming
Kent Gritton, JTIEC/NAWCTSD
Lisa Scott Holt, Ph.D., Intelligent Automation, Inc.
Gregg Lagnese, Autodesk
Adelle Lynch, Thales Cyber & Consulting
Steve McCabe, USAF Simulators Division
Perry McDowell, Naval Postgraduate School
Jeff Mills
Elaine Raybourn, Ph.D., Sandia National Laboratories/ADL Initiative
Trey Reyher, Deloitte Consulting, LLC
Erik Sand, Florida Interactive Entertainment Academy, UCF
Kishan Shetty, Janus Research
Scott Shiffert, Hewlett-Packard
Steve Slosser, JTIEC/NAWCTSD
Juliana Slye, Government Business Results, LLC
Brent Smith
Peter Smith, Ph.D., University of Central Florida
Matt Spruill, Trideum Corporation
Stephen Stewart, Evviva Games
Shane Taber, Engineering & Computer Simulations, Inc.
K. Denise Threlfall, Ph.D., Agehya Global Business Solutions, Inc.
Mary Trier, Capital Communications & Consulting
Greg Trnka, Booz Allen Hamilton
Robert Ward, U.S. Navy

Special Events Committee

Chair

Matt Spruill, Trideum Corporation

Deputy Chair

Kara L. Orvis, Ph.D., Aptima, Inc.

Members

I/ITSEC Fellows

Robert Lutz, The Johns Hopkins University Applied Physics Laboratory
Robert Richbourg, Ph.D., Institute for Defense Analyses
Margaret Loper, Ph.D., Georgia Tech Research Institute
Michael Genetti, Ph.D., Rockwell Collins Simulations Training Solutions

Black Swan

Fred Fleury, ZedaSoft, Inc.
Liz Gehr, Ph.D., The Boeing Company

Operation Blended Warrior (OBW)

Lead Coordinator Kent Gritton, JTIEC/NAWCTSD

OBW Operational Committee

Gary Fraas, Lead, M&S Strategic Partners, LLC
Kent Gritton, Co-Deputy, NAWCTSD
LtCol Robert Kammerzell, Co-Deputy, U.S. Army PEO STRI
CDR Gilbert Gay, USN, Military Lead, NAWCTSD
David Kotick, Sr. Technical Advisor, NAWCTSD
Susan Sherman, Technical Lead, NAWCTSD
Dr. James Frey, Scenario Lead, Aero Simulation, Inc.
Larry Flint, Cyber Scenario Co-Lead, USPACOM/Ingenia Services, Inc.
Ron Allen, Cyber Scenario Co-Lead, GDIT
Brian Pages, Maritime Scenario Lead, CAE
Chuck Peabody, Ground Scenario Co-Lead, Jacobs Technology, Inc.
John Julian, Ground Scenario Co-Lead, Jacobs Technology, Inc.
Dr. Angus McLean, International Lead, Rockwell Collins
Cathy Matthews, International, Matthews Systems Engineering Inc.
Ulf Jinnestrand, Viking Lead, 4C Strategies
Dr. Michael Woodman, Terrain Database Lead, SAIC
Justin Murgia, Air Scenario Lead, Rockwell Collins
Farid Mamaghani, Advisor, Halcyon

Operations Liaison

Len Kravitz, LRK Associates, Inc.

STEM Committee

Chair

Linda Brent, Ed.D., The ASTA Group, LLC; NTSA, Strategic Planning

Members

Serious Games

Jennifer McNamara, BreakAway Games

Future Leaders Pavilion

Ann Friel

Students at I/ITSEC

Bill "Roto" Reuter, R-Squared Solutions, LLC

Scholarships

Janet Spruill, Aptima, Inc.

CEU/Professional Development Workshops

Debbie L. Berry, Lockheed Martin
Maria Cherjovksy, University of Central Florida Continuing Education

America's Teachers at I/ITSEC

Margaret Loper, Ph.D., Georgia Tech Research Institute

STEM Pavilion Project Based Learning Exhibits

Robert Seltzer, NAWCTSD

Teacher Tours and Training

Robert Seltzer, NAWCTSD

stemCONNECT

Jeff Bindell, Ph.D., University of Central Florida
Vicki Morelli, Florida High Tech Corridor Council

Carol Ann Dykes, STEM Education Council of Central Florida
Eileen Smith, University of Central Florida
Hank Okraski, National Center for Simulation
Kristy Murray, Summit Strategic Consulting

Tutorial Board

Chair

David Milewski, Alpha Omega Change Engineering (AOCE), Inc.

Deputy Chair

Lisa Scott Holt, Ph.D., Intelligent Automation, Inc.

Members

Charles Cohen, Ph.D., Cybernet Systems Corporation
James Coolahan, Ph.D., Coolahan Associates, LLC
Luis Miguel Encarnação, Ph.D., The QED Group
Michael Freeman, Ed.D., ACLC, LLC
Kevin Hulme, Ph.D., University of Buffalo, Motion Simulation Laboratory
Lee Lacy, Ph.D., The DiSTI Corporation
Robert Lutz, The Johns Hopkins University Applied Physics Laboratory
Thomas Mastaglio, Ph.D., MYMIC LLC
S.K. Numrich, Ph.D., CMSP, Institute for Defense Analyses
Elaine Raybourn, Ph.D., Sandia National Laboratories/ADL Initiative
Robert Richbourg, Ph.D., Institute for Defense Analyses
Leah Rowe, Ph.D., Air Force Research Laboratory
Don Sine, Ph.D., Dickieson Projects, Inc.
Jim Wall, Ph.D., Texas A&M Engineering Experiment Station

NOTES

Conference Information

ARMY
NAVY
USMC
AIR FORCE
INDUSTRY
'17

HARNESSING NEW TECHNOLOGIES
TO WIN IN A COMPLEX WORLD

About Registration

WHAT DO THE REGISTRATION FEES COVER?

In addition to access to Tutorials, Papers, Special Events and Professional Development Workshops, registration fees cover Continuing Education Units (CEUs), Lunches (T-W-Th), Coffee Breaks (T-W PM, W-Th AM), Continental Breakfasts (W-Th), and the Thursday Banquet. A meeting bag with conference materials (including an Abstract book and CD ROM of the current papers) is included. The fees also cover administrative expenses incurred.

I/ITSEC Registration Services for 2017

We strive to minimize the time spent in line so you can move on to the conference events or the exhibit floor. Our goal is to make your I/ITSEC experience a pleasant one even before you enter the Orange County Convention Center (OCCC). Avoid that line and move on to what you came to I/ITSEC to do!

Traditional Registration Stations. Located in S220 of the South Concourse Registration area, traditional walk-up registration will be available for Full Service Registration, on-site payments, changes/edits to name badges, multiple badge pick-ups, or just because you prefer dealing one-to-one with a real person.

Alternate Registration Stations within the Orange County Convention Center. Limited stations at the Main Registration Station will be open Friday and Saturday to handle early registration, especially exhibitors. Conference Attendees are encouraged to wait until Sunday afternoon or use the Self Badging/Self Registration kiosks.

Self-badging printing stations will be available for those who pre-registered and received a confirmation number. To complete your registration at this station, you must be paid in full with no outstanding balance or questions remaining about your registration.

VIPs, Speakers (including Paper Presenters), Media, and International registrants will have special registration stations. More details will be provided to each group, but be sure and watch for signage pointing to these areas.

Registration outside of the Orange County Convention Center. I/ITSEC Full Service Satellite Registrations will be located at the Hyatt Regency and Hilton from Sunday noon through Tuesday. These stations will be staffed to assist you whether you need to start your registration from scratch or just need to pick up your nametag.

Hyatt Regency location: Convention Level, near the Grand Ballroom as you pass from the Hyatt to OCCC.

Hilton location: Lobby Level at the entrance of the skywalk leading from the hotel to the OCCC.

Parking

EXHIBITOR PARKING

$15 per Day – For regular vehicles with re-entry privileges each day. Exhibitor must show badge and receipt for repeat entries.

$25 per Day – For oversized vehicles with re-entry privileges each day. Exhibitor must show badge and receipt for repeat entries.

ATTENDEE PARKING

$15 per Day – For regular vehicles per entry.

$25 per Day – For oversized vehicles per entry.

AFTER 5PM

$10 per Day – For regular vehicles. Same stipulations as above.

$15 per Day – For oversized vehicles. Same stipulations as above.

ACCEPTED PAYMENT METHODS:

Cash, Traveler's Checks, American Express, MasterCard & Visa

Dress Code

BRANCH	CONFERENCE AND GENERAL SESSIONS	BANQUET
Army	ACUs or Duty Uniform	Army Blue *(Army Evening Mess optional)*
Marine Corps	Service "C"	Evening Dress *(Dress Blue "B" or Service "A" optional)*
Navy	Service Khaki, Navy Service Uniform	Dinner Dress White *(Service Dress White optional)*
Air Force	Short or Long Service Blues	Service Dress Blue with tie and jacket *(Mess Dress optional)*
Coast Guard	Tropical Blue Long	Dinner Dress White *(Service Dress White optional)*
Civilian	Business attire	Black tie *(optional)*

The National Training and Simulation Association has blocked rooms with the Orlando hotels listed below. Make your lodging arrangements either **on-line** or by **phone** through onPeak, Inc., our official Housing Partner, through 24 November 2017. Hotel phone numbers will be posted on the I/ITSEC web at that time for your convenience in making last minute changes or arrangements. (Current room rates may apply after 25 November.) onPeak, Inc. is our official housing partner and the only company authorized to represent I/ITSEC and NTSA. If you are contacted by other companies who present themselves as representing the Conference or Association, please report to bmcdaniel@ndia.org.

On-Line: Go to **http://www.iitsec.org/attend/planning-your-stay/accommodations**, select Lodging, select whether you are a corporate or government attendee and the program attached will lead you through the process from location, to hotel selection, to special needs, to payment and confirmation.

By Phone: If you prefer to book via telephone, friendly and knowledgeable agents are ready to take your calls Monday through Friday from 9:00AM – 7:00PM ET at 800-221-3531 or 212-532-1660.

More Information about Lodging Arrangements:

- Some Room Rates are subject to change, based on the government per diem rate. Those listed with an * are the most likely to change.
- Government Rate Room Reservations: Rooms shown in the "Gov't Rate" column are to be assigned to those with appropriate ID, to be presented at the hotel desk upon check-in. Please do not reserve unless you are eligible to do so.
- Be aware that some hotels may charge an additional Resort Fee as well as applicable taxes.
- Additional hotels may be added at a later date.
- The individual hotels are not authorized to accept reservations directly for this conference. You may state your hotel preference when making your reservations.
- Attendees must identify themselves as being with the I/ITSEC to receive the rates shown.
- The Conference is being held at the Orange County Convention Center, located between the Hyatt Regency and Hilton Hotels. The majority of the I/ITSEC 2017 activities will be held in the South Concourse.
- Shuttle buses/vans will be available throughout the conference.
- To help defray conference management costs, an assessment is included in the room rates shown with these hotels. We encourage you to make your lodging arrangements within the designated housing package established.

★ **Hyatt Regency (Conference Headquarters)**
9801 International Drive
(407) 352-4000
Industry: $273 • Government: $133*

② **Doubletree by Hilton at Sea World**
10100 International Drive
(407) 352-1100
Government: $133*

③ **Extended Stay America Convention Center/I-Drive**
8750 Universal Boulevard
(407) 351-1982
One Rate: $87

④ **Hampton Inn Convention Center**
8900 Universal Boulevard
(407) 354-4447
One Rate: $133*

⑤ **Hilton Orlando**
6001 Destination Parkway
(407) 313-4300
Industry: $237 • Government: $133*

⑥ **Homewood Suites**
8745 International Drive
(407) 248-2232
Industry: $142 • Government: $133*

⑦ **Hyatt Place Convention Center**
8471 International Drive
(407) 370-4720
Industry: $135 • Government: $133*

⑧ **Residence Inn by Marriott/Convention Center**
8800 Universal Blvd
(407) 226-0288
Industry: $148 • Government: $133*

⑨ **Rosen Centre Hotel**
9840 International Drive
(407) 996-9840
Industry: $202 • Government: $133*
NOTE: Special Pre-I/ITSEC Rate of $109 from 20-26 November. (Must also book at I/ITSEC rate during the conference.)

⑪ **Rosen Plaza Hotel**
9700 International Drive
(407) 996-9700
Industry: $194 • Government: $133*

⑫ **Springhill Suites Convention Center/I-Drive Area**
8870 Universal Blvd
(407) 345-9073
Industry: $148 • Government: $133*

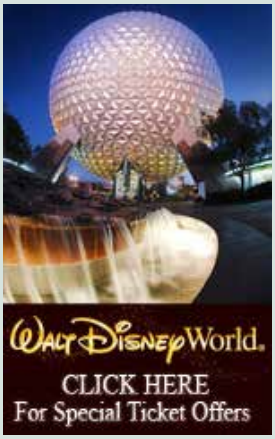
To get from your hotel to the West Concourse of the OCCC, you have several choices of transportation.

- I/ITSEC will provide Shuttle Bus service to all properties listed. (Schedules will be available at the hotels and at the entrance to the conference registration area.)
- Very reasonable Public Transportation is available on the I-Ride trolley bus along International Drive. Check http://www.iridetrolley.com or your hotel for schedules.
- Your own or a rented vehicle. See page 93 for detailed parking information.
- Most of the hotels are within walking distance (wear comfortable shoes).

Hertz®

The National Training and Simulation Association has arranged for the Hertz Company to be the official car rental agency for I/ITSEC with the special rates below. You can also make your reservations on-line through the I/ITSEC website (Lodging/Travel). Vehicles may be returned to any Hertz location in Florida at no additional charge.

CAR	CLASS	DAILY	WEEKEND	WEEKLY	TO RECEIVE SPECIAL MEETING RATES
A	Economy	$39	$19	$169	Call Hertz at 1-800-654-2240 or 405-749-4434 or your nearest Hertz reservation center, your corporate travel department, or your travel agent and give the agent CV#04860010. Rates are guaranteed from November 21 – December 9, 2016 subject to car availability. Government surcharges, taxes, tax reimbursment, title and license fee reimbursement and optional items such as refueling or additional driver fees, are extra. Advance reservations are (strongly) recommended. Minimum rental age is 20 (age differential for age 20-24 applies). Standard rental conditions and qualifications qualify.
B	Compact	$42	$21	$174	
C	Midsize	$45	$23	$184	
D	Standard 2/4-Door	$49	$25	$194	
F	Full Size 4-Door	$55	$33	$205	
G	Premium	$69	$69	$345	
I	Luxury	$89	$89	$399	
Q4	Midsize SUV	$62	$62	$299	
L	Standard SUV	$74	$74	$339	
R	Minivan 2WD	$79	$79	$399	
U	Convertible	$72	$72	$359	
T	Large SUV	$115	$115	$549	
T6	PRM XCAP SUV	$125	$125	$649	



Fill your down time with magical moments. Whether it's spending a truly unforgettable evening with an old friend or sharing a dazzling nighttime sky with a new contact, magical experiences reign supreme in the Walt Disney World® Theme Parks. Special Meeting & Convention Tickets (not available for purchase at the Theme Park Ticket Windows) are available for purchase by attendees. Pre-arrival savings of 10% on multi-day tickets which also include a bonus visit to several other non-Disney park experiences. Disney also offers exclusive partial-day tickets **(After 2 pm and After 5 pm Twilight Tickets)** to the I/ITSEC attendees which are perfect for an open afternoon or evening.

To purchase Florida Resident Tickets or specially priced Disney Meeting/Convention Theme Park tickets, please call **407-566-5600** or visit **http://mydisneygroup.com/iitsec17**. Please note the cut-off date for advance purchase savings is November 26, 2017.

For more information about Disney World during the Holiday Season, please visit https://disneyworld.disney.go.com/events-tours/holidays/

Advertising Opportunities: Official Publications of I/ITSEC

Now more than ever, with the increased challenges facing the defense and security marketplace, you need to keep your organization's message in front of its target audience. Reach the leading decision-makers at the world's largest simulation, training and modeling event of the year by advertising your products and services in the Official Publications of I/ITSEC.

Advertising in these publications is an excellent way to stand out in the crowd and invite the attendees to visit your exhibit, product demonstration and/or website. Then after the event has ended, these publications are used by many as desk-references, so your advertisement will reach the decision-makers long after the conference is over.

The National Training and Simulation Association's Annual Simulation & Training Trends and Technology Review – I/ITSEC Exhibitor Directory

This publication will be available to all the attendees, exhibitors, and exhibit visitors at I/ITSEC. It will be placed in the attendees' conference bags and available at registration, and other locations at the convention center. As an added bonus, your ad will also appear in the December Issue of National Defense Magazine — exposure beyond the walls of the convention center. National Defense is sent to over 81,000 BPA audited readers, including the members of NTSA. *(Directory section will not appear in* National Defense *Magazine)*.

The I/ITSEC Show Daily

Advertise in this year's Daily and be noticed by your customers and potential partners who are attending I/ITSEC. The I/ITSEC Show Daily informs the simulation & training community on breaking events & happenings on-site at I/ITSEC. It is printed overnight and distributed daily at the conference center, choice hotels, and uploaded to the I/ITSEC website. The daily has evolved into a vital part of I/ITSEC; a "must read" while attending the conference. Stop in to Media Room, W206 for more information.

Use both to give your company Unequalled Exposure

Special packages have been created so your organization can take advantage of both opportunities!

Web Banners

A limited number of banner ad spaces are available on the I/ITSEC website.

For more information on advertising in these publications, contact Kathleen Kenney at (703) 247-2576 • kkeney@ndia.org • or at I/ITSEC, Booth 2080

I/ITSEC Proceedings

ONLINE REPOSITORY (PAPERS FROM 1966 – 2017)

The I/ITSEC knowledge Repository provides a valuable link to the I/ITSEC training, simulation and education community. Access the online papers repository at **http://www.iitsecdocs.com**.

YEARLY PROCEEDINGS (PAPERS FROM 1995 – 2017)

Individual CDs for the years shown above are available for $30.00 each. Each CD includes all accepted papers from that year. Orders can be placed by calling (703) 247-9471.
(2002, 2004, 2005, 2007 sold out)

Stay in Touch

Free Wireless hot spots. E-mail/Internet Kiosks.

Complimentary internet, WiFi and email access in the lobby (look for signage). Internet kiosks are also available at no charge in the Connections Lounge and Grill located inside the Exhibit Hall. If you need access outside of the complimentary stations, all of OCCC is now WiFi enabled for a modest user fee.

I/ITSEC is the premier annual event of its kind, attendance by the mainstream and specialist trade press is heavy, resulting in coverage that reaches your key marketing targets. Our media staff stands ready to assist you in achieving maximum exposure during your time at I/ITSEC. Corporate representatives are invited to bring their marketing materials to the Media Room for distribution as early as possible after the opening of registration. The Media Room area will also include a separate facility for briefings/ presentations with a capacity of approximately 30 persons. We strongly recommend early bookings for this room, which will be in demand. Additional exhibitor presentations will be made available inside the exhibit hall at the Innovation Showcase, Booth 2949.

Prior to the conference, contact John Williams at **(703) 362-7005** or **jwilliams@ndia.org**; check out more details on the I/ITSEC News page of **http://www.iitsec.org**. The I/ITSEC Media Room is S201E, phone **(407) 685-4013**.

National Training and Simulation Association

NTSA

The NTSA, an affiliate of NDIA, represents and promotes the business interests of companies in the simulation, training, mission planning/rehearsal, and support services industry. NTSA's 200 corporate and 500 individual members enjoy reduced fees on all NTSA events and services, as well as a monthly e-newsletter (Training Industry News) and National Defense magazine. Sustaining and Regular Corporate members receive early space selection and discounts on exhibit space at I/ITSEC. Individual memberships are also available. For membership information, call **(703) 247-9471** or visit the NTSA website **http://www.trainingsystems.org**.

National Defense Industrial Association

NDIA

Based in Arlington, Virginia, the National Defense Industrial Association (NDIA) is a non-profit, educational association representing industry, government, and all the military services. About 1,600 companies and 85,000 individuals rely on NDIA for networking, knowledge, and business development opportunities. As the nation's leading defense industry association promoting national security, NDIA advocates cutting-edge technology and superior weapons, equipment, training, and support for the warfighter and first responder. Through events, working divisions, local chapters, and four affiliate organizations, NDIA connects the government and defense industry to create a vigorous and ethical forum of information exchange leading to greater support for national security.

For NDIA membership information visit **www.ndia.org** or contact Mike Kibler at **mkibler@ndia.org**.

TO LEARN MORE ABOUT THE REQUIREMENTS AND TO APPLY, PLEASE VISIT **WWW.SIMPROFESSIONAL.ORG** OR CONTACT PATRICK ROWE AT **PROWE@NDIA.ORG**.

EARNING THE CMSP DESIGNATION WILL:

- Demonstrate expertise in the field of M&S to your employer and the larger M&S community
- Provide opportunities for professional advancement

Requirements include 3-8 years of work experience (depending on level of highest collegiate degree), 3 professional letters of reference, and successful completion of an online examination.

CMSP Applicants now have a choice between **CMSP-Technical** and **CMSP-Management** exams.

SAVE THE DATE FOR I/ITSEC 2018!

26-30 NOVEMBER 2018

Orange County Convention Center • South Concourse
Orlando, FL

Exhibit Information

Debbie Langelier, CEM
Assistant Vice President of NTSA Operations
Phone: **(703) 247-9480**
FAX: **(703) 243-1659**
E-mail: **dlangelier@ndia.org**
Visit **http://exhibits.iitsec.org** to view the current floor plan, exhibitor list, and sponsorship opportunities.

Women In Defense

A NATIONAL SECURITY ORGANIZATION

WID WOMEN IN DEFENSE

Women In Defense (WID) cultivates and supports the advancement and recognition of women in all aspects of national security. A proud affiliate of NDIA since 2004, this empowerment organization provides members a dynamic, forward-thinking community for developing leadership skills, cultivating relationships, as well as mentoring, and education through a variety of national and regional events addressing some of the most pressing national defense issues.

Represented by 20 chapters across the country, Women In Defense is in a period of accelerated growth and expansion. Membership is open to women and men whose primary professional activities relate to the national security of the United States and its allies. WID represents members from defense organizations; all branches of the U.S. Armed Forces; government; academia; think tanks, associations and professional services. Active military and government employees receive complimentary membership.

www.womenindefense.net

FOR LIFE THREATENING EMERGENCIES DIAL 911
SECURITY HOTLINE DURING I/ITSEC: (407) 685-6111

Security Training Before The Conference

Technology collection directives contain mandates requiring exhibitors and presenters to receive a Counterintelligence (CI) briefing from their CI support staff prior to I/ITSEC. Contractors with classified contracts may contact their Defense Security Service Special Agents. To avoid security breaches, I/ITSEC presenters and exhibitors should ensure that the required briefing has been received. A list of CI support agencies follows. Please contact your security officer/manager and ensure that an appropriate briefing for yourself and your colleagues is arranged. Providers of the briefings are:

Army	902 Military Intelligence
Navy, USMC, Coast Guard	Naval Criminal Investigative Service
Air Force	Air Force Office of Special Investigation
Contractors	Defense Security Service

Personal Security

The most important thing to protect, of course, is yourself. Pay attention to your surroundings. Report suspicious behavior or security breaches to a security person or NTSA staff. Familiarize yourself with emergency procedures and exits at your hotel and the Convention Center. Please note that security surveillance cameras are in place throughout the conference and exhibit areas.

Emergency Medical Services

EMT and/or paramedics will be on-site during I/ITSEC (including hall build-up and tear-down). During I/ITSEC 2017, they will be located on the same level as Registration, near the escalators between S220 and S230. See the layout on page 12 for the exact location. Dial 911 for life threatening emergencies. For non-emergencies within the center, dial 5-9809 or on your cell dial (407) 685-9809, or alert any security or I/ITSEC staff member with a radio.

Bags and Briefcases

Bags and Briefcases may be carried in by those wearing **Conference Attendee** or **Exhibitor** badges. **Exhibit Visitors** (those who are only visiting the exhibits) WILL NOT be allowed to carry in bags or briefcases. A check room will be available in the main registration area. A small purse or fanny pack is allowed, but is subject to search. Additional security restrictions may be posted on http://www.iitsec.org and on signage at the conference. Conference Management reserves the right to adjust security levels as deemed necessary during the conference.

Presentations

Recording devices will not be permitted in the presentation rooms, unless authorized by the conference management. Presenters and Exhibitors should review their company's policy documents and those of the government agencies with whom you contract regarding open distribution, limited distribution, restricted distribution and sharing limitations.

Cameras

Exhibitors have the right to limit photographs and videos of their displays. Please respect this right by asking before photographing or videotaping. Participants found taking photos or videos without the consent of the subject presentors or exhibitors will be dealt with according to security procedures, to possibly include confiscation of materials and removal from the premises.

Inquiries (before the conference)
Registration (702) 798-8340 • **Exhibit/Sponsorship** (703) 247-9480 • **All other inquiries** (703) 247-2569

Earle L. Denton Memorial Golf Tournament

Organized by Central Florida Chapter NDIA • Sunday, 26 November **OR** Monday, 27 November

Shingle Creek GOLF CLUB

Rosen Shingle Creek Golf Club
9939 Universal Blvd, Orlando, FL 32819 • 407-996-9933 • www.shinglecreekgolf.com

Limited slots—Register early!

Deadlines

Golf On-Line Registration	20 November
Sponsorship	16 November

Tournament Time

Sunday	1100 Registration	1230 Shotgun
Monday	0630 Registration	0730 Shotgun

Point of Contact

Debbie Berry 407-748-3807
debbie.berry@lmco.com

Format

Captain's Choice/Scramble

Pairings & Requests

Final assignments and pairings will be made by the tournament coordinator. Priority is based upon receipt of payment.

NOTE: To guarantee requested pairings, all golfers (two, three or four) MUST be entered during a single login session. Golfers registering separately should clearly specify pairing requests under comments. The tournament coordinator will attempt to honor all requests.

Cancellations

Must be received via email to debbie.berry@lmco.com by close of business 17 November to receive 50% refund. No refunds thereafter.

On-Line Registration

- Register and/or select sponsorship at **www.iitsec.org/ATTENDEES/PLANNINGYOURSTAY/Pages/default.aspx**
- Register one to four players per log in.

Fees

$100 per player *(green fees, range balls, cart, lunch)*

Coordinate club rentals directly with the Rosen Shingle Creek Golf Club pro shop.

Sponsorships

Details available at www.iitsec.org

Tee Box	$500
Putting Green	$500
Driving Range	$500
GPS	$750
Beverage Cart	$2,500
Hole-in-One	$2,500
Boxed Lunch	$3,000

Sponsors

Send your logos via email to debbie.berry@lmco.com no later than 16 November. Do not bring your own sign

**Scholarships and additional qualified initiatives supported through tournament proceeds; for a full list of initiatives (STEM, Wounded Warriors, etc.) supported, please visit: http://www.ndia-cfl.org.*

5K RUN

ANNUAL I/ITSEC 5K RUN/WALK/ROLL 2017

HARNESSING NEW TECHNOLOGIES TO WIN IN A COMPLEX WORLD

WEDNESDAY, NOVEMBER 29, 2017
Orange County Convention Center
5:30AM Packet Pickup • 6:45AM Start Time

WEBSITE:

http://www.iitsec.org/attendees/planningyourstay

www.facebook.com/iitsec5k

All registered runners will receive custom race tech shirt, custom race metal, swag bag, race bib and official timing by Milestone Race Authority, pre- and post-race refreshments. Tax deductible registration.

EARLY REGISTRATION $25 until August 11

August 13 – November 3 (shirt size subject to availability)	$30
November 4 – November 17 (shirt size subject to availability)	$35
November 18 – Onsite (shirt size subject to availability)	$40

CHARITIES THE 5K WILL SUPPORT

Camaraderie Foundation

IITSEC STEM Initiative

TITLE SPONSOR

L3 Technologies

Email Sean Osmond for Race Information at **iitsec5k@gmail.com** or Debbie Langelier for Sponsorship information at **dlangelier@ndia.org**

I/ITSEC 2018

See you next year!

NTSA

NATIONAL TRAINING AND SIMULATION ASSOCIATION

THE WORLD'S LARGEST MODELING & SIMULATION EVENT

I/ITSEC | INTERSERVICE/INDUSTRY TRAINING, SIMULATION & EDUCATION CONFERENCE

LAUNCHING INNOVATION IN LEARNING

NOVEMBER 26-30 ▸ WWW.IITSEC.ORG ▸ ORLANDO, FLORIDA

NDIA

CALL FOR PAPERS AND TUTORIALS

I/ITSEC 2018

ABSTRACT DEADLINE: 24 FEBRUARY 2017

LAUNCHING INNOVATION IN LEARNING

Subcommittees/Categories

- Education
- Emerging Concepts & Innovative Technologies
- Human Performance, Analysis and Engineering
- Policy, Standards, Management & Acquisition
- Simulation
- Training

Tutorials

Information on core M&S, training, and education topics suitable for management and technical personnel.

The submission process for the I/ITSEC Papers and Tutorials coincide. Submittal details will vary slightly, but the milestones will match.

Follow the **Papers/Tutorials Completion Process** for 2018 Abstract Submittal which will be posted in December.

http://www.iitsec.org/authors

I/ITSEC 2018 Program Chair

Robert Kleinhample

SAIC

(757) 325-0014

robert.c.kleinhample@saic.com

I/ITSEC 2018 Tutorial Board Chair

David Milewski

Alpha Omega Change Engineering (AOCE), Inc.

Phone: (757) 224-5491

Email: dave.milewski@aoce.com

Interservice/Industry Training, Simulation & Education Conference
November 26 - 30, 2018
NAVY
USMC
AIR FORCE
ARMY
INDUSTRY
'18
SERIOUS GAMES
SHOWCASE & CHALLENGE
Are you a serious games developer?
If so, don't miss this chance to showcase your work in front of the world's top gaming, software, simulation, and system integration companies!
Enter Your Game by
SEPTEMBER 2018
7
3
AWARD CATEGORIES
Best Student Game
Best Gov't Game
Best Business Game
People's Choice
Students' Choice
Innovation Award
NEW! AR/VR/MR
DEVELOPER CATEGORIES
Government
Business
Student
FOLLOW
www.SGSChallenge.com
SGSChallenge@gmail.com
WWW.IITSEC.ORG

Abstracts

ARMY
NAVY
USMC
AIR FORCE
INDUSTRY
'17

HARNESSING NEW TECHNOLOGIES
TO WIN IN A COMPLEX WORLD

2017 FELLOWS

REMEMBRANCES OF A SIMULATIONIST: AN EXCITING CAREER OF "MAKE BELIEVE" 7

2017 BEST PAPERS

CREATING EFFECTIVE LVC TRAINING WITH AUGMENTED REALITY 8

PERCEPTUAL-COGNITIVE & PHYSIOLOGICAL ASSESSMENT OF TRAINING EFFECTIVENESS 8

HUMAN SYSTEMS AND INSTRUCTIONAL SYSTEM DESIGN FOR A SIMULATOR OF A ROBOTIC SURGICAL SYSTEM 9

ASSESSING SUBMARINERS' INTUITIVE DECISION-MAKING SKILLS USING NEUROCOGNITIVE METHOD 10

DYNAMIC OCCLUSION USING FIXED INFRASTRUCTURE FOR AUGMENTED REALITY 11

AT THE TIPPING POINT: LEARNING SCIENCE AND TECHNOLOGY AS KEY STRATEGIC ENABLERS FOR THE FUTURE OF DEFENSE AND SECURITY 12

EDUCATION

OVERCOMING EDUCATIONAL OBSTACLES TO THE ACHIEVEMENT OF THE FUTURE SPECIAL OPERATOR CONCEPT 13

BLACK SWANS: DISRUPTION OF POWER 13

VALIDATING COMPETENCIES USING A QUANTITATIVE DATA-BASED APPROACH 14

A DYNAMIC LEARNING APPROACH TO TRAINING DIGITAL ACQUISITION PROFESSIONALS 15

A MOBILE STRATEGY FOR SELF-DIRECTED LEARNING IN THE WORKPLACE 15

ENHANCED STEM SUBJECT OUTCOMES FROM THE USE OF INTELLIGENT TUTORS 16

IMPLEMENTING INNOVATIVE CONSTRUCTIVISM: AN ARCHITECTED APPROACH TO ENHANCING STEM EDUCATION 17

MATHEMATICAL SIMULATIONS – STUDENTS NO LONGER LOST IN TWO-DIMENSIONAL SPACE 17

HOW VIDEO LECTURES CAN FREE UP TIME FOR OTHER LEARNING ACTIVITIES 19

TEACHING AND LEARNING DIFFERENTLY: PERSONALIZED E-BOOKS FOR LEARNING (PEBL) 19

ADAPTING ONLINE COURSEWARE TO DECREASE TIME, ENGAGE AND IMPROVE PERFORMANCE 20

US NAVY VIRTUAL WORLD SCHOOLHOUSE CASE STUDY 21

USING VIRTUAL SIMULATION FOR TRAINING THE BRAZILIAN ARMORED TTP 21

VIRTUAL LEARNING SPACES AT THE ROYAL DANISH DEFENCE COLLEGE: EMERGING PRACTICES 22

LEADING LEARNING IN THE WORKPLACE: WHO'S IN CHARGE? 23

IMPROVING ASSESSMENT WITH TEXT MINING 23

ADAPTIVE FACILITATION SKILLS FOR ARMY INSTRUCTORS 24

EMERGING CONCEPTS & INNOVATIVE TECHNOLOGIES

GEOPACKAGE: UNIFYING MODELING AND SIMULATION WITH MISSION COMMAND GEOSPATIAL DATA 25

3D SCANNING AND NAVY SHIPS: AN IMMEDIATE AND OUTWARD LOOK AT UTILIZATION 25

MARINE FORENSICS: THE ART AND SCIENCE OF SIMULATING SHIPS IN STORM CONDITIONS 26

IDE-FORWARD: A PERSISTENT FORCE-ON-FORCE TRAINING FIELD TEST ENVIRONMENT 27

INNOVATION THROUGH DISCOVERY EXPERIMENTATION 28

DEEP LEARNING FOR TRAINING WITH NOISE IN EXPERT SYSTEMS 29

HUMAN ACTIVITY SYNTHETIC DATA GENERATION 29

A GENETIC MODEL OF THE DEVELOPMENT OF MODELING AND SIMULATION 30

MODELING ENVIRONMENTAL IMPACTS ON COGNITIVE PERFORMANCE FOR ARTIFICIALLY INTELLIGENT ENTITIES 31

OPTIMIZING COOPERATIVE GAMES FOR COGNITIVE COMMUNICATION UAVS WITH Q-LEARNING 31

CONTROLLING CGF-GENERATED ENTITIES USING A FUZZY LOGIC-BASED SYSTEM 32

MINDFLIGHT: BRAIN-COMPUTER INTERFACE-DRIVEN DESIGN OF SIMULATED AIRCRAFT CONTROL FRAMEWORKS 33

OPERATIONAL LEARNING: LEVERAGING MISSION DATA TO OPTIMIZE SKILL DEVELOPMENT 33

ACCELERATION OF DIGITAL RADAR LANDMASS SIMULATION ON MULTI-CORE CPU AND GPGPU COMPUTER 34

DEVELOPING A FINANCIAL READINESS MOBILE PERSONAL ASSISTANT FOR LEARNING 35

MENTORPAL: INTERACTIVE VIRTUAL MENTORS BASED ON REAL-LIFE STEM PROFESSIONALS 35

DEVELOPING A NATURALISTIC CATEGORIZATION TASK FOR TESTING INTUITIVE DECISION MAKING 36

3D SPATIAL AUDIO EXTRACTION AND DEMONSTRATION SYSTEM FOR AUGMENTED/MIXED REALITY SIMULATIONS 37

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

PREDICTING MANUFACTURING APTITUDE USING AUGMENTED REALITY WORK INSTRUCTIONS 37

REAL-TIME COVERAGE AREA AND DANGER ZONES ESTIMATION 38

MODELLING AND SIMULATION AS A SERVICE FROM END USER PERSPECTIVE 39

COMMUNICATIONS, NETWORKING AND CYBER MODELLING AND SIMULATION SUPPORT DEFENCE 39

WEB-BASED GUI SYSTEM FOR CONTROLLING ENTITIES IN CONSTRUCTIVE SIMULATIONS 40

INCREASED SYSTEM FIDELITY FOR NAVY AVIATION HYPOXIA TRAINING 41

CREW ROLE-PLAYERS ENABLED BY AUTOMATED TECHNOLOGY ENHANCEMENTS 41

EXPANDING THE USE OF SIMULATORS IN ROBOTIC SURGERY TRAINING 42

HUMAN PERFORMANCE ANALYSIS AND ENGINEERING

AUDITORY PERFORMANCE OF INDIVIDUALS WITH REDUCED HEARING CAPABILITY IN VIRTUAL REALITY ENVIRONMENT 43

EYE TRACKING FEEDBACK TO ENHANCE VISUAL SEARCH TRAINING 43

MULTIMODAL ASSESSMENT OF PILOTS' AFFECTIVE STATES USING PSYCHOPHYSIOLOGICAL SENSOR SIGNALS AND FACIAL RECOGNITION ANALYSIS 44

COMPARING VISUAL ASSEMBLY AIDS FOR AUGMENTED REALITY WORK INSTRUCTIONS 45

A MULTI-METHOD APPROACH TO EVALUATING HUMAN-SYSTEM INTERACTIONS DURING OPERATIONAL TESTING 45

REPROCESSABILITY AND ENGAGEMENT: COMPARING TEXT TO HUMAN FORMS FOR INFORMATION CONVEYANCE 46

INTEROPERABLE ASSESSMENTS USING HPML: A NOVICE CONNING SKILLS ACQUISITION USE CASE. 47

TOTAL LEARNING ARCHITECTURE DEVELOPMENT: A DESIGN-BASED RESEARCH APPROACH 47

USING COMPETENCIES TO MAP PERFORMANCE ACROSS MULTIPLE ACTIVITIES 48

LIVE-VIRTUAL LABORATORY ASSESSMENT OF BEHAVIORS IN OCCUPATIONAL ROLES (LABOR) 49

PERFORMANCE MEASUREMENT CONSIDERATIONS FOR LIVE, VIRTUAL, AND CONSTRUCTIVE (LVC) TRAINING 49

MODELING OPERATOR PERFORMANCE THROUGH TASK-ORIENTED MACHINE LEARNING 50

TRAINING AND PERFORMANCE OF MULTITEAM SYSTEMS IN NAVAL WARFARE ENVIRONMENTS 51

COCKPIT TEAM COORDINATION SKILLS: THE ROLE OF MONITORING AND BACKUP 51

ASSESSING MILITARY PERCEPTUAL EXPERTISE WITH DRIFT DIFFUSION MODELING 52

POLICY, STANDARDS, MANAGEMENT, AND ACQUISITION

ACHIEVING ACTIONABLE INFORMATION IN A COMPLEX OPERATIONAL ENVIRONMENT 53

CONSIDERING TRAINING AS A SERVICE WITHIN THE ACQUISITION STRATEGY 53

A CLOUD COMPUTING BUSINESS CASE ANALYSIS FOR EXISTING TRAINING SYSTEMS 54

EXPLORATION OF NEXT GENERATION TECHNOLOGY APPLICATION TO MODELING AND SIMULATION STUDY GROUP 55

STANDARDIZING HUMAN PERFORMANCE MEASUREMENT FOR EASE OF DATA ANALYTICS 55

MEASURING DISPLAY SYSTEM RESOLUTION PRECISELY 56

DEVELOPING U.S. SERVICE M&S PROFESSIONALS: INTER-SERVICE DIFFERENCES IN THE EDUCATION, TRAINING, AND MANAGEMENT OF UNIFORM AND GOVERNMENT M&S PERSONNEL 57

PATENT LAW AND DEFENSE TECHNOLOGY: ORIGINAL INTENT AND CURRENT PRACTICE 57

A NATIONAL APPROACH TO ACHIEVE INTERNATIONAL DISTRIBUTED SIMULATION INTEROPERABILITY CERTIFICATION 58

SIMULATION

ANALYZING SLAM ALGORITHM PERFORMANCE FOR TRACKING IN AUGMENTED REALITY SYSTEMS 59

MOST EFFECTIVE CAPABILITIES OF HEAD MOUNTED DISPLAYS FOR DISMOUNTED SOLDIER TRAINING USING AUGMENTED REALITY 59

EXPERT-ASSISTED FIELD MAINTENANCE USING AUGMENTED REALITY 60

GPU RAY TRACING-BASED METHOD FOR REAL-TIME ISAR SIMULATION 61

ENHANCED AERIAL RADAR LINE OF SIGHT PERFORMANCE 61

CYBER EFFECTS WITHIN A KINETIC MODEL 62

A CYBER WARFARE PROTOTYPE FOR LIVE, VIRTUAL, & CONSTRUCTIVE SIMULATIONS 63

THE DARPA CODE WHITE FORCE NETWORK 63

FULL 3D VISUALS FOR ADVANCED TRAINING IN SINGLE-SEAT FIGHTERS 64

3D VISUALIZATION FOR POINT OF NEED AND CLOUD BASED TRAINING 65

OPTIMIZATION OF COMPUTER GENERATED THREE DIMENSIONAL MODELS FOR DECREASED LATENCY IN VIRTUAL ENVIRONMENTS 65

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

LARGE AREA HIGH RESOLUTION GEOTYPICAL TERRAIN DECORATION 66

UNEARTHING THE MODELING AND SIMULATION UNDERGROUND WITH VOXELS 67

TERRAIN DATABASE CORRELATION ASSESSMENT USING AN OPEN SOURCE TOOL 67

MODELING UNDERWATER COMMUNICATIONS IN LIVE, VIRTUAL AND CONSTRUCTIVE ENVIRONMENTS 68

A STUDY ON THE EFFECTIVENESS OF VIRTUAL AND CONSTRUCTIVE INTERFACE SIMULATION 69

A LARGE SCALE CORRELATED DYNAMIC WEATHER SIMULATION SERVICE 69

VIRTUALIZATION: NAVY CONTINUOUS TRAINING ENVIRONMENT APPROACH TO CLOUD ENABLING TECHNOLOGIES 70

PERFORMANCE MEASUREMENT IN LVC DISTRIBUTED SIMULATIONS: LESSONS FROM OBW 71

NATO INITIATIVE IN MULTI-NATIONAL MISSION TRAINING THROUGH DISTRIBUTED SIMULATION 71

GENERATIVE REPRESENTATION OF SYNTHETIC THREAT ACTORS FOR SIMULATION AND TRAINING 72

SIMULATION OF NON-COMBATANT POPULATION MOVEMENT IN THE BATTLESPACE 73

TESTING AND TRAINING CONVERGENCE – COMMON SCENARIO GENERATION REQUIREMENTS AND SOLUTIONS 73

HIGH-FIDELITY SURGICAL FASCIOTOMY SIMULATOR FOR TRAINING SPECIAL OPERATIONS MEDICS 74

MODELING COMBAT AIRCRAFT TRAINING AND READINESS 75

LEVERAGE THE TRAINING EFFECT IN STAFF TRAINING BY AUTOMATED REPORTING 75

ARMY TRAINING DATA MANAGEMENT USING A PRODUCT LINE APPROACH . 76

INFORMATION MANAGEMENT: A CORE ENABLER OF THE MSAAS ECOSYSTEM 77

OPERATIONAL DATA TO STIMULATE SIMULATION SYSTEMS AND ENHANCE TRAINING 77

DISCRETE EVENT LOGISTICS SYSTEM MODEL: CALCULATING SIMULATOR REMAINING USEFUL LIFE 78

USING BUSINESS TECHNOLOGIES TO CUT SIMULATION SUPPORT COSTS 79

LVC ENVIRONMENT TO SUPPORT SYSTEM-OF-SYSTEM CYBER TESTING 79

QUALITY OF SERVICE FOR DISTRIBUTED SIMULATION ENVIRONMENTS 80

COMPRESSED DIS 81

ESTABLISHING A HLA CERTIFICATION PROCESS IN NATO 81

TRAINING

INCREASING COGNITIVE READINESS IN JOINT COMMAND BATTLE STAFFS... 82

ASSESSMENT INSTRUMENTS IN SUPPORT OF MARINE INSTRUCTOR DEVELOPMENT 83

LIVE, VIRTUAL, CONSTRUCTIVE DISTRIBUTED MISSIONS: RESULTS AND LESSONS LEARNED 83

HOLISTIC ENVIRONMENT GENERATION AND MULTI-DOMAIN C2 TRAINING . 84

OPTIMIZED PILOT TRAINING FOR COMBAT AIRCRAFT 85

USING INNOVATIVE SYSTEMS THINKING TO OPTIMISE ROYAL NAVY TRAINING 85

JTAC/JFO TEAM TRAINING EFFECTIVENESS IN A SIMULATION-BASED ENVIRONMENT 86

USING IOT SENSORS TO ENHANCE SIMULATION AND TRAINING IN MULTITEAM SYSTEMS 87

MEASURING TEAM PERFORMANCE AND COORDINATION IN A MIXED HUMANSYNTHETIC TEAM TRAINING ENVIRONMENT 87

CREATING DATA DRIVEN TRAINING SCENARIOS 88

ADVANCED READINESS 2025: BALANCED INVESTMENTS ACROSS LIVE, VIRTUAL AND CONSTRUCTIVE 89

TOWARD AUGMENTING ARMY AVIATION COLLECTIVE TRAINING WITH GAME-BASED ENVIRONMENTS 89

ENHANCING MAINTENANCE SIMULATION TRAINING DEVICES AND THEIR APPLICATION THROUGH VERIFICATION AND VALIDATION 90

USING VIRTUAL REALITY FOR TRAINING MAINTENANCE PROCEDURES 91

RAPID PROTOTYPING INNOVATIVE VIRTUAL WORLDS THAT INCLUDE THE WOW FACTOR 91

COLLABORATIVE HELMET AND WEAPON TRACKING FOR AUGMENTED REALITY BASED TRAINING 92

DEVELOPMENT AND ANALYSIS OF VIRTUAL REALITY TECHNICIAN-TRAINING PLATFORM AND METHODS 93

DEVELOPING AN IMMERSIVE VIRTUAL REALITY AIRCREW TRAINING CAPABILITY 93

ENHANCING STRATEGIC THINKING IN ARMY LEADERS THROUGH SKILL-BUILDING EXERCISES 94

MILITARY TEAM TRAINING UTILIZING GIFT 95

POINT OF INJURY TRAINING WITH TWO AND THREE DIMENSIONAL WOUNDS 95

TABLE OF AUTHORS 96

PLEASE NOTE: TUTORIALS ARE INCLUDED ON THE CD

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

REMEMBRANCES OF A SIMULATIONIST: AN EXCITING CAREER OF "MAKE BELIEVE"

2017 IITSEC Paper No. F001

Henry (Hank) Okraski, SES (Retired), P.E., CMSP
Simulation Consultant
Winter Park, Florida

In this paper, the author chronicles his almost 60 years of experience in the modeling, simulation and training industry. He sets the stage by describing the early simulation environment and the pioneers who contributed to its growth. His professional journey begins with a field service position at Link Aviation, Binghamton, N.Y., supporting the U.S. Air Force, followed by a 32 year career with the U.S. Navy's simulation organization. Intense volunteer work followed, focused on workforce development beginning with K-12 curriculum development.
Numerous changes were made over that time period with many "lessons learned". Under Department of Defense direction, logistic support requirements for simulators underwent a paradigm shift to more focused management. Structured project management became necessary for timely trainer delivery. Simulator technology experienced the revolution from analog to digital computation, requiring immediate management action to develop the necessary skillsets to function effectively in this new environment. The digital revolution opened pathways for new and exciting applications and domains. The commercial market of computers and software presented cost-effective designs. Networking with live-virtual and constructive simulations became possible, adding new dimensions and challenges to training our warfighters. The Instructional Systems Design (ISD) process became institutionalized.
Throughout this period, political, economic and social decisions were made that altered the course of the simulation industry. The move of the Navy's simulation organization from Port Washington, N.Y. to Orlando, FL is discussed. The policy of substituting simulator time for aircraft time is described as a "period of enlightenment". After retiring from the Government, the author conducted research in the private sector. Further, the last 20 years were spent "giving back" to the industry in the form of introducing M&S into K-12 schools and developing a certification program for high school students, qualifying them to seek internships with the simulation industry.
Projections for the future are presented.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320A

BP-1 2017 Best Papers

1030
Creating Effective LVC Training with Augmented Reality (17119) (ECIT)

1100
Perceptual-cognitive & Physiological Assessment of Training Effectiveness (17013) (Training)

1130
Human Systems and Instructional System Design for a Simulator of a Robotic Surgical System (17213) (Education)

Notes

CREATING EFFECTIVE LVC TRAINING WITH AUGMENTED REALITY

2017 IITSEC Paper No. 17119

Nathan Jones & Koren Odermann
MARCORSYCOM PM TRASYS
Orlando, FL

Peter Squire
Office of Navy Research
Arlington, VA

Adrienne Read & Natalie Steinhauser
NAWCTSD
Orlando, FL

While live training is often the preferred method for Marines, Force-On-Force (FoF) training exercises lack the visual cues necessary to effectively train Call for Fire (CFF), Close Air Support (CAS), and other engagements. Imagination has been the method of training and feedback on live ranges for decades when weapons and platforms were not available or limited by costs. Augmented Reality (AR) training systems now offer the opportunity to provide realistic visuals of virtual and/or constructive entities and engagements on the live range.
To ensure that AR technology can be utilized to support FoF training, an assessment of the Augmented Immersive Team Trainer (AITT), an AR training system, was conducted to determine how well AITT supports specified training objectives. The AITT system was developed by Office of Naval Research (ONR) and transitioned to Program Manager Training Systems (PM TRASYS). The program office technical assessment team utilized a task and attribute based approach to assess the simulator and simulation on both the activities an individual is required to do in the performance of a specific job (i.e., tasks) and the fidelity the device is required to provide to support that performance (i.e., attributes).
This paper describes the AITT technology and the assessment conducted to support training objectives. In addition, the paper discusses potential for AR technology to enhance the live component in Live-Virtual-Constructive (LVC) environments. This paper provides discussion points based on lessons learned and required development for AR systems being developed to enable an effective LVC training solution.

PERCEPTUAL-COGNITIVE & PHYSIOLOGICAL ASSESSMENT OF TRAINING EFFECTIVENESS

2017 IITSEC Paper No. 17013

Jaclyn Hoke[1], Christopher Reuter[2], Thomas Romeas[3,4], Maxime Montariol[2], Thomas Schnell[2], & Jocelyn Faubert[4,5]
[1]Rockwell Collins, Inc., Cedar Rapids, IA [2]University of Iowa Operator Performance Lab, Iowa City, IA
[3]École de Technologie Supérieure, Montreal, Qc, CA [4]CogniSens Applied Research Center, Montreal, Qc, CA
[5]University of Montreal, School of Optometry, Faubert Lab, Montreal, Qc, CA

Several trends within the simulation and training industry are emphasizing the need for measurable proof that training solutions meet or exceed the requirements for delivering effective training. Cognitive state is a key component of learning, meaning that classification of cognitive state and capacity can provide a measure of training effectiveness. However, accurate classification of trainee state is an extremely challenging task. The more traditional subjective assessment methods have several limitations, while objective assessment methods can be difficult to implement.
We conducted an exploratory study that evaluated the cognitive and physiological load engaged during flight simulation and live flight during maneuvers of three levels of difficulty. The study represents the work performed to date in the first year of a multi-year effort to design a method for assessing the efficacy of training content and devices, including live platforms, that is based on objective cognitive state assessment techniques coupled with control input and mission/platform performance measures. The method employs NeuroTracker, a validated tool for evaluating or training perceptual-cognitive skills, to measure spare cognitive capacity, and physiological measures of workload based on analysis of eye tracking and electrocardiogram data.
This paper briefly summarizes the design, implementation, and initial results of this study. It summarizes the next steps required to further refine the proposed method for assessing training efficacy and describes the planned followon effort. Finally, it discusses additional applications of this method in military and commercial training markets, such as the real-time adaptation of training content to trainee skill level and state.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

HUMAN SYSTEMS AND INSTRUCTIONAL SYSTEM DESIGN FOR A SIMULATOR OF A ROBOTIC SURGICAL SYSTEM

2017 IITSEC Paper No. 17213

Danielle Julian, Roger Smith, Alyssa Tanaka, & Ariel Dubin
Florida Hospital Nicholson Center
Celebration, FL

Traditional spinal surgery procedures are carried out with limited direct visualization and augmented with generous use of fluoroscopic imaging. This imposes limitations on the surgeon's ability to place screws into the spine and exposes the staff to large amounts of cumulative radiation. The Mazor Renaissance robotic system was developed to both improve the accuracy of insertion of the pedicle screw and to reduce the amount of energy exposure to staff and patients. The robot offers a significant advancement in the technology used in spinal surgery, which calls for very specialized training and education programs for surgeons seeking to adopt it. The current standard of training and employment of this device comes with significant constraints on both the trainees and trainers.

Currently, the training must be conducted at specialized training centers that can provide clinical equipment which includes Operating Room (OR) tables and lights, fluoroscopic imaging equipment, cadaveric tissue, surgical instrumentation, certified radiation technicians, tissue storage, and video recording capabilities. These requirements create a learning experience, which can only be supplied to a surgeon a single time and do not support surgeon-initiated refresher training. This suggests that a simulation-based solution may be a valuable supplement to the current training and education model.

This paper describes efforts to apply the theories of human-systems integration (HSI), instructional system design, and simulator engineering to define the requirements for a simulator of a specific robotic surgery system. Specifically, the aim of this project was to outline the instructional opportunities through several instructional analyses that can be filled with a spinal simulator while considering human performance concerns and constraints during the research and design phases of the system. From this, an instructional plan was conducted, to which a HSI driven design document for a simulation system was developed.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM W320A

BP-2 2017 Best Papers

1400
Assessing Submariners' Intuitive Decision-making Skills using Neurocognitive Methods (17090) (Human Performance Analysis and Engineering)

1430
Dynamic Occlusion using Fixed Infrastructure for Augmented Reality (17054) (Simulation)

1500
At the Tipping Point: Learning Science and Technology as Key Strategic Enablers for the Future of Defense and Security (17109) (Policy Standards Management and Acquisition)

Notes

ASSESSING SUBMARINERS' INTUITIVE DECISION-MAKING SKILLS USING NEUROCOGNITIVE METHOD

2017 IITSEC Paper No. 17090

Lisa C. Lucia, Ph.D.
Jeffrey M. Beaubien, Ph.D.
Aptima, Inc.
Woburn, MA

Natalie Steinhauser
Naval Air Warfare Center Training Systems Division
Orlando, FL

CAPT Ronald Steed (USN, ret.)
UpScope Consulting Group, LLC
Mystic, CT

Military missions pose complex cognitive and perceptual challenges, such as detecting potential improvised explosive devices along the roadside, or detecting anomalous social cues in a crowded market that may suggest an impending attack. Situations such as these do not allow time for extensive deliberation; rather, the ability to make quick and accurate decisions is key to survival. Evans and Stanovich (2013) suggest that, unlike deliberate decision-making, this type of intuitive decision-making is extremely fast and requires little or no working memory. Research has shed light on the neural mechanisms underlying intuitive decision-making. For example, Luu and colleagues (2010) used electroencephalography (EEG)-based techniques to identify a neural signal of intuition during an object detection task. In their study, participants viewed fragmented line drawings and indicated whether each image contained a real object. Participants' event-related potentials (ERPs) differed between correctly identified real objects and correctly rejected non-objects after ~200 milliseconds (ms) and this difference persisted through ~500 ms. The purpose of the current study was to examine the generalizability of this neural signal with a military sample performing both everyday decision tasks (object detection) and military-relevant tasks (course safety decisions). Twenty-seven submariners participated in a rigorously-controlled, within-subjects experiment. Statistical analyses of the participants' brain activity confirmed that the neural signal identified by Luu and colleagues generalizes across tasks. Moreover, this signal reliably differentiates expert submariners from novices. This study is unique in that it validated the existence of a neural indicator of accurate intuitive decision-making across both samples and tasks.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

DYNAMIC OCCLUSION USING FIXED INFRASTRUCTURE FOR AUGMENTED REALITY

2017 IITSEC Paper No. 17054

Scott Johnson, John Baker,
Jaime Cisneros, and Juan Castillo
Chosen Realities LLC
Orlando, FL

Pat Garrity
U.S. Army Research Laboratory-Human Research and Engineering Directorate, Advanced Simulation Technology Division (ARL-HRED-ATSD), Orlando, FL

The U.S. Army Research Laboratory-Human Research and Engineering Directorate, Advanced Simulation Technology Division (ARL-HRED-ATSD) performs research and development in the field of augmented/mixed reality training technology. Within training, the Department of Defense (DoD) has a strong interest in augmented reality (AR) for its ability to combine live and virtual assets to reduce cost, increase safety, and to mitigate unavailability of needed live assets. Answering this is the commercial sector, which is rapidly advancing a host of capabilities to support AR, such as head mounted displays (HMDs). An important capability of AR is the realistic occlusion between live and virtual objects based on their respective depth in the augmented reality scene. Existing solutions use pre-scanned environmental depth information to provide this capability; however, this is only useful for objects that will never move or static objects. This does not address live objects that move or dynamic objects (e.g., live Soldiers). Dynamic objects must be constantly scanned using a depth camera(s) to provide the occlusion information for an AR-enabled system. Of the few commercial sector vendors that provide depth cameras on their HMD, most are lacking the sufficient depth range to adequately support occlusion from the HMD – anything beyond roughly two meters has greatly diminished fidelity. This paper describes a solution that will add a network of fixed infrastructure cameras with a centralized occlusion server to merge the depth images from various sources. This then creates depth images suitable for occlusion on the HMDs at any range with realistic fidelity. The paper will report the use of commercial off the shelf (COTS) computers and cameras that instrument an area such that it can be used for occlusion in a training system. The paper will speak to the performance of fusing data, given resolution and volume. Finally, this paper will show scenes where virtual objects are added to a real scene and how the performance of the occlusion system affects the quality of the visuals for the participants.

AT THE TIPPING POINT: LEARNING SCIENCE AND TECHNOLOGY AS KEY STRATEGIC ENABLERS FOR THE FUTURE OF DEFENSE AND SECURITY

2017 IITSEC Paper No. 17109

Elaine M. Raybourn, Ph.D.
ADL Initiative Sandia National Laboratories*
Orlando, FL

Sae Schatz, Ph.D.
ADL Initiative Office of the Secretary of Defense
Alexandria, VA

Jennifer Vogel-Walcutt, Ph.D.
ADL Initiative Office of Personnel Management
Orlando, FL

Kendy Vierling, Ph.D.
Training and Education Command U.S. Marine Corps
Quantico, VA

According to former U.S. Secretary of Defense, Ash Carter, today's national security environment is "dramatically different—and more diverse and complex in the scope of its challenges—than the one we've been engaged with for the last 25 years, and it requires new ways of thinking and new ways of acting" (2016, emphasis is ours). These new ways cannot be achieved without significant changes to lifelong (or at least career-long) personnel development. This paper focuses on one aspect of that (r)evolution, i.e., specifically examining the challenges, goals, projects, and recommended actions related to the transformation of training and education in the defense and security sectors.

For more than a decade, training and education professionals have beaten this drum. Researchers and dedicated practitioners have pursued tactical-level programs in cognitive readiness, improved decision-making, adaptability, accelerated learning, instructional excellence, and so on. Small "inkblots" of excellence formed, and many papers were written. These inkblots are now converging, and grassroots efforts are being strengthened by serious top-level patronage and policy direction. Now, strategic-level organizational change seems possible.

All of the U.S. military services, as well as many other security agencies and coalition partners, have released detailed guidance on how to evolve their learning and development processes. This paper summarizes these complementary efforts and then recommends collective actions that may yield meaningful returns in the short- to mid-term. Specifically, these recommendations focus on instructional quality, competencies, credentials, data analytics, data interoperability, personalization, learning on demand, integrated human–machine systems, a technology-enabled continuum of learning providing multiple paths for achievement, and an enterprise approach to talent management.

TUESDAY, 28 NOVEMBER, 2017 ROOM S320 1400

ED1 Best from Around the Globe

NOTES

TUESDAY, 28 NOVEMBER, 2017 ROOM S320D

ED2 Obstacles and Surprises: Overcoming

1600
Overcoming Educational Obstacles to the Achievement of the Future Special Operator Concept (17063)

1630
Black Swans: Disruption of Power (17174)

NOTES

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

OVERCOMING EDUCATIONAL OBSTACLES TO THE ACHIEVEMENT OF THE FUTURE SPECIAL OPERATOR CONCEPT

2017 IITSEC Paper No. 17063

Debra K. Abbott, Ph.D.
Booz Allen JCC
Joint Special Operations University
Tampa, FL

Homer Harkins, Ed.D.
College of Special Operations
Joint Special Operations University
Tampa, FL

USSOCOM's Future Special Operations Forces (SOF) Operator Concept analyzes the competencies that will be expected of SOF decades into the future, and in it great care has been taken to consider "horizontal competencies" which comprise the development of new skills. However, the integration of knowledge, skills, and abilities over time as well as the development of "vertical competencies" – which equate to the expansion of cognitive capacities – has been less-well considered.

This paper discusses three educational pathways that, taken together, could enable a SOF operator to achieve a significant level of cognitive growth and social learning across the arc of his career via: (1) instruction that utilizes educational methods and techniques which increase transfer, the application of formal learning to many different situations in the field, (2) approaches that foster communities of practice, a key source of knowledge for honing one's tradecraft, and (3) more rigorous language and cultural training to support the development of fluent bilingualism, an area which shows potential for enhancing cognitive flexibility and creativity in individuals.

This paper presents a case for the idea that given the volatile, uncertain, complex, and ambiguous (VUCA) nature of today's operational environment, it is essential for leaders of the uniformed services and SOF to better understand educational pathways capable of increasing the cognitive capacities of service members in addition to factors that inhibit learning.

BLACK SWANS: DISRUPTION OF POWER

2017 IITSEC Paper No. 17174

Julian Stodd
Sea Salt Learning
Bournemouth, UK

Emilie A. Reitz
Leidos
Norfolk, VA

Against a backdrop of disruptive change, it is tempting to try to categorize and spot patterns early: we have seen a recasting of politics, the upset of established systems, the emergence of new media, challenges to traditional models of learning and an evolution in the nature of knowledge itself. The relentless march of technology masks part of the true nature of this change; while technology is a very visible manifestation of change, it is the underlying sociology, the cohesion of communities, and the evolving forms of power behind them, which really count. In this social age, we are seeing a fundamental evolution in types of power that will disrupt much of the previous power dynamics. This paper builds on previous work that centered on how to re-contextualize scripts and frames to educate organizations to better deal with Black Swans (Stodd, Reitz, Schatz, & Fautua, 2016).

Black Swans are disruptive events, unpredictable and disruptive of formal systems. If the nature of Black Swan events is known, then the ecosystem within which they occur is of key interest; as the ecosystem changes, so too does the nature of disruption, the speed with which it occurs, the groups that cause it, and the inability of formal systems to predict or cope with the results. This paper will contextualize these disruptions in terms of types of power, formal and social systems, and the impacts of these effects on learning and leadership today. We propose a learning concept that focuses on increasing strength through highly engaged, high trust, and reputation led, social communities. Additionally, we will provide case studies of military and non-military organizations that have applied similar concepts: they maintain a dynamic tension between formal and social systems which allows them to learn fast, evolve rapidly, and become highly resilient to future black swans.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320D

ED3 Fostering Workplace Competencies

0830
Validating Competencies Using a Quantitative Data-based Approach (17105)

0900
A Dynamic Learning Approach to Training Digital Acquisition Professionals (17264)

0930
A Mobile Strategy for Self-directed Learning in the Workplace (17265)

Notes

VALIDATING COMPETENCIES USING A QUANTITATIVE DATA-BASED APPROACH

2017 IITSEC Paper No. 17105

Joseph M. Thompson, Gayatri Pandit, Laurie Buchanan, & Sarah Scholl
Booz Allen Hamilton
McLean, VA

Traditionally, job analysis and competency modeling have been viewed as separate efforts with separate purposes and separate audiences (Shippmann, et.al., 2000). A common, simplified distinction is that job analysis is more "workfocused" whereas the competency model is more "worker-focused." The outputs of job analysis are typically used by human resources professionals to determine job duties, develop or validate position descriptions, determine qualification for hiring, and provide other human resources information (Levine & Sanchez, 2007). The outputs of competency models are typically used by learning professionals for developing organizational training and education, for developing and validating career paths, and can also be used for assessing employee performance (Campion et al., 2011). However, greater insights can be generated if job analysis and competency modeling are viewed as complementary vice dichotomic processes. This paper documents a multi-phased, data-driven approach that integrates the rigor of an in-depth job analysis methodology with competency model development and the application of the approach across several levels of employee proficiency. This methodology, which has been applied within a Federal agency, produces large sets of quantitative data which can be used to provide a comprehensive picture of a position, of the competencies needed for successful performance, and of how position tasks and competencies change as the employee develops within a position. The outputs and data that result from this combined approach provide organizations with critical insights, supported by quantitative data, which can be used to prioritize and defend training, simulation, and education resources that are often not possible using separate approaches (Gutman & Dunleavy, 2003). The outputs can also be used to support other human capital functions and processes needed to improve organizational performance, including workforce planning, hiring, and promotion. The methodology presented in this paper is wellsuited for understanding positions which are mission-critical, positions which have a wide range of complexity, and positions which have specialized roles within a job series or position.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

A DYNAMIC LEARNING APPROACH TO TRAINING DIGITAL ACQUISITION PROFESSIONALS

2017 IITSEC Paper No. 17264

Faith Powers & Lauren Tindall
ICF
Fairfax, VA

Current Federal procurement practices largely do not provide the flexibility required to buy and deliver modern digital services. Meanwhile, the pace of technological change continues to accelerate while citizen demand for Federal digital services increases. To meet this demand, the Office of Federal Procurement Policy and the U.S. Digital Service needed an immersive development and training program to enhance digital services acquisition expertise across government agencies.

This paper addresses the question: How do you design an effective training program while also being flexible to address evolving learning needs over time? Agile Learning and Human-Centered Design principles were used to design a curriculum that is adaptive to the needs of each participant, while promoting progress against established learning objectives. To address the constant evolution of the subject matter, approximately 60% of the curriculum supports defined learning objectives, while 40% of the curriculum is responsive to the needs of participants. The responsive portion is informed by data from pre-assessments that participants complete at the start of each segment of instruction and that are used to generate participant-specific learning paths. Participants also complete post-assessments at the end of each segment to measure knowledge and skill gains and to support customized remediation. The program includes a mix of instructional strategies to promote comprehension, experiential and problem-based learning, and practice of knowledge and skills, and to engage stakeholders to contribute to the overall acquisition culture change.

This paper will also discuss the results and lessons learned after completing two deliveries of the program and certifying 50+ digital services acquisition professionals. Four months after the first delivery, 83% of participants reported a positive change in their job behavior or role. 91% of participants had been asked to provide advisory services to a Digital Service team at their agency.

A MOBILE STRATEGY FOR SELF-DIRECTED LEARNING IN THE WORKPLACE

2017 IITSEC Paper No. 17265

Michael Freed, Louise Yarnall, Aaron Spaulding, & Melinda Gervasio
SRI International
Menlo Park, CA

Traditional approaches to workplace training often treat learners as equally prepared, drive them through too much content in too short a time, and conclude before ensuring retention. These departures from ideal instructional practice have a common cause—the need to fit learning activities into constrained episodes such as classroom presentations and e-learning courses. Fortunately, advances in mobile technology, learning science, and artificial intelligence are making it possible to deliver learning experiences in less constrained conditions, with reduced risk of overload, and better alignment with an individual's mental and situational readiness to learn.

We developed a mobile strategy that leverages these advances to support adult learning, and implemented this strategy in PERLS, a mobile application that recommends bite-sized learning materials—or microcontent—through a deck of electronic cards. An intelligent algorithm tracks progress and recommends content based on principles of self-regulated learning, goal-setting, and adult learning motivation. Essentially, PERLS aims to engage users in becoming better self-regulated learners on the job.

In this paper, we describe the PERLS mobile learning strategy and results of an evaluation of user satisfaction with the technology and pilot testing of several instruments for continuous improvement. The mobile app was deployed to support training of Defense Support for Civil Authorities (DSCA). By drawing from observations, online usage data, learning outcome measures, and surveys of learner characteristics and attitudes, this paper provides evidence of the feasibility of using this approach to enhance self-directed learning activity among military personnel.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320D

ED4 STEM – Innovated Tools

1400
Enhanced STEM Subject Outcomes from the Use of Intelligent Tutors (17236)

1430
Implementing Innovative Constructivism: An Architected Approach to Enhancing STEM Education (17017)

1500
Mathematical Simulations – Students No Longer Lost in Two-dimensional Space (17127)

Notes

ENHANCED STEM SUBJECT OUTCOMES FROM THE USE OF INTELLIGENT TUTORS

2017 IITSEC Paper No. 17236

Edward Harvey
Advanced Training & Learning Technology, LLC
Virginia Beach, VA

Emilie A. Reitz
Leidos
Norfolk, VA

The military training and education community spends hundreds of hours a year on training warfighters not just for the job in front of them, but their next job, and contingencies foreseen and unforeseen. This training and education process requires a strong foundation of understanding Joint or Service procedures, and is dependent on each warfighter's area of specialization. There are highly technical skill-sets that can decay if unused or un-refreshed on a regular basis. Refresher training is often conducted as a standard process, untailored to each individual's unique skill-set. School age children are, in the end, no different in this learning challenge. A student's proficiency in foundational arithmetic and algebraic skills is critical for success in algebra and higher-level math courses.

Building on data from previous STEM-focused learning interventions, this paper will discuss a case study for applying diagnostic measures as a way to enhance and adapt future learning, focused on application of this technique for 7th and 8th grade foundational math; it will also propose integration techniques with current military data collection concepts such as xAPI. Application of this intervention process proved that use of the intelligent tutor makes for better grades, but also helps to develop and maintain those critical building blocks in the path to success in future STEM pursuits. The framework is currently populated with math content to create an Algebra Readiness Program, whose results will be discussed, but the framework is content agnostic so it can be used to develop effective teaching tools for other subject domains for which proficiency is dependent on learning and retaining declarative knowledge. As the STEM community puts these structured interventions to use, the extrapolation of these techniques to all stages of the military learning environment is crucial.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

IMPLEMENTING INNOVATIVE CONSTRUCTIVISM: AN ARCHITECTED APPROACH TO ENHANCING STEM EDUCATION

2017 IITSEC Paper No. 17017

Erik C. Elstad
Shared Science/ Bellflower USD
Bellflower, California

Dan M. Davis
HPC-Education/USC
Long Beach, California

Constructivism in education is a well recognized approach to teaching science, but often fails to achieve its goals, especially among students who have not been inculcated with cultural norms that emphasize the importance of aggressive inquiry and the challenge of existing dogma. The primary author has developed and implemented an approach, founded in constructivist theory, which provides a carefully architected framework in which the students can learn by engaging in scientific inquiry, rather than memorizing facts in a didactic environment. The need for and benefits of the architected framework are laid out. The applicability of this approach to DoD education, ranging all the way from the DoD Education Activity up to the Staff Colleges, is discussed and justified. The authors' assert that modern warfare has driven the need for pervasive education into all ranks. The initial instantiation of the method was conducted in Biology classes in a school district in the Los Angeles basin, whose student population was extremely diverse, in both ethnicity and socio-economic status. The authors present the basic method implemented, discuss its development, adduce data on its impact on students and comment on its maintenance over time. Further, they discuss the extensibility to other sciences, to other educational levels and to DoD education. A short review of current parallel efforts to improve science education is presented, with analyses as to the compatibility of this approach with others. The issue of the potential requirement of a charismatic "hero teacher" for success of various approaches is considered. Acknowledging the move toward serious games and on-line instruction, the authors present their experience in distributed simulations and the utility of them in educational contexts. The implementation of this approach in either the serious game or on-line education environment is explored. On-going and future research is outlined and various options are analyzed.

MATHEMATICAL SIMULATIONS – STUDENTS NO LONGER LOST IN TWO-DIMENSIONAL SPACE

2017 IITSEC Paper No. 17127

Stephen Chapman, Matthew Mason, & Lindsey Spalding
Modeling, Simulation, and Data Analysis
Paul J. Hagerty High School, Oviedo FL

In his 2013 study on The Effects of Implementing Technology in a High School Math Classroom, Murphy asserts "there is still a great need to continually evaluate what methods are working in the mathematics classroom… educators need to look at possible areas of improvement of the pedagogy of mathematics to a higher-order thinking to motivate and inspire students to learn mathematics, but also see the practical uses of mathematics in the realworld." Empirically, he found only 26% of "high school seniors had shown a strong knowledge with accuracy of [given] mathematical concepts" (Perry & Steck, 2015), (Murphy, 2016). Experiential learning simulations, paired with traditional instructional methods, will yield a greater conceptual understanding and retention of taught material, enabling students to better visualize abstract concepts and apply them in real world situations.

Multiple simulations were created for student interaction in Autodesk Inventor 2016. In addition to interactive simulations, three-dimensional models were created to visually demonstrate conceptual knowledge otherwise lost in two-dimensional space. These models served as an aid for students to fully grasp rotating two-dimensional cross sections defined by the intersection of curves around various axes. Students self-rated their understanding of the material before and after their exposure to the computer simulations. They also took a two-question quiz testing the content area of Volumes by Revolution. Both quantitative and qualitative metrics showed positive correlation between the use of computer simulations and increased student understanding. Quantitatively speaking, a 27-point increase was observed—on average—on participants' scores, with scores out of 100, with a p-value of 2.349%. With a 95% confidence interval, one can expect to see a range of at least a 3.0848-point increase on participants' scores and at most a 50.7613-point increase in participants' scores; with the data supporting the hypothesis.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320D

ED5 Future Leaders

1600

Students from around the country present papers on the projects demonstrated in the Future Leaders Pavilion (FLP). Visit them in Booth #2881 and stand by to be overwhelmed by the depth of their research papers during this session.

THURSDAY, 30 NOVEMBER, 2017 ROOM S320D

ED6 Courseware Creativity: Delivering a Better Experience

0830
How Video Lectures Can Free Up Time for Other Learning Activities (17201)

0900
Teaching and Learning Differently: Personalized E-Books for Learning (PEBL) (17272)

0930
Adapting Online Courseware to Decrease Time, Engage and Improve Performance (17284)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

HOW VIDEO LECTURES CAN FREE UP TIME FOR OTHER LEARNING ACTIVITIES

2017 IITSEC Paper No. 17201

Commander Geir Isaksen
Norwegian Defense University College, ADL section
Oslo, Norway

The Norwegian Defense University College (NDUC) is continuously challenged with cost reduction while increasing instructional quality within the educational system. Specifically, in 2017, the educational sector within the Armed Forces was challenged with reducing overall training costs by 65 million US dollars over the next few years. Less money, fewer instructors and constrained student training time forced the NoD to rethink resident training requirements and leverage online courses.

This paper highlights how video lectures have begun to replace the traditional classroom Power Point-based lectures in the Norwegian military. Furthermore, this paper discusses how NDUC, based on well-known learning principles and instructional science, uses an in-house video studio to produce video lectures in close cooperation with the Subject Matter Experts (SME). Finally, the paper presents the evaluation results from NDUC students engaging in online video lectures and recommends development guidelines for producing online video lectures to maintain, if not increase, instructional quality and decrease overall costs.

TEACHING AND LEARNING DIFFERENTLY: PERSONALIZED E-BOOKS FOR LEARNING (PEBL)

2017 IITSEC Paper No. 17272

Elliot Robson & Peter Berking
Eduworks Corporation
Corvallis, Oregon

Although current eBooks are little more than print shown in an e-reader, as a mobile, connected platform, eBooks have the unrealized potential to support more pedagogical approaches than traditional books, including experiential, problem-based, dynamic, and social learning. To realize this potential, the Personalized eBooks for Learning (PEBL) project has developed a specification that enables new capabilities in eBooks while maintaining the advantages of the "book" format. The PEBL project, funded by the US Advanced Distributed Learning (ADL) Initiative, has extended the standard EPUB3 format to enable eBooks to communicate with other systems in live, virtual, simulated, and constructive environments; to embed and exchange data with simulations, games, and intelligent tutoring systems; and to serve as competency-based training environments.

This paper describes new pedagogical approaches that are enabled by PEBL that go beyond the affordances of current eBooks, and outlines the modular and expandable structure of the PEBL specification. New capabilities include: book content triggered by the learner skills and competency levels; instructor-driven content brokering; dynamic individual and team progress dashboards and native analytics; and exercises in which learners communicate and collaborate with each other. These can each be separately provided by different learning technologies, but not all together in the convenient, media-rich, portable eBooks.

To demonstrate these capabilities, this paper reports on a next-generation cyber security eBook that contains examples of many of the new features and functionality available through PEBL-compliant eBooks and eReaders. We discuss both the pedagogic approaches and technical implementations used in the Cybersecurity demonstration PEBL eBook, and how this eBook has integrated with other technologies using the ADL's Total Learning Architecture (TLA). Finally, this paper outlines the possibilities for using PEBL-enabled eBooks in conjunction with virtual and mixed reality training, and we outline other implementations and specifications related to PEBL that have resulted from the Institute of Electrical and Electronics Engineers (IEEE) Actionable Data Book Industry Connections activity.

ADAPTING ONLINE COURSEWARE TO DECREASE TIME, ENGAGE AND IMPROVE PERFORMANCE

2017 IITSEC Paper No. 17284

Julia Campbell, Ryan McAlinden, David Cobbins, Raymond New, & Anthony DeCapite
University of Southern California
Los Angeles, CA

Catherine Neubauer
U.S. Army Research Laboratory West
Los Angeles, CA

Stephen L. Goldberg
U.S. Army Research Laboratory
Orlando, FL

Chad Cardwell & Jeramy Cook
Army Management Staff College Fort
Leavenworth, KS

United States Army military and civilian supervisors who manage civilian employees must complete the Supervisor Development Course (SDC) upon appointment, and every three years after their appointment. The original SDC online course focused on standardizing course content for supervisors across the Army, and the SDC provided quality information for new and experienced supervisors. While the SDC online content was informative, thorough, and helped to standardize the lesson material Army wide, it had challenges. The Army recognized the need to create new content and application exercises that better engaged learners, and reduced the amount of time supervisors spend to meet refresher training requirements. This paper describes the Supervisor Development Course-Refresher (SDC-R) effort that aims to address several overarching challenges that include: decreasing delivery time while refining instructional integrity, increasing interactivity within the constraints of an online learning environment, evaluating performance, and integrating SDC-R software with the Army Learning Management System (ALMS). Additionally, this paper presents a user study comparing two groups: one completing the original SDC course and the other completing the redesigned SDC-R course. Results compared the original SDC and new SDC-R courses including: participant time for course completion, the number of attempts to pass module posttests, and qualitative reactions to the respective courses. Preliminary results indicate that participants took significantly less time and fewer attempts to complete the SDC-R course compared to the original SDC. Finally, participant feedback suggests that the SDC-R significantly increases opportunities to apply their knowledge.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320D

ED7 Virtualizing the Schoolhouse Around the Globe

0830
U.S. Navy Virtual World Schoolhouse Case Study (17118)

0900
Using Virtual Simulation for Training the Brazilian Armored Tactics, Techniques and Procedures (17143)

0930
Virtual Learning Spaces at the Royal Danish Defence College: Emerging Practices (17172)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

US NAVY VIRTUAL WORLD SCHOOLHOUSE CASE STUDY

2017 IITSEC Paper No. 17118

Leslie A. L. Mazzone
Submarine Learning Center
Groton , Connecticut

Steven Aguiar
Naval Undersea Warfare Center
Newport, Rhode Island

In recent years, the United States Navy has been using virtual world technology to deliver training. The initial Navy course taught in the virtual world was on sonobuoy deployment from surface ships. This course is intended to teach sailors the basic principles of sonar detection and tracking. The virtual world technology used in this course enabled distributed instruction and access to a live tactical trainer between United States East Coast and West Coast learning sites at "full fidelity." The curriculum included classroom instruction, custom visualizations, and access to remote training systems. The effectiveness of this training was assessed using student written tests and student feedback questionnaires, similar to those used in the traditional classroom setting. The presenters will discuss the results of the tests and student feedback, challenges associated with instructor preparation, student engagement and the impact of class size, and course development with instructors and subject matter expert involvement.

USING VIRTUAL SIMULATION FOR TRAINING THE BRAZILIAN ARMORED TTP

2017 IITSEC Paper No. 17143

Andrei Piccinini Legg & Osmar Marchi dos Santos
Federal University of Santa Maria
Santa Maria, RS/Brazil

Pedro Procopio de Castro, Victor Emanuel Neves,
Cristiano de Souza Dorneles & Rodrigo Dias Neto
Brazilian Army
Santa Maria, RS/Brazil

The Brazilian Army has been pushing the use of simulation technology as a key component during training across its different training establishments. One of the first schools inside the Brazilian Army to adopt the use of simulation technology was the Brazilian Armor School (CI Bld - Centro de Instrução de Blindados). During training, CI Bld instructors use virtual simulators to train students to the latest knowledge of the Brazilian Armored Tactics, Techniques and Procedures (TTP) at the company level. Training exercises have a very tight schedule, which include up-to-date TTP subjects using virtual simulators and a tailored after action review. The exercises with virtual simulators have been taking place since 2012. Since then, more than 1000 students have attended the exercise. This work presents the methodology used in the exercises at CI Bld and how it has improved training at the Brazilian Armored Tactics, Techniques and Procedures. Moreover, changes carried out to enhance the training exercises during these years are discussed.

VIRTUAL LEARNING SPACES AT THE ROYAL DANISH DEFENCE COLLEGE: EMERGING PRACTICES

2017 IITSEC Paper No. 17172

Gro Frølund
Institute of Languages and Culture Royal Danish Defence College
Copenhagen, Denmark

A growing proportion of today's educational activity, civilian as well as military, takes place in virtual learning environments. A corollary of this growth is the emerging concern that the educational value of information and communication technology (ICT) is under-used by educators. There are also professional concerns that ICT may even undermine the effectiveness of teaching in some instances. A recent report notes that our educational institutions are ill-prepared pedagogically for making the most of technology. It asserts that simply adding twenty first century technologies to twentieth century teaching practices will "dilute the effectiveness of teaching".

Since our military institutions are currently adopting new technologies extensively, this issue is a pressing one. We need a deeper understanding of how e-learning affects learners in a military context. For this reason, the present study has used a series of qualitative interviews to map the learning experiences of officers from the Royal Danish Defence College. A number of questions animate the study. Firstly, can we identify certain factors that have created increased learning benefit when we come to evaluate the strategies, methods, and media employed in our teaching? Moreover, what are the salient features of the way officers – in this instance, Danish officers – perceive their own learning cultures and styles? In turn, how should this affect our course design?

The study reveals that learners' engagement levels, and the likelihood of them harbouring frustrations, often relate to their course's capacity to offer forms of collaboration. The data suggests that these learners deem collaboration to be part of a military ethos. Hence, unless the didactics underpinning our virtual learning environments align with cultural traits of this kind, they are likely to induce frustration rather than engagement. In view of these results, the paper will make recommendations on course design and pedagogical development in the context of military blended learning.

THURSDAY, 30 NOVEMBER, 2017 ROOM S320D

ED8 Targeting Learning: Developing Behaviors

1330	1400	1430
Leading Learning in the Workplace: Who's in Charge? (17011)	Improving Assessment with Text Mining (17191)	Adaptive Facilitation Skills for Army Instructors (17125)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

LEADING LEARNING IN THE WORKPLACE: WHO'S IN CHARGE?

2017 IITSEC Paper No. 17011

Daisy Mundy
RINA Consulting Defence Ltd
Swindon, UK

In 2014 – 16, UK Ministry of Defence (MOD) commissioned a research study into the benefits of embedding a continuous learning culture (CLC), where the whole workforce is actively engaged in promoting and supporting workplace learning. The study identified key benefits associated with a CLC, which related to development of trainer capability, delivery of effective and efficient training, and wider enablement of organisational learning. Leadership of learning was identified as a critical factor in realising these benefits, as it put in place the necessary organisational conditions, mechanisms and hierarchies that enabled a CLC to develop and thrive. The study recommended that roles and responsibilities for leading learning should be made explicit in the workplace, and individuals should be equipped with the right knowledge, skills and resources to be able to engage effectively with these roles. This paper draws on new research undertaken during 2016 – 17 on behalf of UK MOD by RINA Consulting Defence Ltd (formerly Edif ERA) and the University of Leicester, which followed up on the findings of this earlier research with a focus on developing leadership of learning in the workplace. Literature review and case study research with both military and civilian organisations was used to gather qualitative data on the behaviours used by leaders of learning at different levels of management, from senior manager to work supervisor. Options were then considered for developing leadership of learning behaviours across Defence organisations, using learning pathways which included both formal training interventions and informal workplace learning activities. The paper describes leadership of learning behaviours and their impact on organisational learning culture, and explains how organisations could develop these behaviours in the workforce using learning pathways which exploit the organisation's existing leadership and management training resources. The findings have applicability for all organisations seeking to develop a learning culture that fosters innovation and organisational competitiveness.

IMPROVING ASSESSMENT WITH TEXT MINING

2017 IITSEC Paper No. 17191

Hillary Fleenor & Rania Hodhod
Columbus State University
Columbus, GA

Randy Brou
Army Research Institute
Ft. Benning, GA

Assessment is a key component of education across society. Regardless of whether the setting is academia, industry, military, or non-profit organizations, assessment is essential for gauging educational effectiveness, providing remediation to students, and informing policy and decision-making. However, the use of thorough assessments can be resource intensive. For example, instructors must devote time and effort into scoring/grading assessments. This can be especially costly when teaching complex skills that are not easily measured by convenient means such as multiple choice examinations (e.g., leadership, problem solving, critical thinking, communication). However, one can argue that these kinds of complex tasks are the ultimate goal of any educational system.

Computing holds great potential for reducing the burdens associated with assessment tools designed to measure complex skills. As a case in point, consider the Consequences test (Christensen, Merrifield & Guilford, 1953). It has been used to predict meaningful outcomes for military Officers, but the scoring of the test is extremely time-consuming as it requires test administrators to read and categorize test-taker-generated statements involving the outcomes of hypothetical scenarios. If the scoring of such statements could be automated, the test would become much easier to administer widely as the costs of the assessment would be drastically reduced. The challenge to implementing such a solution has been that computationally processing natural language, especially the kind of free form, conversational responses common in everyday life, is complicated. Nonetheless, tools already exist that show potential for utilization in assessment systems that necessarily use highly unstructured, free text input. In this paper, we discuss the use of open source Python libraries for assessing short answer, free form responses in the Consequences test. Using Latent Semantic Analysis, a well-established technique that has been around since 1988, we were able achieve human computer response categorization interrater reliabilities comparable to human-human interrater reliabilities.

ADAPTIVE FACILITATION SKILLS FOR ARMY INSTRUCTORS

2017 IITSEC Paper No. 17125

Tatiana H. Toumbeva & Krista L. Ratwani	Frederick J. Diedrich & Scott M. Flanagan Sophia Speira	Jennifer Murphy	Louis C. Miller
Aptima, Inc	Carthage, NC	Quantum Improvements Consulting Institute	Army Research
Woburn, MA		Orlando, FL	Ft. Benning, GA

Given diverse learning populations, to increase the efficiency and effectiveness of training, instructors must meet individual student needs and deliver customized training at the point of need (Martin, 2015). The process of adapting instruction is not a trivial challenge and places many demands on instructors. Given the learner-centric approach described in the U.S. Army Learning Concept for Training and Education 2020-2040 (U.S. Department of the Army, 2017), the Army is one of the many organizations attempting to meet this challenge. Although the majority of Army instructors attend the Foundation Instructor/Facilitator Course (FIFC) and learn a variety of instructional techniques, additional tools are needed to help instructors tailor their small group instruction to the individual Soldier. Compounding the issue, instructors often face schedule, time, and resource constraints, as well as understaffing. Thus, instructors may struggle to adopt a learner-centric approach that facilitates career-long learning. This paper showcases a multi-phase process through which a tool was iteratively developed to help instructors meet these challenges. Army instructors within the Abrams Tank Maintenance Advanced Individual Training (AIT) program served as a use case for investigating how instructors recognize and diagnose individual learner problems, and adaptively employ instructional techniques in near real-time to correct those problems. Following a thorough review of academic and military literature, extensive quantitative and qualitative data were gathered through a series of observations, surveys, and knowledge elicitation sessions with instructors and students. These data helped to pinpoint top challenges students face in the course, associated observable student behaviors, diagnostic techniques, and recommended instructional strategies. Finally, findings from an empirical evaluation study indicated that the instructional tool was found helpful, especially for brand-new or novice instructors. The full process, final tool, evaluation results, and theoretical and practical implications (including the generalizability to other contexts) are presented and discussed.

TUESDAY, 28 NOVEMBER, 2017 ROOM S320C

EC1 Trouble with Data

1400	1430	1500
GeoPackage: Unifying Modeling and Simulation with Mission Command Geospatial Data (17065)	3D Scanning and Navy Ships: An Immediate and Outward Look at Utilization (17052)	Marine Forensics: The Art and Science of Simulating Ships in Storms (17086)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

GEOPACKAGE: UNIFYING MODELING AND SIMULATION WITH MISSION COMMAND GEOSPATIAL DATA

2017 IITSEC Paper No. 17065

Kevin Bentley
Cognitics, Inc.
Boise, Idaho

Michala Hill & Ronald Moore
Leidos
Orlando, Florida

Mark Johnson
Optimal Solutions and Technologies (OST) Inc.
Orlando, Florida

OpenFlight™ (a trademark of Presagis, Inc.), the de-facto standard for 3D models and terrain for simulation and training, has been in common use for decades. Despite revisions and expansion over the years, the format remains largely unchanged. The OpenFlight format does not lend itself to storage of abstract feature data and relationships between 3D visual objects and related abstract objects. A typical OpenFlight terrain database or 3D model built for one Image Generator (IG) may lack collision volumes or trafficability rules needed by another system. The OpenFlight database cannot preserve the relationship of polygons to the source features they were built from. Modern SAFs and specific gaming systems all require conceptually different data models, meaning many output files and formats are required to support a confederate of training and simulation platforms. Meanwhile, the Open Geospatial Consortium has adopted the GeoPackage format for Geographic Information Systems (GIS) data. GeoPackage provides a data model and consistency across applications. GeoPackage is built on SQLite, an open source, self-contained, cross-platform embedded database engine. As such, GeoPackage is ideal for expansion in support of the simulation industry. By storing abstract features with relationships to their specific counterparts, a single GeoPackage file could be used to exchange correlated data for simulation systems as well as mission command and GIS applications. A single feature stored in a GeoPackage file can have a relationship to a 3D model used in a legacy image generator and also a model designed for use in a gaming system or SAF.
This paper reports on SE Core's investigation into expanding on the GeoPackage standard for use in simulation and training. We present a demonstration where a single database with visual and abstract objects can provide all the intermediate data necessary to create database products for use in production.

3D SCANNING AND NAVY SHIPS: AN IMMEDIATE AND OUTWARD LOOK AT UTILIZATION

2017 IITSEC Paper No. 17052

Larry Clay Greunke, MS
SPAWAR
San Diego, CA

Mark Bilinski, PhD
SPAWAR SSC PAC
San Diego, CA

Jessica Fuller, MBA
SPAWAR
San Diego, CA

While 3D scanning technologies promise to revolutionize the documentation for worksites, its adoption into Navy processes has been slow and isolated to niche use cases (e.g. 3D models for training, antenna masking analysis on ships, load planning, space capsule recovery design for LPDs). Government labs are popping up that are pursuing these current and new use cases and are working largely independent of one another. With no knowledge or data sharing repository, efforts are not accelerating as fast as they could. Our efforts started off as another example of this story, the intention of this manuscript is to convey our individual use case of the utilization of 3d scanning in ship installation; however we will further provide a shared vision, based on our conversations with other labs, of how the Navy should share this scan data to obtain the most capability from it.

MARINE FORENSICS: THE ART AND SCIENCE OF SIMULATING SHIPS IN STORM CONDITIONS

2017 IITSEC Paper No. 17086

Sean Kery MS PE
CSRA
Washington, DC

Historic vessels provide useful surrogates for modern vessels that can be discussed in the open literature with reduced concern for security or proprietary material. Simulating the motions of a vessel in waves, and the effects on the hull and everything aboard is a fairly complicated process. This paper describes the author's pioneering work extending those analyses to ships in severe weather conditions where non-linear waves, combined with hurricane force winds illicit non-linear responses. Some of the unusual methodologies used to build out the simulation models will be discussed as they apply to the 4 vessels selected for this paper.

TUESDAY, 28 NOVEMBER, 2017 ROOM S320C

EC2 Discovering Transformative Architectures

1600	1630	1700
IDE-Forward: A Persistent Force-On-Force Training Field Test Environment (17184)	Emerging Network and Architecture Technology Enhancements to Support Future Training Environments (17033)	Innovation through Discovery Experimentation (17317)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

IDE-FORWARD: A PERSISTENT FORCE-ON-FORCE TRAINING FIELD TEST ENVIRONMENT

2017 IITSEC Paper No. 17184

W. Cory Bogler
U.S. Army RDECOM ARDEC
Orlando, FL

Jose Rodriguez & Graham Fleener
U.S. Army PEO STRI
Orlando, FL

Gary Hall
General Dynamics Mission Systems
Orlando, FL

Project Manager Training Devices (PM TRADE) has committed to an open architecture, component-based acquisition methodology enabled through the Live Training Transformation (LT2) product line, which is built upon a number of open standards & processes. First, LT2 products use the Common Training Instrumentation Architecture (CTIA) to define interoperability standards among training applications to support live training. PM TRADE then developed the Live Training Engagement Composition (LTEC) to provide an open architecture solution for communication for Tactical Engagement Simulation Systems (TESS) components. This flexible architecture will drive innovation and lower acquisition costs by making it possible for systems to operate in the same training environment given an adherence to the LT2 LTEC Interface Control Document. As a result of open standards and a product-line approach, PM TRADE was able to quickly and efficiently develop, field, and operate an instantiation by integrating the open standards, architecture, and applications of the LT2 product line to create the Integration and Development Environment – Forward (IDEF). IDEF (formerly known as L-FITE) is a persistent training environment that enables proof of principle concepts and emerging capabilities to be utilized during Force-on-Force training events for Soldier feedback prior to full implementation into Army "Live" System Programs of Record.

This paper will begin by with a brief history of Force-on-Force training. Then, it will describe the concept, process, and strategy for IDEF development and operations. In addition, the paper will document results and lessons learned from a number of testing and integration events leveraging IDEF in a land navigation course use case. Finally, this paper will discuss the framework created for IDEF to evolve to provide a verification and validation methodology for future training systems, inform future Army source selections and Programs of Record (POR), and provide the capability to continually review the relevance of fielded training systems.

EMERGING NETWORK AND ARCHITECTURE TECHNOLOGY ENHANCEMENTS TO SUPPORT FUTURE TRAINING ENVIRONMENTS

2017 IITSEC Paper No. 17033

Bruce Caulkins, Ph.D., Brian Goldiez, Ph.D., Paul Wiegand, Ph.D., & Glenn Martin, Ph.D.
Institute for Simulation & Training (IST)
University of Central Florida (UCF), Orlando, Florida

Paul Dumanoir &
Tom Torres
U.S. Army PEO STRI
Orlando, Florida

The Operational Environment (OE) has become increasingly complex, with challenging human factors, exponential proliferation of technology, and an increasingly determined, adaptive threat. Training Army Soldiers, leaders and units in a complex world requires modernized, integrated, realistic, and adaptive training capabilities. The Army must leverage emerging technologies to transform the way it develops and delivers training to enable agile and adaptive Soldiers, leaders and versatile units. It must provide a consistent, persistent ability to train at the point of need (PON) for both current and future operations as part of a Joint, Inter-organizational, and Multinational (JIM) force. The training venues must allow the Army to train as it fights, using its wartime systems on its operational networks and all training environments must replicate the OE to the greatest extent possible.

To address this reality, the U.S. Army Program Executive Office for Simulation, Training and Instrumentation (PEO STRI) and the University of Central Florida (UCF), Institute for Simulation and Training (IST) are conducting research to create new capabilities that support both operations and training while enabling software application migration to Army enterprise data centers and cloud environments. This research pivots on Army directives that focus on modernizing information technology systems and applications. To achieve the distributed nature of this vision, technical enhancements to the underlying Army Enterprise Network (AEN) must be made in the next few years.

This paper investigates potential gaps in simulation enterprise network architectures and describes research results in three major technical areas that address these gaps and will benefit future simulation and network architectures. The research topics include technologies that: (1) efficiently delivers simulations from cloud-like environments using Software Defined Networks (SDNs); (2) facilitates individual and collective home station or field-based training through the use of thin clients; and (3) optimizes computational resources through load-balancing techniques and processes.

INNOVATION THROUGH DISCOVERY EXPERIMENTATION
2017 IITSEC Paper No. 17317

S K Numrich, Kevin Woods, Joel Resnick & Jack Jackson
Institute for Defense Analyses
Alexandria, VA

As the military refocuses its training and acquisition from the counter-insurgency conflicts in Iraq and Afghanistan to the potential for major military conflict in an era of new technologies, there is a need to explore new concepts for using these new technologies. These explorations are essential for developing new tactics, techniques and procedures (TTPs), integrating new capabilities into existing forces, but are also critical in the choices of which technologies to mature and acquire. Discovery experimentation is a process for using simulation to place emerging technologies in the hands of warfighters engaged in virtual battlefields to explore the military utility of new concepts for using emerging systems. Discovery experimentation is designed to allow learning and modification from trial to trial and in that way differs significantly for both traditional scientific experimentation and technology demonstrations. In support of the US Air Force, research staff from the Institute for Defense Analyses conducted a multi-trial, discovery experiment to explore new concepts in close air support (CAS) employing Network-Enabled weapons. This paper will use this experiment to further define discovery experimentation; how it can use existing facilities and simulations with modifications to conduct the exploration; identify potential adversary counters, and how the data acquisition and results of progressive trials altered the initial concept to extract new TTPs and define requirements for supporting equipment. A small team of CAS experts (instructor level) experimented with the new technology in a stressing threat environment responding to the call for fires from an experienced military commander and fires officer. The concept and supporting data that emerged provides initial evidence that the new approach might be capable of addressing more targets in less time than had been possible with traditional tactics might be possible.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320C

EC3 Big Data: Size Matters

0830
Deep Learning for Training with Noise in Expert Systems (17034)

0900
Human Activity Synthetic Data Generation (17059)

0930
A Genetic Model of the Development of Modeling and Simulation (17077)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

DEEP LEARNING FOR TRAINING WITH NOISE IN EXPERT SYSTEMS

2017 IITSEC Paper No. 17034

David A. Noever & J. Wesley Regian
PeopleTec, Inc.
Huntsville, AL

Deep learning systems have achieved a remarkable human-machine parity for some key training tasks, including machines that can speak, listen and see at an expert human level. For image recognition, the state-of-the-art features deep convolutional neural networks (CNN). This paper benchmarks their performance on key recognition objectives: 1) automating large-scale image classification, and 2) identifying types of noisy training data that can improve testing outcomes. This benchmarking relies on two classically hard image problems: 1) distinguishing similar objects, and 2) classifying tiny low-resolution icons. The teacher-based recognition embodies supervised learning since image class labels are known. When deployed using Google's Tensorflow framework, the CNN learns both similar classes and tiny icons with 95.3% and 89.5% accuracy respectively. This paper further explores two competing hypotheses of training noise. The first role for noise may improve outcomes if the noise reduces overfitting. The competing role, however, may diminish learning if noise masks some key object features. We inject quantifiable impulse (or spike) noise to disrupt local object patterns (convolution) and to benchmark learning changes. This choice of localized interference attacks a fundamental assumption underpinning CNN performance, namely that neighboring pixels dominate remote ones. One surprising outcome is that by adding impulse noise to training images, overall classification improves compared to training on unmodified test images (95.4%). The basic principle can be understood as noise benefiting image-based training when it augments data size and diversity or when it obscures background relative to foreground targets. When we apply convolutional neural nets to large-scale image classification, the accuracy compares favorably to the state-of-the-art in published literature and public global data competitions. At least in the case of some multi-class image problems, CNN accuracy exceeds the recognition capabilities of human experts.

HUMAN ACTIVITY SYNTHETIC DATA GENERATION

2017 IITSEC Paper No. 17059

Zhiqing Cheng, Timothy MtCastle,
Todd Huster, & Max Grattan
Infoscitex Corporation
Dayton, OH

John Camp, Huaining Cheng & Monique Brisson
711th Human Performance Wing
Air Force Research Laboratory
Dayton, OH

Data availability often becomes a major hindrance to the development of human centric, computer-vision based technologies, as a large amount of data is usually required for algorithm training and validation, especially when deep learning is used to develop algorithms. Synthetic data which are produced by modeling and simulation could be used to expand and/or supplement real world data which are otherwise not available. While human activity modeling and simulation has achieved success in creating synthetic environments for simulation based training and virtual reality, whether it can be used to generate synthetic data which satisfy requirements for machine learning is yet to be proved.

In this paper, using human activity modeling and simulation to generate synthetic human activity data for machine learning is investigated. The needs for synthetic data are identified from the perspective of human centric, computervision based technology development. The basic requirements of synthetic data are defined in light of machine learning. Factors that contribute to the fidelity and applicability of synthetic data are analyzed. In particular, two factors related to human activity modeling and simulation, bio-fidelity and variability are investigated. Several modeling and simulation tools and game engines (e.g., 3dsMAX, Unity, and NVIG) are used for data generation, and their performances are compared and evaluated. Synthetic full motion videos are generated in electric-optical and infrared modes and tested by machine learning algorithms. The testing results along with examples of synthetic imagery are illustrated in the paper.

Keywords: human activity, modeling and simulation, synthetic image, synthetic full motion video, machine learning

A GENETIC MODEL OF THE DEVELOPMENT OF MODELING AND SIMULATION
2017 IITSEC Paper No. 17077

Morton Tavel Ph.D & Devin Markovits
Inn Innovation Business Partners
Lavallette, NJ

Complex technologies, like Modeling and Simulation (M&S), show evidence of an evolutionary speciation that occurs when the technology is used by different companies in different geographical locations and for different purposes. In this paper we describe "patent genomics," a genetic model of technology evolution that uses the patent database of the U.S. Patent and Trademark Office (USPTO) and its "class codes," to create an "Innovation Genotype" that provides a genetic code of a technology in terms of the areas of knowledge contained in its patented inventions. Using class codes as genetic markers, we have analyzed ten years of M&S patents by all the companies doing M&S in four states, Alabama, Florida, Michigan, and Texas and show that M&S has evolved into different "species" by the insertion of company-dependent "genes" into the knowledge base of the companies in these states. We have also analyzed this speciation in time, to show how different knowledge components may grow or decay. In addition, we create inventor networks for individual companies whose nodes are inventors and whose links are the inventions they have created. Using these networks we identify the sources of innovation and the flow of knowledge in a company. The patent analysis across a state gives us the long-term evolutionary character of a technology while the inventor networks within a company give us the short-term developmental characteristics of a technology. This form of genetic analysis helps to identify the emergence of synergies within a company and between companies that can be applied both to solving new and complex problems and enabling the discovery of disruptive technologies. In short, we may discover the gene for "blackness" among a group of white swans that leads to a method of addressing a potential black swan event.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320C

EC4 Realistic and Effective Action: How Do We Decide?

1030	1100	1130
Modeling Environmental Impacts on Cognitive Performance for Artificially Intelligent Entities (17176)	Optimizing Cooperative Games for Cognitive Communication UAVs with Q-Learning (17132)	Controlling CGF-Generated Entities Using a Fuzzy Logic-based System (17040)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

MODELING ENVIRONMENTAL IMPACTS ON COGNITIVE PERFORMANCE FOR ARTIFICIALLY INTELLIGENT ENTITIES

2017 IITSEC Paper No. 17176

Captain Pierce C. Guthrie, USMC, LCDR Lee Sciarini, PhD, Michael Guerrero, Perry McDowell
Naval Postgraduate School MOVES Institute
Monterey, California

The Marine Corps utilizes virtual simulations as a training tool for ground combat operations. Currently, the artificial intelligence of the entities within these simulations do not exhibit appropriate performance degradation due to environmental conditions such as heat and humidity. These gaps impact training fidelity and can adversely impact transfer of training. To address these gaps, this paper reviews existing approaches to modeling the influence of environmental factors, specifically heat and humidity, on human performance in vigilance and attention tasks. We also explore existing environmental modeling and path finding behaviors within relevant military simulations in order to refine the scope of the problem. We present a novel agent behavior model which incorporates a modified A* search pathfinding algorithm based on empirical evidence of human information processing under the specified environmental conditions. Next, an implementation of the agent behavior model is presented in a military relevant virtual game environment. We then outline a quantitative approach to testing the agent behavior model within the virtual environment. Results show that our human information processing-based agent behavior model demonstrates plausible agent performance degradation in hot, humid temperature environments when compared to paths around the danger area in mild temperature environments. We also present a technique for demonstrating to adjacent agents the environmental temperature condition currently felt by agents in the environment. Doing so will allow for trainees to recognize a potential source of negative performance from members of their unit, and allow for better training on how to operate in spite of these challenges. The results of this research provide an approach for implementing an agent behavior model that accounts for environmental impacts on cognitive performance. We recommend future work to validate the model in a human subjects experiment to facilitate improving the realism of simulation training.

OPTIMIZING COOPERATIVE GAMES FOR COGNITIVE COMMUNICATION UAVS WITH Q-LEARNING

2017 IITSEC Paper No. 17132

Mark Rahmes, David Chester, Richard Clouse & Jodie Hunt
Harris Corporation, Space and Intelligence Systems
Melbourne, Florida

Currently, distributed communications networks based on multiple unmanned aerial vehicles (UAVs) are limited in terms of reliability and network availability. The capacity for each UAV to serve as a node in the network is constrained by limited energy stores, dynamic changes in the network topology, and latency/jitter issues. Typical approaches to address these challenges have focused on partitioning of the network to work around the failed nodes, but the attendant degraded communications links and lengthy network outages underscore the need for a better solution. An innovative approach based on the use of a self-forming, self-organizing, cooperative, autonomous system of distributed UAV communication nodes is being investigated. By enabling each UAV to act collectively and cooperatively, a multi-UAV network's communication links can be made more resilient, resulting in enhanced levels of network availability and improved service quality. To achieve this, we investigated the concept of opportunistic arrays to aid in the development of a cooperative, cognitive system encompassing multiple vehicles. Based on simulations, we have also been able to demonstrate that optimal vehicle positions can be directed using decision algorithms that embody elements of game theory. In addition, by implementing a cooperative reasoning engine for system-level oversight or harmonization, we were able to ensure optimal performance of the overall system and achieve enhanced levels of service quality based on multiple measures of effectiveness.

CONTROLLING CGF-GENERATED ENTITIES USING A FUZZY LOGIC-BASED SYSTEM
2017 IITSEC Paper No. 17040

Hung Tran, Kasey Kolyno & Orlando Laboy
CAE USA Inc.
Tampa, FL

Computer Generated Forces (CGF) is a key component in virtual and constructive simulations and offers a costeffective way to enhance realism by providing methods to control simulated entities. CGF is becoming an essential tool for tactical training, especially for mission rehearsal. CGF facilitates mission training by providing the means to design training scenarios. A training scenario consists of a set of predefined events that occurs during training, which involves setting a number of parameters of the computer-controlled simulation models. On one hand, CGF scenarios tend to be static. Once trainees have completed a scenario, they will likely know how it will behave during the next training session, thereby reducing or removing the reuse value of the scenario. On the other hand, a fundamental characteristic of CGF is decision-making based on artificial intelligence (AI). Current AI decision-making implementations are commonly simplistic, using a fixed set of "Rules of Engagement." The nature of this behavior makes it easy for trainees to distinguish between computer-controlled and human-controlled entities in a simulated environment. These specific CGF characteristics can result in ineffective or negative training because trainees are able to quickly familiarize with the behaviors of the simulated entities and then easily defeat them, which would not occur with human-controlled opponents.
In this paper, we propose a method to control the behavior of constructive entities generated from a synthetic environment. This novel method makes essential use of a fuzzy logic-based system. We illustrate the proposed method with a simulation of an Air Defense Missile System (ADMS). The ADMS simulation computes the missile launch envelope and uses the simulation results to determine the "in-range" condition of hostile air targets. The result of the ADMS simulation demonstrated that the fuzzy logic-based system is suitable to emulate the decision-making process of a human ADMS operator.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320C
EC5 Super Smarts: The Power of Processing

1400
Mind Flight: Brain-Computer Interface-Driven Design of Simulated Aircraft Control Frameworks (17150)

1430
Operational Learning: Leveraging Mission Data to Optimize Skill Development (17226)

1500
Acceleration of Digital Radar Landmass Simulation on Multi-core CPU and GPGPU Computer (17235)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

MINDFLIGHT: BRAIN-COMPUTER INTERFACE-DRIVEN DESIGN OF SIMULATED AIRCRAFT CONTROL FRAMEWORKS

2017 IITSEC Paper No. 17150

Matthew Rich, Johnathan Pino, Zachary Koterba, David Handelman, PhD, Robert Ide, Matthew Fifer, PhD, Brendan John, Nathan Turner, Daniel Cybyk, Jonathan Ellsworth, Denise D'Angelo, Brock Wester, PhD, Eric Pohlmeyer, PhD, James Beaty, PhD, Francesco Tenore, PhD & Michael McLoughlin
Johns Hopkins Applied Physics Laboratory
Laurel, MD

As the complexity of military systems advances, so too must the human-machine interfaces that operators use to control those systems. In support of DARPA's Revolutionizing Prosthetics Program, we developed a method and associated technologies to test the efficacy of novel control interfaces with scalable virtual and live aircraft control frameworks. The design of these test frameworks supports compatibility with multiple control modalities, ranging in complexity from joysticks, eye-tracking, and electromyography sensors, to the direct decoding of neural activity within the brain. MindFlight's virtual fixed-wing aircraft control framework leverages a commercial-off-the-shelf simulation and visualization platform commonly used for civilian and military aviation training. Early control evaluations featured basic aircraft control tasks, such as two-degree-of-freedom control of a single aircraft in free flight. Additional features provided support for increasingly complex test paradigms involving navigation through hoops courses or simultaneous control of multiple aircraft. The test system also supports tasks in which the pilot must make control decisions based on novel information provided via visual cues, vibrotactile stimulation of the skin, or even intracortical microstimulation of neurons. Several tests with this platform have shown its usefulness for assessing brain-computer interface control of simulated aircraft.

Proof of concept demonstrations involving live aircraft will be critical to assessing the effectiveness of MindFlight's method for evaluating the operational utility of novel control interfaces. A custom-built live aircraft test framework enables control of one or multiple quadrotor unmanned aerial vehicles (UAVs) by a single operator using any of the same control modalities and interfaces as the virtual fixed-wing aircraft control framework. The quadrotor framework supports multiple control modes and enables test operations from a remote control site via an internet connection. Additionally, it provides a virtual representation of the live quadrotor UAV system for operator training prior to live flight.

OPERATIONAL LEARNING: LEVERAGING MISSION DATA TO OPTIMIZE SKILL DEVELOPMENT

2017 IITSEC Paper No. 17226

Kent C. Halverson, Alan Carlin, Kristy Reynolds, David Perlaza, & Evan Oster
Aptima, Inc.
Woburn, MA

During a military career, frequently exercised skills appreciate into expertise, while infrequently exercised skills can decay. Decay can be caused by inattention to the skill, which in turn can be caused by infrequent tracking. Although trainee skill states are systematically measured and monitored during formal training (e.g., school house, Initial Qualification Training (IQT), and Mission Qualification Training (MQT)), once trainees are qualified and assigned to operational missions, assessment is less frequent. Training sustainment programs intended to maintain skill proficiency (e.g., Continuation Training (CT)) only require that tasks be accomplished without systematically measuring, storing, or analyzing skill proficiency data. Thus, the problem this paper addresses is that trainee data is not sufficient to determine the nature and magnitude of the skill decay, making it difficult to know the true skill state of military operators at any given time. Fortunately, military operational databases are filled with information related to missions executed, tasks accomplished, tools/platforms used, etc., and can be a rich source of data from which operator skill states can be inferred. In this work, we describe a suite of machine learning data mining algorithms that operate not only on training data stored in Learning Management Systems (LMSs), but also on operational databases, to make inferences about operator skills states that can be used to personalize learning to ensure that only deficient skills are trained. This innovative approach to leverage operational mission data will allow keen insights into operational learning, or the learning that occurs when formal training ends.

ACCELERATION OF DIGITAL RADAR LANDMASS SIMULATION ON MULTI-CORE CPU AND GPGPU COMPUTER

2017 IITSEC Paper No. 17235

Taieb Lamine Ben Cheikh
École Polytechnique de Montréal
Montréal, Canada

Pascal Guillemette
CAE Inc.
Montréal, Canada

Gabriela Nicolescu
École Polytechnique de Montréal
Montréal, Canada

Digital Radar Landmass Simulation (DRLMS) for the purpose of training radar operators is a challenging computationally-intensive task. To improve fidelity, the databases are continuously increasing in resolution and density. Moreover, the radar simulation involves increasingly sophisticated physics-based models. One of them is the application of the radar antenna radiation pattern illuminating a particular region composed of landmass, sea clutter, precipitation and targets. To achieve real-time, a number of approximations are used in current simulations, which includes modeling a narrow antenna radiation pattern and employing a coarse sampling of the illuminated region. However, this harms the simulation fidelity.

To avoid these approximations while respecting the real-time constraints, this paper proposes a multi-level parallelization approach of landmass simulation applicable to multi-core Central Processing Unit (CPU) and General-Purpose Graphics Processing Unit (GPGPU). At the first level, the processing is divided into two parallel pipelines: (1) the power accumulation, which involves database processing and (2) the antenna pattern convolution. At the second level, the convolution is divided into several threads running in parallel. Two implementations are compared: one on multi-core CPU and one on GPGPU.

As benefits for training, we improve considerably the simulation performances as we are capable to apply a more detailed radar antenna pattern and support more complex databases, both contributing to more realistic radar images. The improved DRLMS shows respectively, a speedup of 12x on multi-core CPU running 16 threads, and a speedup of around 250x on a contemporary high-end graphics card over a one-thread execution on CPU.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320C

EC6 Marking Smart Decisions

1600
Developing a Financial Readiness Mobile Personal Assistant for Learning (17252)

1630
MentorPal: Interactive Virtual Mentors Based on Real-life STEM Professionals (17263)

1700
Developing a Naturalistic Categorization Task for Testing Intuitive Decision Making (17146)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

DEVELOPING A FINANCIAL READINESS MOBILE PERSONAL ASSISTANT FOR LEARNING

2017 IITSEC Paper No. 17252

Frank Hannigan, Jennifer Murphy, & Tarah Daly
Quantum Improvements Consulting LLC
Orlando, FL

Chad Udell & Dan Pfieffer
Float LLC
Morton, IL

Sae Schatz & Marcus Birtwhistle
Advanced Distributed Learning Co-Lab
Alexandria, VA

While Service members and their families receive unique financial benefits as a result of their service, few are well educated in the best ways to manage their finances. Consequently, they may fall prey to predatory lending practices, high pressure sales pitches, and other financial pitfalls. Adding to the complexity of this problem is the fact that Service members' financial priorities change throughout their lives, both during service and after separation. 10 U.S. Code § 992 requires financial literacy training to be provided at specific points in Service members' careers, including significant life events, at promotion, and in concert with deployments. However, there is no guidance for what specific training content should be provided or when. Further, there is no solution to provide Service members complete access to financial literacy information. Due to the breadth of the financial domain, an effective solution must tailor content to the individual Service member, providing the right information in a timely way, and in an engaging and effective way. Although adaptive training is not a new concept, it is rarely designed to provide lifelong support to learners. Even less frequently are these solutions designed for mobile devices. In this paper, we describe research that designs and develops a mobile Personal Assistant for Learning to support Service member financial literacy. First, we describe the front-end analysis conducted to determine the scope of the domain and identification of learning objectives. Second, we discuss the process to develop a framework mapping the content to specific points in a Service member's career to enable an adaptive learning experience. We also present research findings to support our approach. Our goal with this paper is to share the process used to design adaptive content to support lifelong learning and discuss lessons learned through our research.

MENTORPAL: INTERACTIVE VIRTUAL MENTORS BASED ON REAL-LIFE STEM PROFESSIONALS

2017 IITSEC Paper No. 17263

Benjamin D. Nye, Nicholas J. Kaimakis, Madhusudhan Krishnamachari, William Swartout, Julia Campbell, and Clinton Anderson
Institute for Creative Technologies, University of Southern California
Los Angeles, California

Dan M. Davis
High Performance Computing Education
Long Beach, California

In an ideal world, all students could meet STEM role models as they explore different careers. However, events such as career fairs do not scale well: professionals have limited time and effective mentors are not readily available in all fields. The result is that students' understanding is minimal about what professionals in STEM fields do every day, what education is needed, and even what STEM fields exist. Moreover, since in-person interactions rely on finding people engaged in current STEM careers, students may form career goals for stagnant fields rather than growing fields (e.g., projected workforce needs). To address this problem, we are designing a scalable tablet-based app that gives students the opportunity to converse with interactive recordings of real-life STEM professionals. These conversational virtual agents will emulate a question-and-answer session with STEM professionals who have Navy ties and who are engaging, enthusiastic, and effective mentors. These interactions will allow students to have a lifelike informational interview with a virtual agent whose responses are directly drawn from a specific real professional's video-recorded interview. This work differs from prior research on career guides by capturing the experiences of a collection of unique mentors, which should be more authentic and engaging than a generic agent or resource which speaks only about the average experience. This paper will discuss the process of creating the first such virtual STEM mentor prototype, including the development of an extensive mentoring question bank (approximately 500 questions); key mentoring topics that intersect STEM, DoD, and civilian life; techniques for cost-effective recording of remote mentors; and the process of training and verifying a natural language dialogue model for answering and suggesting career questions. Finally, we conclude with implications, strengths, and drawbacks of virtualizing the experience of talking with specific mentors, from the perspectives of efficacy, scalability, and maintainability.

DEVELOPING A NATURALISTIC CATEGORIZATION TASK FOR TESTING INTUITIVE DECISION MAKING

2017 IITSEC Paper No. 17146

Max Kailler Smith, Ben Reuveni, Michael S. Cohen, Marcia Grabowecky & Paul J. Reber
Northwestern University
Evanston, Illinois

Intuitive Decision Making (IDM) depends on knowledge that cannot be easily articulated. It does not reflect explicitly learned rules and guidelines. Rather, it is hypothesized to rely on implicit learning (IL). Basic science research on the phenomenon of IL provides a theoretical framework for understanding the acquisition of knowledge outside of conscious awareness from practical experience. This framework has the potential to accelerate the development of IDM during training and speed the acquisition of expertise. Here we describe a procedure and present a program of research based on adapting a more operationally relevant task to controlled laboratory conditions to bridge basic science and enhanced simulation-based training. The underlying task is one in which a complex decision is made based on environmental terrain characteristics, such as the formation in which to proceed with a patrolling infantry squad. This decision process is analogous to laboratory tasks in which participants learn to discriminate among a set of visual categories, but requires a new kind of task in which the visual stimuli are constructed from complex terrain dimensions. We defined a stimulus space based on four environmental dimensions: vegetation density, topography (hilliness), time of day and weather conditions. An artificial category structure was then defined within this stimulus space around three hidden prototypes. Participants learned these categories through trial-and-error with feedback about their decisions. Across three experiments, participants exhibited learning, increasing their decision accuracy across a range of task parameters selected to promote reliance on IL and use IDM. The resulting protocol will serve as a testbed for quantification of IDM effects and allow future work to examine training and educational interventions aimed at improving effective use of IDM. In addition, the task development process can serve as a model for bridging basic science research and operationally relevant domains.

THURSDAY, 30 NOVEMBER, 2017 ROOM S320C

EC7 Audio, Aptitude and Areas

0830
3D Spatial Audio Extraction and Demonstration System for Augmented/Mixed Reality Simulations (17009)

0900
Predicting Manufacturing Aptitude using Augmented Reality Work Instructions (17224)

0930
Real -time Coverage Area and Danger Zones Estimation (17185)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

3D SPATIAL AUDIO EXTRACTION AND DEMONSTRATION SYSTEM FOR AUGMENTED/MIXED REALITY SIMULATIONS

2017 IITSEC Paper No. 17009

Jay Saffold & Tovar Shoaf
Research Network, Inc
Kennesaw, GA

Pat Garrity
U.S. Army Research Laboratory-Human Research and Engineering Directorate, Advanced Simulation Technology Division (ARL-HRED-ATSD) Orlando, FL

The U.S. Army Research Laboratory-Human Research and Engineering Directorate, Advanced Simulation Technology Division (ARL-HRED-ATSD) performs research and development in the field of augmented/mixed reality training technology. As part of this continuing research, 3D spatial audio concepts previously developed have been further matured culminating in a desktop demonstration system and a set of novel real-time approximations for sound propagation in a true 3D environment. While much attention has been given to the visual representations in augmented/mixed reality systems, true 3D spatial audio has generally been overlooked. The 3D spatial audio simulation has tremendous utility in immersive environments used for augmented/mixed reality training. This technical challenge has been thoroughly researched for many years and many approaches have been designed, developed and studied over the years but yet still a viable system is lacking which exploits the availability of high fidelity and low-cost gaming engines. The basis of these studies is that while immersed into an augmented/mixed reality training environment, a soldier must be able to sense the direction and distance of sound sources from virtual components as he moves through the augmented world. The developed concept is based on true 3D geometry computations and virtual mixers which preserve the sound source implementations. Representation of the 3D spatial audio field is demonstrated using a discrete transducer desktop system which fully supports all six primary sound field directions; up, down, left, right, front, and back. This paper describes the implementation of real-time approximations to sound propagation in realistic dismounted environments, a novel demonstration system to produce the 3D sound, and presents the remaining challenges to be overcome. Designs for the next phase of experimentation are also discussed along with the remaining challenges required to provide 3D spatial representation in real-time to immersed humans on the move in augmented/mixed reality training systems.

PREDICTING MANUFACTURING APTITUDE USING AUGMENTED REALITY WORK INSTRUCTIONS

2017 IITSEC Paper No. 17224

Anastacia MacAllister, Eliot Winer, & Jack Miller
Iowa State University
Ames, IA

The complexity of manufactured equipment for the U.S. military has increased substantially over the past decade. As more complex technology is integrated into battlefield equipment, it is more important than ever that workers manufacturing this equipment have the necessary skills. These specialized manufacturing skills require careful workforce selection and training. However, traditionally, workers are assigned roles based on instructor evaluation and qualitative self-assessments. Unfortunately, these assessments provide limited detail about a candidate's aptitude. By using more detailed data captured from assembly operations, a more complete profile of an operator's skills can be developed. This profile can then guide assignment of a worker to maximize productivity. This paper develops a Bayesian Network (BN) to predict worker performance using data captured from 75 participants via augmented reality guided assembly instructions. Information collected included step completion times, spatial abilities, and time spent on different assembly operations. For analysis, participant data was divided into training and testing sets. The data was mined for trends that could statistically predict measures of performance like errors or completion time. Based on these trends, the training set was used to construct the BN. The authors found that the model could predict some aspects of performance accurately, such as assembly completion time in the testing set. While these results were encouraging, further analysis demonstrated the network was biased by probabilities that were greatly influenced by the number of data points present in a category. The results highlight that, with small data sets, there is often not enough observed evidence to produce accurate predictions with BN. This suggests that a method of data simulation or generation is required to increase the number of training set samples. This would enable powerful BN tools to be used in real world manufacturing applications were collecting hundreds-of-thousands of data points is not feasible.

REAL-TIME COVERAGE AREA AND DANGER ZONES ESTIMATION

2017 IITSEC Paper No. 17185

Yekta KILIÇ
Turkish Naval Academy
Istanbul/TURKEY

Gürkan KOLDAŞ
Simsoft Computer Technologies/Bahçeşehir University
İstanbul/TURKEY

Coverage area analysis is a challenging research topic in military applications especially for naval operational area. Each unit estimates its own coverage area via visual contact and sensors such as radars and shares it with allied forces. The chief of naval operation manages the operation, gets precautions and plans his attack considering both where his units enlighten on and where the possible threads such as assault boats and warplanes attack from. 3D real-time simulation of the naval operational area just before or during the operation is very useful for decision makers. Unfortunately, modeling the virtual operational area and estimating coverage area require intense computations like line-of-sight tests and ray-shooting implementations.

Our aim is to find where enemy may attack from with assault boats or warplanes in highly obscured naval operational areas near coastline or between islands since the response time for a close or unexpected attack is so limited in such environments. In this paper, we propose an efficient decision support system tool that estimates the coverage area of allied units in naval operational area for real-time simulations. We firstly modeled the operational area by using its digital terrain model in Unity 3D. Then, we proposed a visibility culling method based on occlusion horizon for the estimation of coverage area considering 2½D properties of the environment rather than using ray shooting approach. As a result, we obtained 3D coverage area of each unit in the naval operational area and significantly reduced the cost of coverage area estimation to O(mLog(n)) complexity where m is the amount of land quadrants inside the range and n is the total amount of land quadrants.

Keywords—coverage area; visibility; naval operational area; real-time simulation

THURSDAY, 30 NOVEMBER, 2017 ROOM S320C

EC8 Virtually Forging Foreign Ties

1030	1100	1130
Modeling and Simulation as a Service from End User Perspective (17209)	Communications, Networking and Cyber Modelling and Simulation Support Defence (17120)	Web-Based GUI System for Controlling Entities in Constructive Simulations (17043)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

MODELLING AND SIMULATION AS A SERVICE FROM END USER PERSPECTIVE

2017 IITSEC Paper No. 17209

Lt.Col. Marco Biagini, Lt. Col. Jason Jones,
Lt.Col. Michele La Grotta,
Maj. Alfio Scaccianoce, & Capt. Fabio Corona
NATO Modelling & Simulation Centre of Excellence, Rome, Italy

Dr. Dalibor Prochazka
Czech Republic
University of Defence

Agatino Mursia, Marco Picollo, &
Christian Faillace
Leonardo Company.
Genova, Italy

Modelling and Simulation as a Service (MSaaS) is a new approach being explored by NATO Science and Technology Organization (STO) Modelling & Simulation Group (MSG) Panel for a permanently available, flexible, service-based framework to provide more cost effective availability of Modelling and Simulation (M&S) products, data and processes to a large number of users on-demand. This Research Task Group is working on the development of the implementation of this framework, defining policies, stakeholders' roles, services and reference architecture and reference engineering processes. MSaaS can be defined as "enterprise-based level architecture for discovery, orchestration, deployment, delivery and management of M&S services".
The University of Defence of the Czech Republic and the NATO M&S Centre of Excellence are investigating and proposing an approach to contribute to the definition of the MSaaS from an End User perspective. The paper proposes definition of M&S Software as a Service (MSSaaS), M&S Platform as a Service (MSPaaS) and M&S Infrastructure as a Service (MSIaaS) to introduce new roles and new business connections taking also into consideration Service Oriented Architecture (SOA) definitions and those definitions stated in NATO Modelling and Simulation Master Plan (NMSMP). In particular the authors propose a contribution to the definition of the different stakeholders' roles and their relationships, starting from those of the MSG 136 group (M&S Group 136, Modelling and Simulation as a Service) and introducing new roles regarding the End User.
In conclusion, this research and study activity proposes, in addition to the existing definitions, a taxonomy comparing roles across service models (MSSaaS, MSPaaS and MSIaaS). Furthermore, the M&S services' classification is analysed in the framework of the MSG 136 Operational Concept draft, in order to identify the services which are to be properly composed and orchestrated to satisfy the End User requirements.

COMMUNICATIONS, NETWORKING AND CYBER MODELLING AND SIMULATION SUPPORT DEFENCE

2017 IITSEC Paper No. 17120

Lt. Sonia Forconi, Lt.Col. Marco Biagini, & Cpt. Fabio Corona
NATO Modelling & Simulation Centre of Excellence
Rome, Italy

The exponential growth in the today's communication and network infrastructures (wired, wireless, radio and satellite network) introduces high technological content and evolution in the Defence network and the related cyber defence aspects. It is necessary to make forecasting and proactive end-to-end performance analysis to evaluate the acquisition process of the Defence network technological evolution and the protection of the information exchange in case of cyber operations. This paper discusses the Communication, Networking and Cyber Modelling and Simulation (CN&C M&S) concept to support military M&S aspect for the technology innovation, data protection, evolution, development and acquisition of new defence capabilities. The authors illustrates how CN&C M&S is utilized to support the definition of the operating technical requirements for the evolution and rationalization of a Defence telecommunication network. This approach allowed the definition of a possible support to the procurement model that would reduce the risks in the acquisition process by evaluating the proposed solution in a simulated environment before its implementation. From a cyber defence point of view, the paper illustrates a National Research Military Project namely "Cyber Security Simulation Environment (CSSE)" where the reuse of Defence network model support the modelling and simulation in the field of Cyber Defence to demonstrate the effects of a Cyber Operation on a command and control systems (C2). Finally, the aspects of Communication, Networking and Cyber Modelling and Simulation discussed in this paper may constitute a support tool for the evaluation of applications and the related use of this capability in the Defence fields.

WEB-BASED GUI SYSTEM FOR CONTROLLING ENTITIES IN CONSTRUCTIVE SIMULATIONS

2017 IITSEC Paper No. 17043

Per-Idar Evensen, Kristian Selvaag, Dan Helge Bentsen, & Håvard Stien
Norwegian Defence Research Establishment (FFI)
Kjeller, Norway

At the Norwegian Defence Research Establishment (FFI) we investigate how to increase combat effectiveness in land force operations. As part of this work we need to conduct detailed, entity-level simulations of battalion to brigade level operations, to assess the performance of different land force structures and operational concepts.
Traditional constructive simulation systems often do not have the required level of resolution, are too complex and cumbersome to use, or are not flexible enough with respect to representation of new technologies (e.g. new sensor systems, weapon systems, and protection systems). Previously, we have successfully employed Virtual Battlespace (VBS) for several smaller-sized (platoon to company) virtual simulation experiments for evaluating the operational benefit of new technologies and new concepts. Recent improvements allow simulation of more than a thousand constructive, semi-automated entities in VBS, but it currently lacks an appropriate user interface for controlling constructive entities.
We are developing an easy-to-use, web-based graphical user interface (GUI) system for controlling constructive entities simulated in VBS. So far we have developed functionality for controlling indirect fire entities and maneuver entities. In the future we plan to extend the system with functionality for controlling combat service and support entities simulated in VBS, and air and air defense entities possibly simulated in VR-Forces. Since we conduct simulations for experimentation and analysis purposes, and not command and staff training, the system has been designed to only require a minimum amount of input from the operators. It is a goal that military officers should be able to control the entities with minimal instruction. In addition, the simulations should be conducted with a minimum number of operators on each side.

In this paper we describe the overall design and implementation of the GUI system, as well as the experiences from the initial experiments with the system.

THURSDAY, 30 NOVEMBER, 2017 ROOM S320C

EC9 Waiting to Exhale with My Imaginary Friends

1330
Increased System Fidelity for Navy Aviation Hypoxia Training (17225)

1400
Crew Role-players Enabled by Automated Technology Enhancements (17219)

1430
Expanding the Use of Simulators in Robotic Surgery Training (17060)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

INCREASED SYSTEM FIDELITY FOR NAVY AVIATION HYPOXIA TRAINING

2017 IITSEC Paper No. 17225

Beth F. Wheeler Atkinson
Naval Air Warfare Center Training Systems Division
Orlando, FL

Jonathan Reeh, John Zbranek, Ashwin K. Balasubramanian
Lynntech Inc.
College Station, TX

Janet K. Marnane
Embry-Riddle Aeronautical University
Daytona Beach, FL

LCDR David M. McEttrick
Aviation Survival Training Center
Whidbey Island, WA

LCDR Daniel L. Immeker
Chief of Naval Air training (CNATRA), Corpus Christi, TX

CDR W. Tyler Scheeler
Naval Aerospace Medical Institute (NAMI), Pensacola, FL

In 2009, the Naval Aviation Survival Training Program (NASTP) Trainer Management Team (TMT) identified a need for a next-generation normobaric mask-on hypoxia trainer with enhanced capabilities due to the lack of positive air pressure provided by existing capabilities. The lack of a positive pressure-on-demand airflow delivery for current mask-on hypoxia training has been cited as a potential training gap wherein 44% of students experience air hunger (Artino, Folga, & Vacchiano, 2009). As a result, it is unclear whether students are able to recognize more subtle symptoms of hypoxia or if they are masked by air hunger. To address this, researchers have investigated an innovative technology solution to deliver representative pressure-on-demand flow rates, thereby increasing training fidelity by replicating the air delivery method of aircraft systems. This research also provided an opportunity to seek additional novel advances. Reducing the logisitical footprint and increasing portability by removing the need for compressed gases was a goal to ease implementation within higher fidelity training simulators with limited space to increase immersive training opportunities. This paper will provide an overview of the training need and the technical approach to the training device development. Additionally, the authors will discuss the engineering and human subjects testing conducted to evaluate the system. The results will include how symptoms experienced using this novel device compare to historical data from other training systems, in addition to whether the system reduces or eliminates air hunger issues.

CREW ROLE-PLAYERS ENABLED BY AUTOMATED TECHNOLOGY ENHANCEMENTS

2017 IITSEC Paper No. 17219

Beth F. Wheeler Atkinson
Naval Air Warfare Center Training Systems Division
Orlando, FL

John P. Killilea
Stracon Services Group
Orlando, FL

Brian Stensrud, Bob Marinier, Paul Schermerhorn, Chad Dettmering, & Sohaib Saadat
Soar Technology, Inc.
Orlando, FL

Emily C. Anania
Embry Riddle Aeronautical University
Daytona Beach, FL

U.S. Naval aviation, similar to units in its sister services, uses the family of simulators approach to training that enables trainees to build on skills progressively throughout the training pipeline. The progression begins with system skills (e.g., buttonology), continues to individual tasks (e.g., understanding radar data), and concludes with aircrew coordination for tactical proficiency (e.g., prosecuting an anti-submarine warfare mission). However, this approach requires workarounds (e.g., instructor role-players) or a tradeoff in fidelity when trainees reach a point in skills training that requires communication from other crewmembers while still conducting standalone training tasks. With recent technological advances in speech recognition (Stensrud, Newton, Atkinson & Killilea, 2015), the feasibility of incorporating synthetic role-playing crewmembers into a dynamic training event has increased. This paper highlights the need for this technology within the target transition community, the P-8A Poseidon, as part of its part-task training simulator. Successful integration will promote efficient use of resources (e.g., manpower), increased fidelity through the availability of realistic crew communication and coordination, and flexibility in crew composition availability. The prototype architecture is discussed, including the integration of speech capabilities (e.g., recognition, dialog, understanding, synthesis) and behavior modeling to yield an interactive model for P-8A crewmember agents. Next, the authors provide lessons learned and challenges to the technological implementation, as well as the sustainment, given the rapid pace of tactic and protocol changes that will impact the underlying technologies. Additionally, the authors provide results of a preliminary usability analysis of the system, including primary stakeholder fleet evaluations regarding system reliability and synthetic voice analysis. Finally, the authors highlight the importance of performance testing, offer suggestions for adapting the technology to other use cases, and discuss future directions for interactive system research and development.

EXPANDING THE USE OF SIMULATORS IN ROBOTIC SURGERY TRAINING
2017 IITSEC Paper No. 17060

Roger Smith, Danielle Julian, Alyssa Tanaka, & Ariel Dubin
Florida Hospital Nicholson Center
Celebration, FL

The Mako Rio surgical robot was created to provide robotic assistance and computer-assisted planning to orthopedic surgeons performing hip and knee replacement procedures. Training to use this device is conducted in traditional face-to-face, instructor-led courses with the real robotic system on synthetic and cadaveric tissue. This form of training is expensive to produce and does not support reinforcement or repeated learning for the surgeon. This paper describes the analysis and design process for a simulator device that can supplement the current training methodology and allow for surgeon-initiated refreshment and repetitive training. The design process identified two different avenues for advancement in this field. First, existing surgical simulators were analyzed for technologies and capabilities that could be applied to a simulator for the Mako Rio. This included the capabilities of the hardware in 3D vision, 3D manipulation, and system operations; as well as the functionality of the software in VR exercises, validated scoring and metrics, system administration, student record management, and data export and reporting. This analysis identified two existing simulators that are viable platforms from which to create a Mako simulator – the Mimic dV-Trainer and the OSSIM coupled with a 3D vision system. Second, the study identified a much broader set of training needs surrounding all of robotic surgery education. All current simulators focus on basic surgical skills or surgical procedural skills. However modern immersive VR systems with haptic controls can provide a platform for simulation-based training that includes robotic mechanical control, surgical procedure planning, patient imagery analysis and selection, OR equipment and human patient placement, instrument table layout, and recovery from complications. None of these scenarios are available in any simulator device, though modern simulator systems have the capability to represent all of them. The results of this study indicate that medical and surgical simulator manufacturers and educators need to broaden the scope of the services offered to surgical educators.

TUESDAY, 28 NOVEMBER, 2017 ROOM S320A

H1 Hear, See and Sense No Evil

1400	1430	1500
Auditory Performance of Individuals with Reduced Hearing Capability in Virtual Reality Environment (17039)	Eye Tracking Feedback to Enhance Visual Search Training (17275)	Multimodal Assessment of Pilots' Affective States using Psycho Physiological Sensor Signals and Facial Recognition Analysis (17008)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

AUDITORY PERFORMANCE OF INDIVIDUALS WITH REDUCED HEARING CAPABILITY IN VIRTUAL REALITY ENVIRONMENT

2017 IITSEC Paper No. 17039

Hung Tran
CAE USA Inc.
Tampa, FL

The effort to apply Virtual Reality (VR) technology to advance the fields of medicine, education, engineering, and entertainment is currently underway. The military uses VR to carry out training such as aircraft maintenance or virtual war scenarios. Despite important progress made in display technologies, a complete immersion in VR space is not possible without an auditory representation of the simulated environment. Sound is important in an immersive virtual environment because it enhances the sense of presence (Freeman, Lessiter, 2001) and improves situational awareness by providing feedback for situations that are not in the listener's field of view (Kukka et al., 2016). Additionally, the degree of presence experienced by an individual affects the performance of the training tasks (Stevens, Kincaid, 2015).
In order to synthesize a functional auditory environment, it is important to obtain a better understanding of how ears receive and process sound. To assess human training performance, it is essential to understand how the perception of the simulated sound environment is impaired for individuals with reduced hearing capability, which can be caused either by natural factors (e.g., age-related hearing loss [presbycusis]) or by external agents (e.g., noise-induced hearing loss). This paper provides a literature review for identifying limitations in auditory perception for individuals with sensorineural hearing loss (SHL). We reviewed hearing impairments due to SHL, which will likely affect auditory performance in a virtual environment. Using an ecological approach to explain the relationship between hearing impairments and auditory demands, we analyzed how this relationship affects human training performance. Finally, we provide guidelines to effectively design and implement VR environments, while taking into account human auditory performance, including individuals with reduced hearing capability.

EYE TRACKING FEEDBACK TO ENHANCE VISUAL SEARCH TRAINING

2017 IITSEC Paper No. 17275

Jesse D. Flint & Kelly S. Hale
Design Interactive, Inc.
Orlando, FL

Darren P. Wilson
U.S. Department of Homeland Security
Washington, DC

Law enforcement officers (LEOs) need to develop the visual search skills necessary to compare facial features of individuals to identification document (ID) photos and determine whether or not the individual is an imposter. This task presents a challenge, as individuals may differ in age and appearance compared to the provided ID photo. Training LEOs to effectively gain these visual search skills is typically accomplished through instructor-led presentations in a classroom setting, with instructors describing the techniques and highlighting the critical visual cues (e.g., facial features) needed to perform the task. However, trainees do not currently have a means to visualize performance during the task, and obtain objective feedback of how well they visually interrogated critical cues or if they followed the recommended process or procedure in the sequence or execution of the task. Eye tracking technology provides the capability to visualize search patterns and associate those to critical visual cues, thereby providing individualized feedback on objectively measured performance that allows trainees to see their strengths and areas for improvement. The current investigation was a feasibility study to determine if presenting eye tracking feedback to trainees learning the imposter detection task enhanced learning. A total of 95 new-hire LEO trainees viewed image pairs to detect imposters. After each trial, trainees were able to view eye tracking overlays of scan patterns to visualize critical cues that were and were not attended. Trainees participated in three sessions of seven minutes each, with the first session used to acclimate to the task and training system and accommodate any learning curve. Limitations of the study included a lack of a control group and time available to train. Despite these limitations, instructors and trainees reported significant value of training with objective feedback, and demonstrated improved performance from second to third training sessions through an increase in sensitivity (A′) and impostor detection (hit rate), and a decrease in average response time. Future research will empirically examine skill transfer to a live scenario-based training task.

MULTIMODAL ASSESSMENT OF PILOTS' AFFECTIVE STATES USING PSYCHOPHYSIOLOGICAL SENSOR SIGNALS AND FACIAL RECOGNITION ANALYSIS

2017 IITSEC Paper No. 17008

Agata Lawrynczyk
CAE Canada; Carleton University
Ottawa, Ontario

Maher Chaouachi
CAE Canada, McGill University
Montreal, Quebec

Susanne P. Lajoie
McGill University
Montreal, Quebec

Human error in aviation can lead to catastrophic results. Since 1959, the majority of fatal airplane accidents worldwide occurred during the takeoff and landing phases of flight and upwards of 60% are attributed to pilot error. Psychologists Robert Yerkes and John Dodson proposed an empirical relationship (Yerkes-Dodson law) that performance increases with physiological or mental arousal, but only up to a point, after which it decreases. Understanding a pilot's arousal during flight and its relationship with performance can ultimately contribute to the design of improved flight safety and flight training systems.

The objective of this research is to provide guidelines for the multimodal assessment of pilots' arousal level and affective states using noninvasive biosensors to answer the following three questions: i) Which data processing approach must be adopted to track pilots' arousal; ii) What affective/cognitive model can be used to interpret these measurements; and iii) How can these measurements be used as training assessment criteria?

This paper reports on an experimental study we conducted in a full-flight simulator to explore the answers to the above questions. Pilots' heart rate and galvanic skin response (GSR) were non-invasively and continuously recorded using a wristwatch biosensors during a 45 min flight of varying levels of complexity. Their facial expressions were recorded using a cockpit webcam to enable facial recognition analysis. Results revealed that physiological patterns may be related to the complexity level of the flight phase and to the pilots' performance and experience. Specifically, the mean amplitude sum of the GSR phasic component revealed the pilot arousal level while the valence of the pilot's affective state was captured through facial emotion recognition. These results can be mapped to the Circumplex Model of Affect as a framework to assess both individual and group performance.

TUESDAY, 28 NOVEMBER, 2017 ROOM S320A

H2 Build, Test and Perform

1600	1630	1700
Comparing Visual Assembly Aids for Augmented Reality Work Instructions (17208)	A Multi-method Approach to Evaluating Human-system Interactions during Operational Testing (17267)	Reprocessability and Engagement: Comparing Text to Human Forms for Information Conveyance (17187)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

COMPARING VISUAL ASSEMBLY AIDS FOR AUGMENTED REALITY WORK INSTRUCTIONS

2017 IITSEC Paper No. 17208

Anastacia MacAllister, Melynda Hoover, Stephen Gibert, James Oliver, Rafael Radkowski, Timothy Garrett, Joseph Holub, & Eliot Winer
Iowa State University , Ames, Iowa

Scott Terry & Paul Davies
The Boeing Company
St. Louis, Missouri

Increased product complexity and the focus on zero defects, especially when manufacturing complex engineered products, means new tools are required for helping workers conduct challenging assembly tasks. Augmented reality (AR) has shown considerable promise in delivering work instructions over traditional methods. Many proof-ofconcept systems have demonstrated the feasibility of AR but little work has been devoted to understanding how users perceive different AR work instruction interface elements. This paper presents a between-subjects study looking at how interface elements for object depth placement in a scene impact a user's ability to quickly and accurately assemble a mock aircraft wing in a standard work cell. For object depth placement, modes with varying degrees of 3D modeled occlusion were tested, including a control group with no occlusion, virtual occlusion, and occlusion by contours. Results for total assembly time and total errors indicated no statistically significant difference between interfaces, leading the authors to conclude a floor has been reached for optimizing the current assembly when using AR for work instruction delivery. However, looking at a handful of highly error prone steps showed the impact different types of occlusion have on helping users correctly complete an assembly task. The results of the study provide insight into how to construct an interface for delivering AR work instructions using occlusion. Based on these results, the authors recommend customizing the occlusion method based on the features of the required assembly task. The authors also identified a floor effect for the steps of the assembly process, which involved picking the necessary parts from tables and bins. The authors recommend using vibrant outlines and large textural cues (e.g., numbers on parts bins) as interface elements to guide users during these types of "picking" steps.

A MULTI-METHOD APPROACH TO EVALUATING HUMAN-SYSTEM INTERACTIONS DURING OPERATIONAL TESTING

2017 IITSEC Paper No. 17267

Heather Wojton, Chad Bieber, & Jonathan Snavely
Institute For Defense Analyses
Alexandria, VA

The quality of human-system interactions is a key determinant of mission success for military systems. However, operational testers rarely approach the evaluation of human-system interactions with the same rigor that they approach the evaluation of physical system requirements, such as miss distance or interoperability. Often, testers evaluate human-system interactions using solely survey instruments (e.g., NASA-Task Load Index (NASA-TLX)), excluding other methods entirely. In this paper, we argue that a multi-method evaluation approach that leverages methodological triangulation to address a research question provides greater insights into the quality of humansystem interactions during operational testing and its potential impact on operations. Specifically, we present data from an operational test in which a multi-method approach was used. Ten attack helicopter pilots identified and responded to threats under four conditions: high vs. low threat density and presence vs. absence of a threat detection technology. Testers recorded two primary measures of pilot workload: time to detect first threat and the NASATLX. Pilots took significantly longer to detect threats under low threat density than high threat density when the threat detection technology was absent. However, there was no difference in time to detect threats when the threat detection technology was present. The NASA-TLX data showed a similar pattern of results, suggesting that the observed effect is a result of pilot workload rather than the method used to measure workload – i.e., survey instrument vs. behavioral metric. Triangulating methods in this way provides a more rigorous and defensible test of the research question, and when combined with qualitative methods, provides useful information for identifying whether degradations in performance should be addressed through additional training or interface redesign.

REPROCESSABILITY AND ENGAGEMENT: COMPARING TEXT TO HUMAN FORMS FOR INFORMATION CONVEYANCE

2017 IITSEC Paper No. 17187

Douglas C. Derrick, Joseph A. Allen, & Kerry W. Ward
University of Nebraska – Omaha, Omaha, Nebraska

With the increasing pace of change, employee training is an important element in maintaining an organization's competitiveness. One avenue to efficiently address this need is to use information and communication technologies (ICT) to support technology mediated learning (TML). The use of TML is cost effective relative to other approaches such as formal training by human instructors (Gupta & Bostrom, 2009). Developers of TMLs tend to design increasingly complex user interfaces before research can support the efficacy of these designs which motivates this study. This study provides a foundational step toward understanding the design of ICTs for conveyance of information.

This research draws upon Media Synchronicity Theory (MST) to examine the mode of information presentation in a task-performance context and evaluates how the mode of information presentation impacts user engagement, task performance, and satisfaction. We conducted an experiment with 147 participants, testing the relationship between four increasingly human modes of presentation (text, audio, embodied agent, and video). Our findings indicate that text increases engagement and that engagement mediates the relationship to task performance and task satisfaction. Specifically, this research found that in the context of information conveyance for task completion, text increased engagement resulting in increased task performance and satisfaction over other increasingly human modes of presentation. The findings indicate limitations on the use of embodied computer agents (Avatars) for conveying information for task completion due to the need for reprocessabilty of the information being conveyed.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320A

H3 Learning Operability: All Together Now

0830	0900	0930
Interoperable Assessments using HPML: A Novice Conning Skills Acquisition Use Case (17072)	Total Learning Architecture Development: A Design-based Research Approach (17117)	Using Competencies to Map Performance Across Multiple Activities (17139)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

INTEROPERABLE ASSESSMENTS USING HPML: A NOVICE CONNING SKILLS ACQUISITION USE CASE.

2017 IITSEC Paper No. 17072

Bruno Emond
National Research Council Canada
Ottawa, Ontario

Demands in training require organizations to maximize access to adaptive training through high and low-fidelity simulations. However, an increase of learning opportunities through simulations must also be associated with a high level of efficiency and efficacy of the training system as a whole (Atkinson & Killilea, 2015). To avoid the risk of creating a collection of practice simulators instead of objective-based training environments (Stacy, Merket, Freeman, Wiese, & Jackson, 2005), training simulators must provide a precise yet comprehensible means to express and manipulate measurements, and assessments across a range of learning opportunities (Stacy, Ayers, Freeman, & Haimson, 2006). The motivation for the work reported in this paper originated from the need to redeploy measure and assessment software from a training simulation application to another. Given our interest to repurpose investments in learning design, the main research questions the current paper seeks to address consist of determining: 1) what approach would best fit interoperable measure and assessment computations, and, 2) to what extent the selected approach is adequate to represent specific measures and assessments we had implemented in our training simulation. The first section briefly presents major interoperable assessment initiatives. The section concludes that the Human Performance Markup Language (HPML) seems to best fit our interoperable measure and assessment needs, which is to repurpose and allow interoperability of measure and assessment computations. The Human Performance Markup Language (HPML) aims at fulfilling this purpose by providing a simple and reusable way to represent the performance of individuals and teams in those systems (Walker, Tolland, & Stacy, 2015). HPML supports the representation of measurements and assessments, and how they relate to performance and learning data, as well as training objectives. In the latter case, the HPML training objective package for instance, provides a scalable formal mechanism to document and manage training objectives, their relationships to scenario conditions, and performance measures (Stacy & Freeman, 2016). The second section gives an overview of HPML, followed by a presentation of a target use case, a training simulation for novice ship conning skill acquisition. The third section discusses how some HPML assessment templates can be applied to the use case. The application of HPML to the use case indicated that most of the assessment computations that were used in the training simulation for novice ship conning skill acquisition could be represented. A possible extension to HPML for expressing otherwise cases in category selection was identified, which would simplify assessment templates. However, the sparse HPML documentation, and low number of examples available made it difficult at times to determine if the analysis of our use case respected the intention of the HPML standard proposal. …..

TOTAL LEARNING ARCHITECTURE DEVELOPMENT: A DESIGN-BASED RESEARCH APPROACH

2017 IITSEC Paper No. 17117

P. Shane Gallagher, Ph.D.
Institute for Defense Analyses
Alexandria, VA

J.T. Folsom-Kovarik, Ph.D.
Soar Technologies, Inc.
Orlando, FL

Sae Schatz, Ph.D.
ADL Initiative
Alexandria, VA

Avron Barr & Sarah Turkaly
Institute for Defense Analyses
Alexandria, VA

Organizations that use learning technology to educate and train are facing a new set of interoperability problems. Many new products—including adaptive systems, intelligent digital tutors, real-time data analytics, and interactive e-books—offer dramatic learning benefits. However, these products primarily "stand alone" and work outside of typical browser-based delivery environments controlled by traditional learning management systems. Yet, these intelligent systems' effectiveness often depends on their access to data generated and stored in other systems.

The U.S. DoD Advanced Distributed Learning (ADL) Initiative is designing a framework of specifications, called the Total Learning Architecture (TLA), to ultimately enable "plug-and-play" interoperability of learning technologies. That is, the TLA will allow these new products to interoperate with each other, with other existing learning systems, and even human capital management technologies to not only track learner activity while managing learner roles and identities but to share intelligent or inferential data and adapt their behavior accordingly. Because of the rapid rate of innovation in such distributed technologies, we adopted a multiyear design-based research approach. During the project's first year, an initial set of specifications have been developed and evaluated for technical and functional adequacy using a multi-round Delphi approach with a panel of international participants (n = 54). Also, in partnership with the U.S. Army JFK Special Warfare Center and School's Special Warfare Education Group, we conducted a live prototype test and demonstration with Special Operations Soldiers (n = 73). This yielded data on the nascent system's functionality, performance, user experience, and learning potential. Analysis of these data will lead to recommendations, which in turn will inform the second cycle of TLA development process. This paper summarizes the TLA concept, development process, first-year analysis efforts and outcomes, and lessons learned leading to design improvements for the second year of TLA development.

USING COMPETENCIES TO MAP PERFORMANCE ACROSS MULTIPLE ACTIVITIES
2017 IITSEC Paper No. 17139

Robby Robson
Eduworks Corporation
Corvallis, OR

Jonathan Poltrack
Advanced Distributed Learning (ADL) Initiative
Johnstown, PA

When a single training system accumulates data on learner performance, the data are stored in a way determined by the system's designers. This enables the system to access these data and to apply them to its interactions with learners. In environments such as live-virtual-constructive federations, each component may store performance data in its own way, making it difficult for one component to access and use data produced by another. To enable cross-component sharing of performance data, it is necessary to establish shared definitions of skills and outcomes; create a common language for expressing performance data; interpret data produced at differing levels of granularity; and (in some cases) satisfy a large array of security and privacy requirements.

This paper is based on work done by the US Advanced Distributed Learning (ADL) Initiative, the Credential Engine foundation, and several standards bodies. It starts by discussing the above challenges and their manifestations in use cases ranging from federations of different learning environments to more traditional online learning environments. The paper then describes a potential solution for collecting and processing assertions of competency, skills, and performance from multiple sources. Each assertion is of the form "Learner X has (or has not) achieved competency Y at level Z with confidence p based on evidence E." "Competencies" are drawn from shared, machine-readable frameworks that can represent knowledge, skills, ability, and objectives. Assertions can be collected directly or generated by ingesting granular performance data and correlating it to competencies, enabling algorithms that use explicit rules and relationships to draw further inferences.

This paper ends with a description of a system that implements the suggested solution and its application in the context of live trials with 73 subjects run as part of a design-based research effort.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320A

H4 Is It Live or Is It Memorex?

1600
Live-Virtual Laboratory Assessment of Behaviors in Occupational Roles (LABOR) (17006)

1630
Performance Measurement Considerations for Live, Virtual, and Constructive (LVC) Training (17091)

1700
Modeling Operator Performance through Task-oriented Machine Learning (17038)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

LIVE-VIRTUAL LABORATORY ASSESSMENT OF BEHAVIORS IN OCCUPATIONAL ROLES (LABOR)

2017 IITSEC Paper No. 17006

Kevin F. Hulme, Ph.D., CMSP, Rachel Su Ann Lim & Liam Homeyer
Motion Simulation Laboratory (MSL) University at Buffalo, Buffalo, NY

Gregory A. Fabiano, Ph.D. & Sandro M. Sodano, Ph.D.
Department of Counseling, School, and Educational Psychology University at Buffalo, Buffalo, NY

Karen L. Hulme, Gina Stephan, Abigail Caserta, Rachel Reitano, & Allan LaFlore
Center for Children and Families (CCF) Buffalo, NY

Attention-deficit/hyperactivity disorder (ADHD) is a commonly diagnosed neuro-developmental disorder that is chronic, persists into adulthood, and causes impairment in social, educational, and occupational functioning. While the educational and social impairments of ADHD are well understood, far less is known about the occupational impairments that affect young adults with ADHD, who are known to earn less and change jobs more frequently than their typical peers. Thus, it is vital to understand the type and intensity of functional problems within workplace settings with a goal of reducing occupational impairment.

To analyze this critical human performance deficiency, we have developed an analog single-Laboratory restaurant setting: a hybrid Live-Virtual "pizza place" training environment. A total of forty-nine young adults (24 ADHD, 25 Typical) were recruited to participate in a simulated workday doing typical job tasks: receive food requests, provide customer service (using confederates), prepare food orders, plan the most efficient driving route to make food deliveries, "deliver" the orders, and make appropriate change, and settle up finances once "returned" to the restaurant. Stated tasks require working memory, sequencing, sustained attention, direction-following, cognitive flexibility, and problem-solving. To identify specific areas of impairment for food order deliveries, we have computationally modeled a residential neighborhood to be endeavored upon a high-fidelity driving simulator. During the delivery cycle, the efficiency of the route, an evaluation of correct delivery and money management, and quantifiable simulator metrics (e.g., speeding, failure to stop at signs and signals) are observed as dependent variables. We likewise solicit feedback on the fidelity/usability of the analog setting (i.e., user experience), including suggested improvements for future work. In this paper, our discussion will emphasize critical Modeling & Simulation (M&S) engineering details of the simulator environment design and implementation. Likewise, our multi-measure data analysis methods will focus on measuring human performance and effectiveness within the Live-Virtual environment, and comparing preliminary observations from both cohorts.

PERFORMANCE MEASUREMENT CONSIDERATIONS FOR LIVE, VIRTUAL, AND CONSTRUCTIVE (LVC) TRAINING

2017 IITSEC Paper No. 17091

Jeffrey M. Beaubien, Ph.D.[1], Michael Knapp, M.S.[2], Alexander Wade, M.S.[2]
Eric Watz, M.S.[3], E. Webb Stacy, Ph.D.[1], & Sterling L. Wiggins, M.A.[3]
Aptima, Inc.
Woburn, MA[1], Orlando, FL[2], Fairborn, OH[3]

Performance measurement is a critical component of training because it can help to diagnose the causes of effective vs. ineffective performance and suggest appropriate remediation strategies. It is particularly important during combined Live, Virtual, and Constructive (LVC) training because such exercises can be extremely resource intensive, thereby limiting the number of training opportunities. Additionally, large computer networks often produce an "online disinhibition effect," which increases the chances that learners may misbehave during training.

This paper presents four categories of unclassified performance metrics, along with specific examples of each, that were tested during the Operation Blended Warrior (OBW) 2015 and 2016 demonstration events. All of the measures were collected automatically and unobtrusively from the Distributed Interactive Simulation (DIS) network. The first category concerns measures of learner proficiency, such as force preservation and efficiency of fires. The second category concerns training rule (TR) violations, such as maintaining appropriate physical separation between assets and avoiding supersonic travel over populated areas. The third category concerns rules of engagement (ROE) violations, such as prohibitions against unprovoked attacks. The final category concerns network violations, such as not overloading the network with irrelevant traffic. The software code for these measures is freely available to the LVC community, upon request.

While these four categories of performance metrics provide very different information to different constituencies, collectively they help to make sense of what happened during the training event. As a result, we believe that they will be useful to the LVC community-at-large. Although many of these measures were tailored to the OBW air battle, we believe that they are generalizable to other LVC events and mission types. The paper concludes with lessons learned to help LVC event planners obtain the best value from their performance measurement-related efforts.

MODELING OPERATOR PERFORMANCE THROUGH TASK-ORIENTED MACHINE LEARNING

2017 IITSEC Paper No. 17038

Bryan Vandrovec	Robert Lutz	Timothy Bagnall	Tracy Sanders
RED-INC	The Johns Hopkins University	Mosaic ATM	The MITRE Corporation
Human Systems Division	Applied Physics Laboratory	Leesburg, VA	McLean, VA
California, MD	Laurel, MD		

Autonomous systems are quickly evolving to provide a versatile and essential capability in both military operations and commercial applications. From a human-systems perspective, these recent technological developments are changing the role of human operators into that of supervisory controllers of complex automated and autonomous systems who must maintain situation awareness (SA), and be ready to rapidly intercede in complex or critical situations that require human judgment and general intelligence. Unfortunately, this rapidly advancing technology has exceeded the ability of traditional methods, often relying on expertise and intuition, to predict how operators will perform and interact.

In support of U.S. Navy unmanned aircraft system (UAS) airspace integration initiatives, a high-fidelity simulated representation of air vehicle operator (AVO) behavior and performance is in development. The Operator Model (OM) employs machine learning (ML) and other artificial intelligence techniques for characterizing observed responses of AVOs to air traffic encounters, along with a means to reproduce and generalize those responses for use in faster-thanreal-time constructive computer simulations. In doing so, this model addresses several needs, such as providing an economical means of generating the volume and variety of human-performance data required for platform certification, and informing future design and training decisions.

The OM represents a significant new capability for unmanned aviation-systems development. It combines task analysis and experimental psychology with advances in machine learning to support simulation-based acquisition in a complementary and cost-effective manner, enabling certification of defense systems with higher levels of autonomy and more complex patterns of human-computer interaction (HCI). This paper will provide an overview of the OM hardware and software architecture, and highlight the Live-Virtual-Constructive (LVC) trials that have been performed at the Naval Air Warfare Center, Aircraft Division (NAWCAD) to validate UAS sense-and-avoid (SAA) capabilities. Phase 1 results indicate a strong agreement between LVC and OM measures of effectiveness (MOEs).

THURSDAY, 30 NOVEMBER, 2017 ROOM S320A

H5 Team Up and Decide

1030	1100	1130
Training and Performance of Multi-team Systems in Naval Warfare Environments (17234)	Cockpit Team Coordination Skills: The Role of Monitoring and Backup (17012)	Assessing Military Perceptual Expertise with Drift Diffusion Modeling (17202)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

TRAINING AND PERFORMANCE OF MULTITEAM SYSTEMS IN NAVAL WARFARE ENVIRONMENTS

2017 IITSEC Paper No. 17234

Leah Ellison, Jessica Wildman, Patrick Converse, Erin Richard, Trevor Fry, & Shelby-Jo Ponto
Florida Institute of Technology
Melbourne, FL

Jennifer Pagan, Alyssa Mercado, & Melissa Walwanis
Naval Air Warfare Center Training Systems Division
Orlando, FL

Andrea Postlewate
StraCon Group Services, LLC.
Fort Worth, TX

Amy Bolton
Office of Naval Research
Arlington, VA

Multiteam systems (MTSs) often provide benefits over traditional teams when completing work or tasks in the context of complex and dynamic environments. However, challenges still exist in understanding and capturing the processes driving successful MTS performance. In the current effort, a cognitive task analysis (CTA) methodology was utilized to explore the driving antecedents of successful MTS coordination and integration within a carrier strike group (CSG) operating in a Naval warfare environment. The CTA identified critical incidents and emergent themes through structured interviews of 59 subject matter experts across Naval surface and air units operating in warfare environments. Researchers utilized a top down approach, leveraging existing frameworks (Ishak & Ballard, 2012; Marks, Mathieu, Zaccaro, 2001; Mathieu, Maynard, Rapp, & Gilson, 2008; Pagan, Kaste, Zemen, Walwanis, Wood, & Jorett, 2015; Wildman et al., 2012) of team knowledge, skills, and attitudes (KSAs) to be applied to the multiteam domain of the CSG. The framework was used to code CTA data to determine the KSAs necessary for successful MTS performance and modified to reflect domain specificity as required. The KSA framework was then used as guidance to provide recommendations for MTS training and performance measurement. These recommendations are currently being used to develop specific, multilevel performance measures of the KSAs needed to effectively operate in changing, complex environments. The development of these performance measures also coincides with efforts to develop training to provide feedback on coordination, information exchange, and other elements of MTS performance. Finally, efforts are also being conducted towards the development of experimental, quasi-experimental, and agent-based modeling in order to evaluate the recommendations and performance measurement criteria. Execution of these recommendations, performance measures, and training are expected to improve decision-making and information exchange of the CSG as a whole within these complex

COCKPIT TEAM COORDINATION SKILLS: THE ROLE OF MONITORING AND BACKUP

2017 IITSEC Paper No. 17012

Alan R. Martinez & Mary F. Hibberts
U. S. Coast Guard Aviation Training Center
Mobile, Alabama

Dale L. Lunsford
The University of Southern Mississippi
Long Beach, Mississippi

Successful flight crew team performance in today's advanced technology cockpits is essential for mission accomplishment and contingent on crewmembers monitoring each other and providing the appropriate backup (Kontogiannis & Malakis, 2009; Tullo, 2010). Flight crew monitoring can serve as the last line of defense against aviation accidents and monitoring failures are evident in many recent accidents (Dismukes & Berman, 2010; FAA, 2017). In our study, thirty U.S. Coast Guard cockpit flight crews flew automated and non-automated instrument takeoffs as both pilot flying and pilot monitoring in the Coast Guard's MH-65 Operational Flight Trainer. We explored the effects of shared situational awareness, aviation experience, and level of cockpit automation on monitoring and backup performance. Instructor pilots observed the interaction of the cockpit flight crews to evaluate the level of monitoring and backup during the nighttime overwater instrument takeoffs. Based on the study's findings, the U.S. Coast Guard is redefining monitoring and backup in aircraft cockpits, defining critical behaviors for effective cockpit automation management, and changing how Coast Guard pilots are trained and evaluated to successfully perform in advanced technology multi-piloted cockpits.

ASSESSING MILITARY PERCEPTUAL EXPERTISE WITH DRIFT DIFFUSION MODELING
2017 IITSEC Paper No. 17202

Webb Stacy, Jeff Beaubien & Sterling Wiggins
Aptima, Inc.
Woburn, MA and Fairborn, OH

One way to assess military perceptual expertise is to present brief stimuli to military experts and novices and to ask them to make a 2-choice expertise-related judgment as quickly and accurately as they can. The differences in the distributions of their reaction times and errors can then reveal differences in their perceptual expertise. The difficulty is that reaction times and errors are often not independent. In some cases, participants make a speed-for-accuracy tradeoff. In other cases, correct responses occur quickly but error responses require a lot of perceptual processing. Either way, an analysis of reaction times or errors by themselves can produce misleading results. An increasingly popular solution is to use reaction time and error distributions together to perform a Drift Diffusion Model (DDM) analysis. This approach yields a profile of several cognitively meaningful components, including an estimate of the speed of processing, the level of the response threshold (indicating how much information the participants needed in order to make a perceptual decision), and the amount non-decision time, which often translates to the amount of time it takes to encode the stimulus. By comparison, traditional methods for assessing reaction time and accuracy (separately) do not differentiate the component cognitive processes of encoding, decision-making, and response execution, respectively. These components can yield surprising results. For example, DDM has shown that the main culprits in aging are increases in response threshold and in non-decision time but not speed of processing. Moreover, speed of processing, but not response threshold or non-decision time, is related to working memory capacity and reasoning ability in adults of all ages. In this paper we will discuss strategy and techniques of DDM analysis. We will then illustrate them by discussing an experiment we performed with military experts and novices using this methodology, with the aim of encouraging other researchers to adapt the approach for their own research issues.
Disclaimer: The views expressed herein are those of the authors and do not necessarily reflect the official position of the Department of Defense or its components or the organizations with which the authors are affiliated.

TUESDAY, 28 NOVEMBER, 2017 ROOM S320F

P1 Data and Delivery: Addressing the Challenges

1400	1430	1500
Achieving Actionable Information in a Complex Operational Environment (17153)	Considering Training (Effectiveness) as a Service as an Acquisition Strategy (17156)	A Cloud Computing Business Case Analysis for Existing Training Systems (17053)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

ACHIEVING ACTIONABLE INFORMATION IN A COMPLEX OPERATIONAL ENVIRONMENT

2017 IITSEC Paper No. 17153

Tony Cerri	Cynthia Harrison	John Andrew Landmesser	Ralph O'Connell	Emilie Reitz
TRADOC G27 Fort	PEO STRI	PEO C3T	Joint Staff J6	Leidos
Eustis, VA	Orlando, Fl	Aberdeen PG, MD	Norfolk, VA	Norfolk, VA

During operations in Iraq, Afghanistan, and elsewhere over the last decade, one significant lesson has been learned: a failure to recognize, acknowledge, and accurately define the operational environment (OE) led to a mismatch between forces, capabilities, missions, and goals. Fortunately, warfighters and senior leaders were able to overcome the information technology (IT) capability shortfalls through materiel and non-materiel solutions -- building relationships with the local population and key leader engagements, creating fusion cells to assimilate operations and intelligence information, and expanding the use of liaison officers. The Afghan Mission Network (AMN) (Serena, Porche, Predd, Osburg, & Lossing, 2014) is one solution which has had long-lasting impacts on how we, as a joint and multinational force, come together to share data. It has led to the NATO Federated Mission Networking (FMN) concepts, and the US contribution to FMN, the Mission Partner Environment (MPE).

Sharing OE information with mission partners in an FMN/MPE promotes unity of effort and effectiveness across interagency, coalition, host-nation partners, think tanks, academia, commercial entities, and non-governmental organizations. Fielding IT data services in an enterprise environment that automates mining and extracting missionrelevant data from vast amounts of restricted and open source repositories is prerequisite to fully understanding a complex OE. This political, military, economic, social, information, and infrastructure (PMESII) data about a specific geospatial location at a point in time must be integrated and transformed into actionable information that considers second-order effects.

This paper will describe the Joint Staff and Army's collaborative approach to leverage and horizontally integrate Combatant Command, military Service, DOD Agency, and multinational capabilities as enterprise solutions that advance a comprehensive understanding of a complex OE; supporting decision making with actionable information, and promote information superiority over trans-regional, multi-domain, and multi-functional adversaries.

CONSIDERING TRAINING AS A SERVICE WITHIN THE ACQUISITION STRATEGY

2017 IITSEC Paper No. 17156

Joan H. Johnston, Gino Fragomeni, Tamara Griffith
U.S. Army Research Laboratory
Human Research and Engineering Directorate
Orlando FL

Jeremy Lanman
Program Executive Office for
Simulation, Training and Instrumentation
Orlando FL

Recently, the US Army Human Dimension Concept (2014) and US Army Warfighting Challenges (2017) have called for a more flexible, adaptive, and effective training strategy and technologies that accelerate acquiring collective team skills to keep pace with rapidly changing, and complex warfare requirements. Currently, reviews of the Army's nonsystem training devices indicate large footprint training simulators target just a small portion of collective skills, have high sustainment costs and low usage rates, and training effectiveness is difficult to track (United States General Accounting Office, 2016). To address these issues the Army has proposed the single Synthetic Training Environment with the vision of providing greater training flexibility at reduced cost through low footprint, mobile, reconfigurable, immersive simulators that provide the right level of cognitive fidelity tailored to learning requirements specified by end-users at the Point of Need (PoN). The purpose of this paper is to discuss the requirements for an effective PoN capability. We describe how the Training as a Service (TaaS) paradigm could support the PoN and argue for an innovative concept of TaaS within the acquisition strategy. For example, providing evidence of training effectiveness could be built into the requirements for delivering a service, and could be employed as procurement selection criteria. To illustrate, we describe a use case example and a concept for a Collective Training Management Architecture (CTMA) that we propose will be necessary to implement TaaS to achieve a PoN solution.

A CLOUD COMPUTING BUSINESS CASE ANALYSIS FOR EXISTING TRAINING SYSTEMS
2017 IITSEC Paper No. 17053

Paul Dumanoir
PEO STRI
Orlando, FL

Jeffery Bergenthal, Mark Hodgins, John Tamer, & Rodney Yerger
The Johns Hopkins University Applied Physics Laboratory
Laurel, MD

The US Army has published several documents and directives that establish the overarching strategies, guidance, and an implementation plan for the rationalization and modernization of the Army's information technology (IT) systems and applications. The guidance and implementation plan mandate a Business Case Analysis (BCA) be performed when assessing the migration of IT systems and applications to approved hosting environments, and closing or consolidating data centers. These overarching strategies, guidance, and implementation directive impact how the Army's Integrated Training Environment (ITE) will be hosted in the future. The individual training devices and simulations that comprise the ITE have existed for some time, and some of the architectures may not support effective homestation training if they are hosted in a distant enterprise data center. This paper reports on the analysis performed to assess the main systems that comprise the ITE System of Systems (SoS), and conduct a BCA in accordance with the Army guidance. The technical assessment framework that was developed for the characterization and technical assessment of training and simulation systems is described. The paper then discusses how the framework was utilized to characterize and assess each of the systems, including critical system-of-systems aspects, and generate the technical rationale for feasible cloud migration alternatives. The approach and methodology for the BCA are described, and the calculated cost and economic viability are presented for each of the feasible migration alternatives. Sensitivity analysis results are shown illustrating the extent to which alternative rankings change as a result of varying certain factors and/or assumptions. Finally, the paper discusses how the technical assessment and BCA provide PM ITE with the information necessary to support planning, budgeting, and architectural evolution for the migration of the ITE to the cloud.

TUESDAY, 28 NOVEMBER, 2017 ROOM S320F

P2 Standards and Policy Setting the Bar

1600
Exploration of Next Generation Technology Application to Modeling and Simulation Study Group (17045)

1630
Standardizing Human Performance Measurement for Ease of Data Analytics (17223)

1700
Measuring Display System Resolution Precisely (17016)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

EXPLORATION OF NEXT GENERATION TECHNOLOGY APPLICATION TO MODELING AND SIMULATION STUDY GROUP

2017 IITSEC Paper No. 17045

Chris McGroarty & Christopher J. Metevier
US Army Research Laboratory
Orlando, FL

Dr. Joe McDonnell
Dynamic Animation Systems, Inc.
Fairfax, VA

Scott Gallant
Effective Applications Corporation
Orlando, FL

Lana McGlynn
McGlynn Consulting Group
Cary, NC

The rapid pace of commercial technology advancements applicable to the Modeling and Simulation (M&S) communities is staggering. However, those technology advancements are not based on (or influenced by) the current state of M&S and its programs. M&S has much to gain in leveraging technology advances, such as Wearable Technology Synched with Computing, Streaming, Advanced Hardware, Cloud Services, and Data Sharing. In order to better understand the implications to M&S and standardization, the Simulation Interoperability Standards Organization (SISO) has established the Exploration of Next Generation Technology Applications to Modeling and Simulation (ENGTAM) Study Group (SG), which began in December 2015.

The purpose of the ENGTAM SG is to capture the technical concepts, to learn from examples applicable to the M&S domain, and to continue to elucidate a better understanding of how the latest and greatest technology can help M&S. The SG is also examining how to minimize the struggles that are typical when trying to adopt new technology, including: the risk of the unknown; expensive changing of processes based on that risk; and understanding enough about the technology to take full advantage. Moreover, it is exploring other undiscovered struggles of large organizations taking on new, and hopefully useful, technology.

This paper covers findings from nearly two years of examination in order to capture the latest industry technology trends and available solutions, specifically focused on their applicability to the M&S domain. We explain a slight change in SG focus towards technology adoption, and present the next steps for continuing the education and documentation of best practices for large organizations to examine, adopt, and utilize the newest technologies for M&S as the technologies present themselves.

The advances in technology will not be slowing down. M&S practitioners must adopt a strategy that supports properly leveraging these advancements in order to enable reuse, cost savings and interoperability.

STANDARDIZING HUMAN PERFORMANCE MEASUREMENT FOR EASE OF DATA ANALYTICS

2017 IITSEC Paper No. 17223

Beth F. Wheeler Atkinson, Mitchell J. Tindall
Naval Air Warfare Center Training Systems
Orlando, FL

John Killilea
Stracon Services
Orlando, FL

Michael Tolland & Courtney Dean
Aptima
Woburn, MA

As interest grows for big data analytics within the Department of Defense (DoD), one prime opportunity to leverage existing data sources is performance assessment. Specifically, the use of quantitative performance data for determining skill levels of trainees supports diagnostic feedback, targeted remediation, and identification of opportunities to accelerate or tailor training to student learning progress. The successful implementation of automated, system-based performance measures within DoD training systems for assessment and trend analysis purposes, however, necessitates standardization in implementation to ensure success. Based on on-going efforts, the authors propose two areas for consideration: 1) adoption of standards for hardware and software simulation interoperability, and 2) an approach to measurement definition that is flexible to the military's crawl-walk-run approach to training and conducive to trend analysis. Currently, the simulation community lacks a standardized way to represent human performance data requirements that are generalizable, scalable, interoperable, and transparent. Because of this gap in standards, developers are challenged with finding ways to implement technology in environments that lack the right type of data. The first step toward increased consistency would be an industry standard for interoperability. As such, this paper will outline a proposed human performance measurement standard under consideration by the Simulation Interoperability Standards Organization (SISO). This standard provides a framework for defining how a system can utilize available data to determine if trainees achieve desired outcomes based on the mission context. However, because not all facets of human performance measurement can be defined by a standard, researchers and developers must consider other factors during measure implementation. For example, measures may be presented in the form of raw data to inform instructor formulated assessments (e.g., number of kills), or assigned values to automatically classify calculations (e.g., percentage, expert vs. novice). Both of these forms of measurement provide unique data benefits throughout the training lifecycle, but a theoretical approach to defining and implementing performance measurement for trend analysis is required to fully realize those benefits. Therefore, in addition to a proposed interoperability standard, the authors will provide lessons learned and best practices for performance measurement when long-term goals include pursuing big data analytics.

MEASURING DISPLAY SYSTEM RESOLUTION PRECISELY
2017 IITSEC Paper No. 17016

Charles J. Lloyd
Visual Performance LLC
Ellisville, Missouri

Spatial resolution is arguably the most important determinant of display system performance. However, the simulation training industry currently uses variations of low precision subjective measures of resolution to evaluate training display systems. Furthermore, these subjective methods are not applied consistently across programs or over the life of a single training device. Meanwhile, far more precise objective measures are commonly used to specify other lessinfluential display system attributes such as geometry, luminance, and white point.

This paper summarizes the results of a series of papers describing the research, development, and testing of an objective metric of display system resolution designed specifically to meet the needs of the simulation training industry. This multi-year R&D effort culminated in the development of a proposed standard Metric description, Test pattern definition, and measurement Procedure (MTP) that is provided for consideration by the simulation training community. Test results indicate the standard deviation of repeated measurements made using the proposed method is 1/12th of that obtained using the current subjective methods and the correlation between the proposed and current methods is strong (R2 = 0.79, 17 df). Multiple resolution measurements can be made across the field of view of a display system using a simple pan-tilt unit in 1/14th the time required using the current methods.

The substantial improvement in the precision of resolution measurements is expected to increase the probability that delivered systems will meet customer expectations and reduce arguments and delays during the acquisition of these complex systems. The significant improvement in measurement speed translates into the ability to make comprehensive measurements of complex display systems consistently across programs and over time.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320F

P3 Technology and Workforce: Tying it all Together

0830	0900	0930
Developing U.S. Service M&S Professionals: Inter-Service Differences in the Education, Training, and Management of Uniform and Government M&S Personnel (17178)	Patent Law and Defense Technology: Original Intent and Current Practice (17035)	A National Approach to achieve International Distributed Simulation Interoperability Certification (17044)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

DEVELOPING U.S. SERVICE M&S PROFESSIONALS: INTER-SERVICE DIFFERENCES IN THE EDUCATION, TRAINING, AND MANAGEMENT OF UNIFORM AND GOVERNMENT M&S PERSONNEL

2017 IITSEC Paper No. 17178

Colonel Joseph M. Nolan, USA
Army Modeling and Simulation Office
Fort Belvoir, Virginia

Brett Telford
Marine Corps Modeling and Simulation Office
Quantico, Virginia

Imre Balogh, PhD & Perry McDowell
MOVES Institute, Naval Postgraduate School
Monterey, California

Edward Degnan, PhD
Air Force Agency for Modeling and Simulation Orlando, Florida

Ivar Oswalt, PhD
Alion Science and Technology Corporation
Norfolk, Virginia

It is said time and time again: "We are only as good as our people." It is critical to have uniformed officers and government service personnel significantly involved in properly shaping modeling and simulation (M&S) programs as the services increasingly adopt M&S; live, virtual, and constructive (LVC) simulations, virtual environments (VEs) and digital engineering (DE) solutions that address training, acquisition, and assessment missions. Yet, investment by the defense establishment and the military services in recruiting, educating, promoting, retaining and utilizing uniformed and government M&S professionals is mixed at best. Each service designates these officers and civilians differently, with the Army having a functional area (57) and career program (36), the Navy a subspecialty (6202), the Marine Corps a military occupational specialty (8825), and the Air Force identifies three special experience identifiers for M&S that cover positions that require awareness, management or senior leadership skills. However, these differences are more than semantics. The differences between the Army and Navy show just how dissimilar different service approaches can be. For example, the Army has scores of billets requiring an FA-57, and once Army officers become FA-57s they will almost always fill an M&S billet. In contrast, the Navy has significantly reduced the number of billets requiring an M&S subspecialty code, and Navy officers who receive that designation may never serve in an M&S position during the remainder of their careers. This paper describes the education, training and workforce management of uniformed and government M&S professionals in the U.S. military services. It then presents applicable insights and lessons learned, looking specifically at similarities and differences in how the services recruit, educate, train and manage their M&S workforces. The goal is to better educate and empower warfighting simulation professionals.

PATENT LAW AND DEFENSE TECHNOLOGY: ORIGINAL INTENT AND CURRENT PRACTICE

2017 IITSEC Paper No. 17035

Mark C. Davis
Computer Engineer
Morrisville, North Carolina

Douglas W. Robinson
Lenovo Group Ltd.
Morrisville, North Carolina

Nicholas J. Kaimakis & Dan M. Davis
University of Southern California
Los Angeles, California

The protection of inventions and other intellectual property (IP) is provided for in Article I of the U.S. Constitution, but the passage of time and the evolution of society has clouded the original goals and obfuscated the vision of promoting progress. Using diverse points of view, the authors present the history and the current impact of the patent system on the development and deployment of technology, especially as these relate to national defense issues. This paper begins with a quick review of the inherent need for the protection of IP, the founders' intent, and the ways in which the legal processes have altered over the decades. They justify their assertion that not all of these changes have been salutary and discuss times when they have become impediments to or destructive of progress. Some feel that protection of the lone inventor has given way to providing weapons for organized interlopers and requiring defensive tactics by large corporations. Patent grants have exploded to unimaginable levels. Data will be presented on the number and complexity of patents. The paper will follow that with an analysis of the pressures that have caused that drift from the original goals. There is a review of thought concerning the current practice and future changes to encourage creative endeavors from the point of view of legal, technical and academic participants. A brief outline is given of international issues and the impact of various countries' approach to this problem and steps that the U.S. might take to enhance the rule of law and the global protection of IP. This is discussed in relation to its being necessary for a strong defense environment for the nation and its allies. The paper closes with possible areas of future change.

A NATIONAL APPROACH TO ACHIEVE INTERNATIONAL DISTRIBUTED SIMULATION INTEROPERABILITY CERTIFICATION

2017 IITSEC Paper No. 17044

Grant Bailey
UK Ministry of Defence
UK

Daran Crush & Ian Page
Defence Simulation Centre
UK

As the capability and utility of simulation across Defense grows, it is becoming increasingly important to understand if each simulation system is fit for purpose, well understood and meets distributed simulation interoperability requirements. To support this, the UK Ministry of Defence's (MoD) Defence Training and Education Coherence (DTEC) approach has developed a set of compliance rules and identified a number of international standards that must be employed, or at the very least demonstrate (from the Enterprise level Value for Money perspective) why they have been discarded. These rules compel system developers to investigate and employ the standards, best practices and resources in which UK MoD has invested. To further support these developments UK MoD is beginning to develop Defense-wide capabilities, delivered as services, to provide common simulation components and resources.

Distributed simulation offers increased opportunity to train collaboratively across national boundaries. With the High Level Architecture (HLA) the preferred NATO interoperability standard, initiatives (such as MSG-134 Distributed Simulation Architecture & Design, Compliance Testing and Certification) are investigating and developing tools for HLA certification. The MSG-134 output will support interoperability testing enabling national and international activities. There is also potential for the development of a UK Distributed Simulation Management Service for Defense that could, for example, manage interoperability software (e.g. the HLA Run Time Interfaces (RTIs)), network performance, interoperability exchange definitions (e.g. the NATO Education Training Network (NETN) Federation Object Model (FOM) modules) and the certification of HLA federations.

This paper describes a potential option that the UK MoD is investigating to develop a coherent testing capability that will support the evaluation of simulation components and the certification of simulation systems interoperability at a national and international participant level. The paper highlights key programs where certification would be required, outlines what a certification service might look like and identifies initiatives that will support the development of such a service.

TUESDAY, 28 NOVEMBER, 2017 ROOM S320B

S1 Augmented Reality

1400
Analyzing SLAM Algorithm Performance for Tracking in Augmented Reality Systems (17161)

1430
Most Effective Capabilities of Head Mounted Displays for Dismounted Soldier Training Using Augmented Reality (17055)

1500
Expert-Assisted Field Maintenance using Augmented Reality (17262)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

ANALYZING SLAM ALGORITHM PERFORMANCE FOR TRACKING IN AUGMENTED REALITY SYSTEMS

2017 IITSEC Paper No. 17161

Dr. Joseph J. LaViola Jr. & Brian M Williamson
University of Central Florida
Orlando, Florida

Dr. Robert Sottilare & Pat Garrity
U.S. Army Research Laboratory-Human Research and Engineering Directorate, Advanced Simulation Technology Division (ARL-HRED-ATSD) Orlando, FL

In developing augmented reality based tutoring scenarios difficult issues can arise if the environment used is not initially known. Lacking in pre-determined fiducial markers, the tracking of the user's position and orientation relative to their starting point can easily be lost. A potential solution lies within the robotics field: simultaneous localization and mapping (or SLAM) algorithms which rely on visual tracking methods to both determine the layout of the environment and the robot's current position and orientation given the previous estimate. However, when applied to a human subject in an augmented reality environment, the agility of their movement during performance activities can lead to issues. In this paper, we discuss the framework used to test a set of SLAM algorithms and determine their capabilities of tracking a human subject performing a variety of movements. We detail the SLAM algorithms analyzed and explain their potential usage given equipment combinations that may be developed in a lab environment. We also go through each movement set, detailing the hardware used in the recording process and how the user's movements are designed to test the limits of a SLAM algorithm. By developing a networked framework, we show how the system is easily adapted to test an algorithm with minimal changes to its code and how it may be used to evaluate future SLAM research. In the end, our framework shows the capabilities and limits of SLAM algorithms when tracking a human user in an augmented reality system.

MOST EFFECTIVE CAPABILITIES OF HEAD MOUNTED DISPLAYS FOR DISMOUNTED SOLDIER TRAINING USING AUGMENTED REALITY

2017 IITSEC Paper No. 17055

John Baker, Scott Johnson, Jaime Cisneros, & Juan Castillo
Chosen Realities LLC
Orlando, FL

Pat Garrity
U.S. Army Research Laboratory
Orlando, FL

Within training, the Department of Defense (DoD) has a strong interest in augmented reality (AR) for its ability to combine live and virtual assets to reduce cost, increase safety, and to mitigate unavailability of needed live assets. During the past two years, a rapid increase of interest in AR for consumer use has spawned a multitude of innovations for head mounted displays (HMD). Increased fields of view (FOV), tetherless computing, integrated depth-sensing, external spatial audio, and simultaneous location and mapping (SLAM) are just a few features that have become a boon for military use, such as dismounted Soldier training. However, the usefulness of these features varies for the dismounted Soldier training use case. This paper examines features from nearly a dozen of today's consumer AR HMDs and contrasts the tradeoffs required to reap their benefits. We evaluated these HMDs primarily against key tactics and skills required in ATP 3-21.8 'The Infantry Rifle Platoon and Squad' doctrinal framework – specifically employing fires, offensive operations, defensive operations, and patrolling. Finally, this paper explores what features are missing or are suboptimal on these HMDs for dismounted Soldier training use.

EXPERT-ASSISTED FIELD MAINTENANCE USING AUGMENTED REALITY
2017 IITSEC Paper No. 17262

Jonathan Schlueter & Eliot Winer
Iowa State University
Ames, Iowa

In 2016, the US military had an operation and maintenance budget of almost USD $200 billion, the largest budget of any appropriation category. As such, it is imperative to minimize errors and costs when performing maintenance tasks. Unfortunately, the military may not always have enough skilled technicians on hand to send to all maintenance sites. Because of this, warfighters must often perform maintenance on systems outside their area of expertise. Augmented reality (AR) has been shown to effectively deliver context-aware instructions, reducing the time needed to identify suitable maintenance steps by more than 50%. However, even with the use of AR, it would be impractical to create maintenance instructions for each unique piece of machinery. By connecting a remote warfighter to a skilled technician, a plethora of maintenance knowledge can be quickly transferred in a targeted manner.

This paper details a mobile application that puts both the power of AR and the knowledge of a technician directly into the hands of a warfighter in the field. A mobile application was developed using the Unity3D game engine that enables technicians to use AR to visually share maintenance knowledge with a remote warfighter. A live camera feed of the warfighter's immediate area is streamed to the technician. Observing this feed, the technician sends back real-time maintenance guidance in the form of augmented 3D models and animations, selected from a list or created dynamically. Once received by the remote warfighter, the augmentations are overlaid onto the physical object, and the technician-recommended maintenance step is visible to the warfighter. While there has been ample research regarding AR-assisted processes, little focus has been given to leveraging the detailed knowledge of existing personnel. This paper discusses the application development and technical evaluation to ensure real-time connectivity in geographically distributed locations.

TUESDAY, 28 NOVEMBER, 2017 ROOM W320B

S2 Radar Simulation

1600
GPU Ray Tracing-based Method for Real-time ISAR simulation (17237)

1630
Enhanced Aerial Radar Line of Sight Performance (17051)

Notes

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

GPU RAY TRACING-BASED METHOD FOR REAL-TIME ISAR SIMULATION

2017 IITSEC Paper No. 17237

Taieb Lamine Ben Cheikh
École Polytechnique de Montréal
Montréal, Canada

Pascal Guillemette
CAE Inc.
Montréal, Canada

The Inverse Synthetic Aperture Radar (ISAR) technique serves to identify and/or classify targets such as aircraft, ships and ground vehicles. In the context of radar operator training, ISAR simulation is a complex CPU-intensive process since it needs to compute and update a target's range-Doppler signature for constantly varying aspect angles. The main challenge is to generate a reliable ISAR image in real-time. To do so, current simulators employ several approximations. These commonly consist of (1) computing only direct reflections and tuning manually some reflection features by editing the 3D models, (2) coarsening the target mesh to reduce the number of intersected polygons or (3) undersampling the integration time by ignoring intermediate aspect angles.
In this work, we present a solution where we implement a modified visual ray tracing method as an analogy to simulate the radar wave scattering. The objective is to improve real-time simulation of the ISAR imagery for the purpose of radar operator training. The method presented here has the ability to compute multiple reflections. Consequently, intense flashes produced by corner reflectors are naturally depicted. The method also allows using complex 3D models directly without offline preprocessing or manual modifications of the models. Real time is achieved by implementing a ray tracing-based algorithm written in CUDA running on GPU. This takes advantage of the massive number of parallel threads that can run on current GPUs. Moreover, the general-purpose programming model supported by CUDA offers a more flexible implementation with more appropriate data structures.
The proposed solution can generate realistic ISAR images of a ship at sea including effects of multiple reflections on a mid-range graphics card. Since this solution does not require preprocessing or manual alteration of the 3D models to add scatterers, it makes training on realistic ISAR simulation more accessible.

ENHANCED AERIAL RADAR LINE OF SIGHT PERFORMANCE

2017 IITSEC Paper No. 17051

Mr. Oren Koler, M.Sc. & Ms. Tal Shintel, M.Sc.
Israel Aerospace Industries
Israel

Airborne Aerial Radars are often required to track a large number of ground vehicles moving within a specific area. When simulating such a radar, detection computation must consider the existence of line of sight between the radar and each of the simulated ground platforms, resulting in multiple long range LOS computations performed simultaneously, from a single aerial point. When using very high resolution terrain with ground vehicles scattered over large areas (hundreds of square miles) in dense vegetation, urban structures and mountainous terrain, the polygon count required for geometry intersection calculations used by each LOS query can be very high. In some cases, processing multiple LOS queries, results in poor simulation performance. This paper suggests a simple approach for reducing the number of required LOS calculations, where multiple long-range LOS queries originate from the same aerial point. By using a shadow map generation method and positioning the source of light at the LOS origin point, Ground points that are inside a shadow can then be filtered out from further LOS computations. The more ground points there are the better cost effective this method is.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM W320B

S3 Cyber Simulation and Training

0830	0900	0930
Cyber Effects within a Kinetic Model (17181)	A Cyber Warfare Prototype for Live, Virtual, & Constructive Simulations (17015)	The DARPA CODE White Force Network (17018)

Notes

CYBER EFFECTS WITHIN A KINETIC MODEL

2017 IITSEC Paper No. 17181

Christopher Daiello, Kyle Hancock, John Surdu, Ph.D., & Daniel J. Lacks, Ph.D.
Cole Engineering Services, Inc.
Orlando, Florida

Often when the military talks about cyber training, the focus is on a "cyber range" in which operators practice their skills and test new tools and techniques. This level of training is necessary but not sufficient to prepare US forces to dominate a tactical battlefield against a cyber-savvy adversary in a Multi-Domain Battle environment (Shrinkman, 2016). Stimulating staffs by integrating cyber and traditional military operations is critical. Cyber operations at the tactical level involve both offensive and defensive actions – integrated and supporting traditional military operations – where cyber may be the supported operation within traditional military operations, and vice versa.

There are limited means of representing cyber operations and effects – beyond simple models of communication and network degradation – within most simulations. The Army has funded the architecture prototype implementation to link cyber and kinetic simulations leveraging the strengths of each simulation without trying to force both sets of capabilities into a single model. Cyber actions (e.g., SQL injection attacks to gain control of a supervisory control and data acquisition (SCADA) systems) are best represented in live or synthetic cyber simulations. Cyber effects (e.g., the cyber operator shuts off the power to an area of interest) are then represented in a constructive simulation.

The integration of the cyber simulation with constructive simulation allows realization of the effects from cyber operations on the kinetic domain and the effects from kinetic operations on the cyber domain. The interface between the cyber simulation and constructive simulation was standardized, allowing improved and reliable integration. As this interface matures, it may be used to link any arbitrary cyber and kinetic simulations that comply with the interface. The constructive simulation was enhanced to model streetlights, searchlights, cameras, and controller systems (e.g. SCADA). Additionally, 2D and 3D displays were enhanced for visual representation of the cyber effects. In this paper, we discuss the architecture, integration, enhancements, use cases, and demonstration capabilities implemented for representing cyber effects within a kinetic model.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

A CYBER WARFARE PROTOTYPE FOR LIVE, VIRTUAL, & CONSTRUCTIVE SIMULATIONS

2017 IITSEC Paper No. 17015

Henry Marshall & Nathan Vey
Army Research Laboratory (ARL) Human Research and Engineering Directorate (HRED) Simulation and Training Technology Center (STTC)
Orlando, Florida

J. Allen Geddes & Lawrence Elliott
Dynamic Animation Systems
Orlando, Florida

Cyber warfare has quickly moved to the forefront of the Army's training needs. With the realization that cyberspace is now a warfighting domain, simulation and training program managers are left struggling to identify the best solution for implementing cyber warfare effects into the training domain. The term cyber itself can imply a broad range of possibilities including electronic warfare (e.g. jamming), kinetic warfare (e.g. destroying systems), hacking attacks, and insider threats. Current major training simulations among the Live, Virtual, Constructive, and Gaming (LVC&G) domains lack a cyber implementation, with the exception of a low fidelity cyber warfare effects simulation in the One Semi-Automated Forces (OneSAF) program. It is necessary to train in this warfighting domain, but the requirements and best strategies for conducting cyber training have created a challenging technical gap for the simulation and training communities. Presently, the Army's Cyber Mission Force teams require cyber range training to provide the realistic data exchanges necessary to develop their skills. This type of training is commonly referred to as "cyber for cyber." The rest of the Army falls into another category of cyber training commonly referred to as "cyber for others." After talking with numerous stakeholders, we decided to develop a prototype system for training the "cyber for others" group to experience cyber-attacks on their tactical mission command systems and to make recovery decisions. This prototype, called Cyber Operations Battlefield Web Service (COBWebS), provides the capability to simulate the effects of various cyber-attacks on command and control communication between the synthetic entities and the Blue Force's mission command systems. Our prototype leverages the OneSAF Mission Command Adapter Web Service (MCA-WS) and adds cyber warfare effects modeling. We will share our experience developing and field testing this cyber warfare training capability.

THE DARPA CODE WHITE FORCE NETWORK

2017 IITSEC Paper No. 17018

David Scheidt
Weather Gage Technology, LLC
Edgewater, MD

Robert Lutz
JHU/APL
Laurel, MD

James Sturim
CENTRA Technology, Inc
Arlington, VA

The DARPA Collaborative Operations in Denied Environments (CODE) program is developing highly advanced collaborative autonomy capabilities that will allow unmanned aircraft systems (UAS) to successfully engage mobile targets in denied or contested electromagnetic environments. The core goal is for CODE enabled Air Vehicles (AVs) to autonomously sense and evaluate the state of its operational environment, form teams, and carry out defined mission objectives with limited human supervision.

The testing of CODE capabilities on live ranges requires an interacting set of live, virtual, and constructive (LVC) assets to provide the necessary stimulus to the system under test (SUT). The CODE White Force Network (WFN) is designed to dynamically interject operationally-relevant effects, such as denial of communications or GPS, into the CODE software during flight as a means of stimulating and then verifying the performance of CODE autonomy algorithms. The WFN also allows large numbers of high fidelity virtual assets running the actual CODE software to be part of the test scenarios. In addition, the WFN ground station provides synthetic forces generation services and various control, visualization, and logging functions that interact in real-time with the on-board WFN flight software to create the desired effects.

This paper provides an overview of the WFN design and describes how the WFN was integrated into recent CODE test campaigns at NAWC-WD in China Lake, CA. The paper also discusses the increase in complexity planned for the next CODE phase test environment and how the WFN will address the associated technical challenges.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320B

S4 Modeling and Virtualization

1030
Full 3D Visuals for Advanced Training in Single-seat Fighters (17050)

1100
3D Visualization for Point of Need and Cloud Based Training (17067)

1130
Optimization of Computer Generated Three Dimensional Models for Decreased Latency in Virtual Environments (17170)

Notes

FULL 3D VISUALS FOR ADVANCED TRAINING IN SINGLE-SEAT FIGHTERS

2017 IITSEC Paper No. 17050

C. E. (Tommy) Thomas, PhD; Steve L. Kelley; Paul G. Jones
Third Dimension Technologies
Knoxville, TN

Leonard "Sherman" Kearl; Benjamin "Hoolio" Orsua
Rickard Consulting Group
Litchfield Park, AZ

Greg Sidor
Air Force Research Laboratory
Wright-Patterson AFB, OH

David A. Miller
CymSTAR.
Orlando, FL

For 5th Generation fighters such as the F-35, two-seat configurations are not available. Therefore, training relies heavily on ground simulators to prepare new pilots. Instructors have long noted that simulators have shortfalls in visual cues provided to the pilot, which are especially important for tasks where the pilot is required to visually maneuver the aircraft in relation to an outside object. One of the most obvious examples of this is aerial refueling, which has become increasingly important as 5th Generation aircraft tend to fly longer missions and in order to maintain stealth do not carry external fuel tanks. These two factors combine to drive much higher rates of aerial refueling. For single-seat fighter aircraft it is more difficult for new pilots to receive the necessary training given the absence of 3D cues in current simulators. The important visual cues for aerial refueling are stereopsis (different view to each eye) and head motion parallax (head movement to look around objects). An emerging class of light field displays offers a way to reproduce these cues at suitable fidelity. This paper discusses the requirements for a 5th Generation part task trainer with an emphasis on visual cues. Types and characteristics of different forms of 3D display are discussed with regard to their suitability for use in part task trainers. While it would be highly desirable to have true 3D displays in full-mission simulators, this could be extremely expensive and only useful for certain tasks. A part task trainer with a suitable 3D display could be extremely cost effective for training in such tasks as air-to-air refueling, takeoff and landing (in particular carrier landings), close air support, and extreme low level flight. Display requirements for a part task trainer able to simulate these situations are discussed.

Keywords – part task trainer, single-seat fighter, visual cues, receiver aerial refueling, light field displays

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

3D VISUALIZATION FOR POINT OF NEED AND CLOUD BASED TRAINING

2017 IITSEC Paper No. 17067

Greg Dukstein
Dignitas Technologies, LLC
Orlando, Florida

Keith Nielsen & Paul Dumanior
PEO STRI, PM ITE
Orlando, Florida

US Army Modeling, Simulation, and Training (MS&T) is moving toward cloud based solutions to meet the future training needs of the Warfighter. Cloud based solutions will need to provide easily accessible synthetic training tools that will enable soldiers all over the world to train together. The Army is investing in cloud technologies and leveraging research to provide Point of Need (PoN) training services and reduce the cost of deployment and sustainment. This paper captures the lessons learned from a government funded effort to develop an open source light weight cloud based 3D visualization tool for MS&T applications. In addition to looking at broader applications, our effort is specifically targeting needs of the Army's Live Virtual Constructive – Integration and Architecture (LVC-IA) program as a transition target. Our work has resulted in a thin client 3D viewer that runs in a browser and leverages common US Army standards and components for exercise data, terrain, and model data. We will discuss how open solutions and leveraging new government developed technologies can provide a cost-effective solution while still achieving commonality and interoperability. We will discuss the approaches used, such as streaming terrain elevation data, ground surface imagery, and 3D models from cloud based servers to thin client 3D viewers and examine different technologies for rendering a 3D scene in a web browser. We discuss the practical challenges of transitioning this technology to meet cloud requirements of LVC-IA and other Programs of Record. Lessons learned will be presented regarding implementation and fielding of a web based solution into a large, complex training environment.

OPTIMIZATION OF COMPUTER GENERATED THREE DIMENSIONAL MODELS FOR DECREASED LATENCY IN VIRTUAL ENVIRONMENTS

2017 IITSEC Paper No. 17170

Varun Aggarwal & Denise Nicholson
Soar Technology, Inc.
Orlando, FL

Due to demand for realism and high-fidelity experiences by today's users, rendering virtual environments proves to be a computational challenge for lightweight computing platforms (e.g. mobile devices). Traditional simulated environments typically use as much processing power as available to render the entire scene in high detail, limiting simulations to higher end computers. One approach to optimize processing power for three dimensional models is to use varying, decreased, level of detail (LOD) for distant representations (Sik & Pattanaik, 2011). This research attempts to future optimize resources by expanding the adaptive LOD approach based on the object's location in the field of view (FOV) in addition to the object's distance. Such FOV adaptation would take advantage of state-of-theart head and gaze tracking capabilities. This paper presents results from an initial investigation focused on identifying the minimal LOD that objects can be reduced to before the they become unrecognizable. A simulation was designed that presented randomized sets of objects of various LOD. Subjects were asked to choose an object from the group based on an on-screen prompt. The speed and accuracy of each subject's response was recorded to determine the LOD at which there was no difference in recognition from the full-detail objects. The researchers concluded that the minimum required LOD for recognition without sacrificing speed or accuracy lies between 20% and 80% depending on the shape and distinct features of each object. Specific levels of detail were determined for six objects of different feature complexity to be used in further research studies.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320F

S5 Terrain Modeling

1030
Whole Earth Rendering (17285)

1100
Unearthing the Modeling and Simulation Underground with Voxels (17100)

1130
Terrain Database Correlation Assessment Using an Open Source Tool (17004)

Notes

LARGE AREA HIGH RESOLUTION GEOTYPICAL TERRAIN DECORATION

2017 IITSEC Paper No. 17285

Paul L. Isaacson & David F. Ottley
Rockwell Collins
Salt Lake City, UT

Complex and large area training scenarios place very challenging requirements on the training and simulation synthetic environment. Terrain texture resolutions are commonly required at 50 centimeters and higher. Correlated 3D feature placement is also a common expectation in today's scenarios. In addition, time-of-day and seasonal variations are also necessary. Often a correlated sensor classification is also required. While high-resolution geospecific aerial-imagery and associated 3D feature-model databases are routinely constructed for given areas of interest, covering the globe or large areas with such data is prohibitively expensive. This paper will explore a method for procedurally synthesizing both high-resolution terrain textures and correlated 3D feature-models over the entire globe while minimizing objectionable repetition patterns.

The set of procedures, algorithms, data structures, and memory-management mechanisms for both off-line preprocessing and run-time processing will be discussed. The set of source data to create the library of generic 2D and correlated 3D feature models will also be explored. Using regions around the globe will allow variety and more geospecific look in the generic textures and 3D feature-models incorporated in the Whole Earth rendering. By using these algorithms with the library of data they can self-repeat for a continuous tiling effect, but are sufficiently large so that even at high training altitudes, very little repetition is discernable. Thus large areas of high resolution terrain with correlated 3D feature placement can be achieved at a relatively low cost. Lastly, this paper will present a mechanism on how to integrate custom geo-specific imagery and geo-specific 3D feature models within the Whole Earth procedural rendering.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

UNEARTHING THE MODELING AND SIMULATION UNDERGROUND WITH VOXELS

2017 IITSEC Paper No. 17100

Freddie Santiago, John Moran & Jon Watkins
Dignitas Technologies
Orlando, Fl.

Julio de la Cruz
ARL HRED ATSD
Orlando, FL

Adequate representation of underground structures is necessary for modeling and simulation (M&S) applications to provide quality training for both military and civilian use cases. Urban and asymmetric warfare is becoming more predominant, and training applications require technological advances in order to replicate the complexities of these urban environments. Underground roadways, basements, subways, sewer systems, and even subsurface multilevel buildings or garages are examples of the underground elements that play a role in urban and asymmetric warfare. Underground structures are important outside of urban environments as well. Naturally occurring underground features, such as cave systems, present special case challenges to existing synthetic environment algorithms that are tailored around open environments or structured building interiors. Given the prominence of aerial bombing to prepare for a ground invasion, complex military infrastructure will increasingly be found underground in bunkers or cave systems. In urban environments, infrastructure such as power, water, internet, and sewage, are already primarily underground, and require modeling to realistically replicate the urban battlespace. Simulations that include underground environments need to consider environmental effects, infrastructure interruptions, propagation of smoke and sound, fire propagation, and ventilation. This paper discusses an approach for representing and dynamically manipulating complex underground environments, both natural and man-made. The approach uses voxelization techniques found in modern game engines, movies, and medical imaging systems. The voxelized data for soil and structures is subdivided into chunks and organized into variations of B+ trees for efficient access and storage. Smooth-mesh algorithms analyze the voxel data and generate meshes for rendering and navigation mesh generation. We describe and propose an architecture for providing underground capabilities to existing and future simulation systems in a distributed fashion. Within this architecture, we also define functional components that will be modularized in order to take advantage of cloud computing technologies.

TERRAIN DATABASE CORRELATION ASSESSMENT USING AN OPEN SOURCE TOOL

2017 IITSEC Paper No. 17004

Leonardo Seiji Oyama, M.S.
Brazilian Army Brasília, DF - Brazil

Carlo Kleber da Silva Rodrigues, D.Sc.
University Center of Brasília (UniCEUB)
Brasília, DF - Brazil

Sérgio Simas Lopes Peres, M.S.
Prospectare Brasil Brasília, DF - Brazil

Brian Goldiez, Ph.D.
University of Central Florida
Orlando, FL

Configuring networked simulators for training military teams in a distributed environment requires the usage of a set of terrain databases to represent the same training area. The results of simulation exercises can be degraded if the terrain databases are poorly correlated. A number of methodologies for determining the correlation between terrain databases have been developed, by both government and industry, aiming at Verification, Validation & Accreditation of distributed simulations involving different simulators. However, there are few computational tools for this task and most of them were developed to address government needs, have limited availability, and handle specific digital formats. The goal of this paper is thus to present a novel open source tool developed as part of an academic research project. This tool analyzes a pair of terrain databases generating numeric data suitable for statistical analysis, as well as identifies specific areas where correlation may be an issue by using a configurable threshold. The analysis takes into consideration line-of-sight correlation differences between the databases. The sample size and characteristics of the line-of-sight tests, for instance elevation and azimuth, are selectable via a graphical user interface which also provides a 3D visualization of the terrain databases. Being open source, programmers may add more capabilities to the tool, such as including support to more digital formats or implementing new software methods to measure the correlation between terrain databases. Plans for extending the tool's capabilities and its possible utilizations are also included herein.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320B

S6 Non-Traditional Aspects of Military Simultion

1400
Modeling Underwater Communications in Live, Virtual and Constructive Environments (17295)

1430
A Study on the Effectiveness of Virtual and Constructive Interface Simulation (17114)

1500
A Large Scale Correlated Dynamic Weather Simulation Service (17308)

Notes

MODELING UNDERWATER COMMUNICATIONS IN LIVE, VIRTUAL AND CONSTRUCTIVE ENVIRONMENTS

2017 IITSEC Paper No. 17295

Terry Whelan, Wei Liu, Jeff Weaver, & Rajive Bagrodia
Scalable Network Technologies
Culver City, CA

Pedro A. Forero, Jose Chavez
Space and Naval Warfare Systems Center Pacific San Diego, CA

Underwater communication networks (UCN) are enablers of current and future military and commercial applications involving undersea exploration, monitoring, and surveillance. Unmanned Underwater Vehicles (UUVs) hold promise for stealthy low-cost surveillance, particularly in areas where manned undersea platforms cannot be easily deployed, operated, and maintained. Aiming to extend the operational lifetime of UUVs, underwater hubs are being developed for charging UUVs and exfiltrating data from UUVs. As the number and heterogeneity of undersea platforms and infrastructure expected to operate in concert continuous to increase, command, control and coordination of undersea platforms, and timely and secure transfer of data become increasingly important.

UCNs face an inherently disconnected, interrupted and low-bandwidth operational environment and often require specialized protocols for supporting reliable transfer of data. Furthermore, different communication technologies being considered for undersea applications, such as acoustic, optical, and RF communications, have different, yet complementary, characteristics in terms of propagation delay, communication range, and bandwidth. Characterization of the performance of a UCN is critical to avoid unexpected operational disruptions. Yet, in-water experimentation is restrictive and costly, and often cannot be performed in an environment similar to where the UCN deployment is planned. Network modeling and simulation tools offer a low cost alternative for characterizing the performance of a UCN. Unfortunately, most commercially available network simulators designed for modeling wired and RF-based wireless networks are not well suited for modeling UCNs.

This paper describes UCN-X, a scalable UCNs simulator that can be used to investigate real-time underwater command and control, data transfer and exfiltration. UCN-X leverages parallel discrete-event model execution and system-in-the-loop interfaces from EXata, to provide a scalable, live, virtual, constructive (LVC) UCN simulator that can interface with live modems and mission operation and management software applications. UCN-X captures undersea signal propagation effects obtained based on the characteristics of the undersea propagation environment and a diverse set of protocol models at all layers of the communication stack. It additionally includes store-andforward protocol, data muling, and air/water gateway node models. To support its use within a system-of-system context, UCN-X can be federated with other simulators including force-force training environments to provide realistic undersea communication modeling. UCN-X can also be interfaced with live and unmodified UUV command-and-control (C2) software. By providing a realistic representation of the dynamic network performance under realistic operating conditions, such a federated model provides a rich and extensible training capability for both military and commercial applications.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

A STUDY ON THE EFFECTIVENESS OF VIRTUAL AND CONSTRUCTIVE INTERFACE SIMULATION

2017 IITSEC Paper No. 17114

YounChol, Cho, Jin Seok, Oh & Chan Ho, Jung
Navy System Analysis Div
Republic of Korea

Recently, considerable number of real world problems in ROKN(Republic Of Korea Navy) has been solved by simply relying on the scenarios and algorithms implemented in Constructive model. However, the need for new measures of analysis is in demand to accommodate the increasingly specific and heightened reliability expectations of operating forces. The ROKN is planning to acquire a LVC(Live•Virtual•Constructive) based warfighting experiment system to flagship the combat force development through complicated future defense environment. It will serve as an alternative to present problem analysis and solutions. In this study, we try to confirm the necessity and feasibility of establishing the warfighting experiment system through an interface experiment between ROKN Anti-submarine aircraft simulator(V) and Anti-submarine operational effectiveness analysis model(C). A Broker SW applied with HLA/RTI international standard was developed to conduct the interoperability. As a result, current Anti-submarine operational effectiveness analysis model(C) which is limited to engagement level analysis, was enhanced through interfacing with the weapon systems level analysis of Anti-submarine aircraft simulator(V). Furthermore, by calculating the analysis result which contains the human factor and various external factors in weapon systems level analysis, the V-C interface warfighting experiment is confirmed to increase the reliability of operations analysis. The result of this study is expected to be a foundation for a more reliable simulation analysis and be utilized as a valuable data for establishing naval warfighting experiment systems.

A LARGE SCALE CORRELATED DYNAMIC WEATHER SIMULATION SERVICE

2017 IITSEC Paper No. 17308

Craig Pepper
Boeing Research & Technology
Brisbane, Australia

Providing suitable weather conditions is important in the conduct of simulations for domains as diverse as individual and distributed training; analysis & experimentation; research, design & development; virtual test & evaluation; and mission planning & rehearsal. Despite this importance, it has typically been difficult or impossible to create realistic, dynamic, correlated large scale weather environments – simulations typically operate in a static, overly simplified environment, or use a single snapshot of real weather data.

This paper describes an innovative virtual weather service which can be used to create realistic and consistent weather environments. These environments can replicate historical or current forecast weather conditions and events, or simply provide dynamically changing conditions over a basic standard atmosphere model. The weather service is able to provide dynamic, correlated atmospheric, ground and ocean conditions with global coverage over long timeframes to many simultaneous end users via industry standard web protocols, through an application programming interface, or via a simple web service.

The paper will briefly survey the history of weather simulation, then present and discuss the requirements used to drive the development of the weather service. The paper will provide background on the architecture, components and data requirements of the service; describe the interfaces and present sample integrations with client applications; and provide performance measurements in terms of throughput, processing time and storage requirements. The paper will conclude with a review of opportunities for further work and thoughts on the standardization of weather data exchange.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320F

S6 LVC in a Distributed Environment

1400	1430	1500
Virtualization: Navy Continuous Training Environment Approach to Cloud Enabling Technologies (17289)	Performance Measurement in LVC Distributed Simulations: Lessons from OBW (17207)	NATO Initiative in Multi-national Mission Training through Distributed Simulation (17200)

Notes

VIRTUALIZATION: NAVY CONTINUOUS TRAINING ENVIRONMENT APPROACH TO CLOUD ENABLING TECHNOLOGIES

2017 IITSEC Paper No. 17289

Philip N. Brazell, Kenneth Sahr, & Michael A. White, PhD
Alion Science and Technology
Norfolk, VA

The Navy Continuous Training Environment (NCTE) was designated a Navy Enterprise Network on 20 OCT 2014. NCTE was growing in size and complexity (e.g., by April 2015, over 50 nodes worldwide and ~650 servers), which prompted the need for enterprise standardization and reduction in infrastructure management requirements. In 2010, the Secretary of Defense directed IT infrastructure consolidation to achieve cost savings, improve DoD mission execution and defend against cyber threats. The Core Data Center Reference Architecture (2012) categorized DoD computing and data storage facilities into four types: Core Data Centers (CDC), Installation Processing Nodes (IPN), Special Purpose Processing Nodes (SPPN), and Tactical/Mobile Processing Nodes (TPN). After declaring NCTE nodes SPPN, the Navy Enterprise Information Governance Board (NEIGB) requested a report on NCTE data center efficiency initiatives. This paper reports on 1) the NCTE SPPN efficiency analysis; 2) the challenges NCTE faced in complying with the DoD mandate to implement cloud-enabling technologies wherever practical; and 3) the team's approach toward creating an architecture that enables NCTE to support cloud services. The analysis investigated hardware/software efficiencies, operational efficiencies, and implications of adopting alternative life cycle strategies. NCTE supports over 100 distributed Fleet Synthetic Training (FST) events and other afloat and ashore events and experiments annually, thus intensifying the interest in decreasing infrastructure footprint and providing a more flexible, scalable architecture. The effort produced some interesting observations; some expected, others somewhat a surprise. First - Review of the data suggests that efficiencies were achieved across the NCTE SPPN data centers, albeit not necessarily capital expenditure- related. Second – use of Virtualized Desktop Infrastructure (VDI) appears to improve return on investment (ROI). Third - Geographically dispersed servers and C4I systems limit the virtualized server reduction ratio. Finally, new technology advances bring about new challenges in sustaining a continuing ROI.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

PERFORMANCE MEASUREMENT IN LVC DISTRIBUTED SIMULATIONS: LESSONS FROM OBW

2017 IITSEC Paper No. 17207

Jaclyn Hoke
Rockwell Collins, Inc.
Cedar Rapids, IA

Lisa Townsend &
Sam Giambarberee
Naval Air Warfare Center Training Systems Division (NAWCTSD)
Orlando, FL

Sae Schatz
Advanced Distributed Learning (ADL) Initiative
Washington, D.C.

Operation Blended Warrior (OBW) 2016 marked the second year of a three-year effort to document lessons learned and understand barriers to implementing Live, Virtual, Constructive (LVC) distributed training. In the first year of the event, LVC focus areas included connectivity, interoperability, data standards, after-action review, and cyber security. Year two introduced additional focus areas: multi-level security, cross domain solutions, long-haul feeds, and performance measurement. This paper focuses on this latter area—defining and collecting performance measures. Performance measurement in simulation-based training faces formidable obstacles, including the identification of individual and collective performance dimensions, how these dimensions relate to training goals, and how training transfers to operational readiness. Blending of LVC elements introduces additional complexity, not only for human performance assessment but also for evaluating the effectiveness and efficiency of the technical system. In this paper, we present the measures defined and collected during OBW in four primary areas: 1) cost analysis, 2) network performance, 3) trainee performance, and 4) whether OBW met the expectations of participating organizations. We also discuss three categories of Measures of Effectiveness (MoEs) and Measures of Performance (MoPs) established by the OBW Strategic Integrated Product Team: Programmatic, Technological, and Learning. These MoEs and MoPs will facilitate annual comparisons of performance measurement at OBW and encourage use of the event as a sandbox to design and validate LVC performance measurement tools. Finally, we present the goals and measures established for Performance Measurement during OBW 2017 and recommendations for future events.

NATO INITIATIVE IN MULTI-NATIONAL MISSION TRAINING THROUGH DISTRIBUTED SIMULATION

2017 IITSEC Paper No. 17200

Arjan Lemmers
Netherlands Aerospace Centre NLR
Amsterdam, The Netherlands

Dr Jean-Pierre Faye
Thales Air Operations
Massy, France

Ole Martin Mevassvik
FFI (Norwegian Defence Research Establishment)
Kjeller, Norway

Detlef Stueter
German Air Force Forces Command
Simulation Control Center
Cologne, Germany

M. Haluk Canberi
STM Savunma Teknolojileri Muhendislik ve Tic.
Ankara, Turkey

Dafna Dempsey
A.S. Royal Netherlands Air Force,
Air and Space Warfare Centre
Breda, The Netherlands

NATO and nations face challenges regarding live training and exercises. Current and future operations are multinational in nature, the missions and the systems are becoming more complex and need detailed preparation. Furthermore rapid adaptation to changing circumstances is needed. At the same time opportunities for live training and mission preparation are reduced due to less available resources, more peacetime restrictions and limited time span between political decision making and deployment. Mission Training through Distributed Simulation (MTDS) presents a solution to these challenges and is therefore crucial to NATO and nations' mission readiness. Despite a number of initiatives in the past to set up a NATO MTDS capability, currently NATO does not have a standing operational MTDS capability.

In October 2013 the NATO task group MSG-128 was set up with the objective to establish essential elements for a permanent NATO MTDS capability for air operations and validate these elements through initial operational exercises and evaluation. The approach of MSG-128 is two-fold: 1. Define a concept of operations and reference architecture for a permanent MTDS infrastructure for air operations, including architectural requirements for integration of live components (connected flying platforms) in the MTDS architecture 2. Build the MTDS environment incrementally by executing a yearly MTDS exercise The MSG-128 concludes its work with a 4th exercise in March 2017. This exercise proves that realistic combined mission training for fighter pilots and controllers can be achieved in the initial NATO MTDS capability.

This paper describes the concept of operations and initial MTDS environment that provide NATO and nations already with a current capability to conduct realistic multi-national training for air operations. The paper concludes with a path for future growth towards an effective persistent LVC environment for air operations training which is defined by the reference architecture and the requirements for integrating live flying assets.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320B

S8 Threats and Scenarios

1600	1630	1700
Generative Representation of Synthetic Threat Actors for Simulation and Training (17140)	Simulation of Non-Combatant Population Movement in Battlespace (17214)	Testing and Training Convergence – Common Scenario Generation Requirements and Solutions (17129)

Notes

GENERATIVE REPRESENTATION OF SYNTHETIC THREAT ACTORS FOR SIMULATION AND TRAINING

2017 IITSEC Paper No. 17140

J. Wesley Regian & David A. Noever
PeopleTec, Inc.
Huntsville, AL

In this paper we describe a generalized and generative synthetic threat actor (SynthActor) modeling capability as currently implemented in the Web Ontology Language (OWL 2). SynthActor is general in the sense that it readily supports representation and reasoning about threat actors at any level of aggregation (individuals, groups and nation states) and for any domain of aggression (kinetic, cyber, insurgency, and asymmetric warfare). SynthActor is generative in the sense that it can automatically respond to simulated or hypothesized conflict situations with behaviors that are consistent with previously specified threat actor world views and technical/aggression capabilities. Threat actor world views are represented in SynthActor as cultural sub-models reflecting the belief systems of the actor (social, political and theological). Threat actor technical/aggression capabilities are represented in SynthActor as knowledge/skill properties of the actor (chemical, nuclear, explosives, cyber and melee). SynthActor enables modeling of threat individuals and groups as active and engaged entities which respond to changing situations, prosecute an agenda, define operational goals, and execute operations to achieve those goals. Violent threat actor properties, as modeled in SynthActor, are aligned with the Multilateral Interoperability Program (MIP) and its Information Model (MIM). MIM modeling enables automated machine sharing of information about violent threat actors and activities. Cyber threat actor properties, as modeled in SynthActor, are aligned with the Department of Homeland Security's Structured Threat Information Expression (STIX) modeling language. STIX modeling enables automated machine sharing of information about cyber threat actors and activities. SynthActor, with MIM and STIX language extensions, enables automated machine derivation and sharing of detailed information about realistically unfolding threat actor campaigns in adversarial simulation environments.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

SIMULATION OF NON-COMBATANT POPULATION MOVEMENT IN THE BATTLESPACE

2017 IITSEC Paper No. 17214

Tony Cerri
TRADOC G-27, OE TSC, DSMS
Ft. Eustis, Virginia

Nicole Laster
TRADOC G-20 GCKN,
CGI Federal
Ft. Leavenworth, Kansas

Alejandro (Andy) Hernandez
Deputy Director,
Naval Postgraduate School
Monterrey, California

Steven B. Hall
MOVES Institute,
Naval Postgraduate School
Monterrey, California

Neil F. Sleevi
TRADOC G-27,
M&S Branch, CGI Federal
Ft. Leavenworth, Kansas

Andrew Johnson
TRADOC G-20, GCKN, Capstone
Corporation
Ft. Leavenworth, Kansas

The risk of adversaries instigating mass human migration, refugee flows and crowd formations in the battlespace1 requires mitigation because unexpected population movements can adversely impact the United States and partners' freedom of operations abroad. As well, Information operations and physical events initiated by operations in an area may result in population activity patterns (second and third order effects/events). Even relatively small gatherings of non-combatants, especially at urban choke points can have repercussions impacting military operations which rely on predictable traffic flow on roads and infrastructure. Simulation in the field of Pattern of Life Analytics (PoLA) is critically important to the military because it may lead to improvements in predicting patterns of movement and other behaviors that are realistic, reliable, and repeatable among non-military populations. There is insufficient modeling of the political, economic and social conditions within the operational environment (OE) and their effects on combatants and noncombatants. Meanwhile, emerging connected device tracking technologies provide rich new data sources required to assess ongoing patterns of life activity levels (traffic patterns, work, shopping, pedestrian flow, refugee movement, crowd gatherings and so on). This paper describes a technique for representing migration of a civilian population in a way that is amenable to computation (i.e., simulation). The model firmly rooted in social science principles for: a) establishing a baseline of population location data, b) calculating populace mood changes based upon Political, Military, Economic, Social, Infrastructure, Information, Physical Environment, and Time (PMESII-PT) interventions, and c) forecasting timing and size of refugee flows and direction of their movements to, d) further model their external migration in Athena. As a result, the military decision makers can understand PMESII-PT impacts of non-combatant population movement in the battlespace. Lessons learned from this work could be used to simulate and predict non-combatant movement and identify potential impacts in the OE.

TESTING AND TRAINING CONVERGENCE – COMMON SCENARIO GENERATION REQUIREMENTS AND SOLUTIONS

2017 IITSEC Paper No. 17129

Roy Scrudder, Kevin Gupton
Applied Research Laboratories
The University of Texas at Austin, Austin, Texas

John Diem
US Army Operational Test Command
Fort Hood, Texas

Scenario generation for simulation-enabled environments (particularly for events with integrated mission command systems and networks) is a time-intensive, complicated task involving many data sources and a variety of tools. Historically, the testing and training communities have created and maintained separate scenario generation and database population capabilities to meet their specific test requirements. The absence of collaborated solutions is commonly due to unproven assumptions that scenario requirements between the two communities are vastly dissimilar. The Army Operational Test Command (OTC) is committed to investing in and employing common testingtraining solutions to the maximum practical extent. Thus, the command conducted an analysis of scenario generation capabilities in 2016, to explore the potential for cross-community solutions. Additionally, OTC has launched a major test technology investment, the Integrated Live-Virtual-Constructive (LVC) Test Environment (ILTE) program, with a charter to establish and fund common test and training capabilities.

OTC's initial analysis focused on the testing of intelligence, surveillance, and reconnaissance (ISR) sensor platforms and information systems. OTC performed this analysis to inform a decision on replacing or updating its Intelligence Modeling and Simulation for Evaluation (IMASE) Scenario Generation Tool (ISGT). ISGT, developed and used by OTC since 2007, has become unsupportable based on cost and evolving data requirements. OTC sought a common, cross-community solution that could replace ISGT as well as address broader simulation-mission command environments. This paper describes the development of scenario generation requirements using ISGT as an initial basis, and then compares those requirements with scenario generation capabilities employed by the training community. These tools include the Exercise Design Tool (EDT), Web Military Scenario Development Environment (WebMSDE), Intelligence and Electronic Warfare Tactical Proficiency Trainer (IEWTPT), and Joint Training Data Services (JTDS). No single scenario generation tool (to include SGT) met all ISR test requirements. However, the analysis revealed that a combination of training community tools (with some tool augmentation) could support all necessary scenario generation processes for ISR testing as well as broader T&E and training applications. As a result, OTC has begun acquisition and implementation of those capabilities.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320F

S9 Applying Simulation for Readiness

1600	1630	1700
High-fidelity Surgical Fasciotomy Simulator for Training Special Operations Medics (17087)	Modeling Combat Aircraft Training and Readiness (17149)	Leverage the Training Effect in Staff Training by Automated Reporting (17133)

Notes

HIGH-FIDELITY SURGICAL FASCIOTOMY SIMULATOR FOR TRAINING SPECIAL OPERATIONS MEDICS

2017 IITSEC Paper No. 17087

Jordan Coulter & Angela M. Alban
SIMETRI Inc.
Winter Park, FL

William Y. Pike & Jack Norfleet
US Army Research Laboratory
Orlando, FL

Richard Kelly
Joint Special Operations
Medical Training Center
Fort Bragg, NC

Fascia, a fibrous connective tissue, is responsible for allocating skeletal muscles and corresponding neurovasculature into function-based compartments. Pressure is capable of accumulating within these compartments, initiating the onset of a condition commonly referred to as compartment syndrome. When the pressure within the compartment compromises the arterial supply, it prevents perfusion of oxygen into the surrounding tissues, leading to tissue necrosis, or tissue death. Once diagnosed, a fasciotomy must be performed immediately to prevent severe complications. A recent study evaluated the incidence of fasciotomies performed during Operations Enduring Freedom and Iraqi Freedom and found that of 4,332 casualties to the extremities, 669 (15%) underwent a fasciotomy. According to the Joint Special Operations Medical Training Center (JSOMTC), the current training methods are insufficient for practicing the surgical technique, while other methods, such as cadaveric and live tissue training, are cost-prohibitive for the number of students that require annual training. The U.S. Army Research Laboratory Human Research and Engineering Directorate Advanced Training and Simulation Division (ARL HRED ATSD) identified the requirement to develop a next-generation lower extremity fasciotomy Part-Task Trainer (PTT) in response to JSOMTC's need for a more realistic, durable, and cost-effective training approach. The paper will describe the research conducted to satisfy these requirements, including identifying, developing, and validating the essential anatomy and physiology required to provide a realistic and effective next-generation surgical PTT. Additionally, the paper will explore how innovations in novel synthetic materials provided realism approaching traditional methods while greatly minimizing cost and maximizing training opportunities.

Key words: Fasciotomy, simulation, part-task trainer, lower extremity, compartment syndrome

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

MODELING COMBAT AIRCRAFT TRAINING AND READINESS

2017 IITSEC Paper No. 17149

Justin Carlson
The Boeing Company
Seattle, WA

The simulation of combat aircraft operations has been evolving for over thirty years, with myriad applications, ranging from optimizing aircraft maintenance policies to predicting a developmental aircraft's combat reliability. The problem asks the modeler to represent multiple, independent aircraft—sometimes operating from different bases—and the required aircraft maintenance that follows each flight.

Methods vary in their complexity, but most have measured success in terms of total sorties generated or flight hours flown. In other words, all sorties are considered equally valuable. While this assumption has some applications, a combat squadron spends most of its time and resources on advanced training (or, "workup") for combat, which requires pilots to execute a defined sequence of training events. Success, in other words, requires more than simply generating a sortie; the squadron must generate a sortie, with the right pilot, flying the right event, at the right time. This presents a dilemma: some sorties have more training value than others, but they all incur the same maintenance cost. Squadron leaders manage this dilemma through policies and priorities that seek to optimize training and minimize maintenance. Complicating matters are pilot turnover and resources that are shared between multiple squadrons.

This paper examines the squadron workup process within the requirements and constraints of the Marine Corps F/A-18 Hornet community—a particularly complex case. The model makes significant additions to previous successful models by adding the event dependency that characterizes the workup process, as well as an agent-based element that incorporates the priorities made by the squadron leadership. The model is driven by and evaluated against ten years of detailed flight, failure, and maintenance statistics, and offers the ability to more accurately evaluate the effects of management priorities, resource allocations, and policy decisions—such as the rate of pilot turnover—at the squadron level and higher.

LEVERAGE THE TRAINING EFFECT IN STAFF TRAINING BY AUTOMATED REPORTING

2017 IITSEC Paper No. 17133

Peter Hammar & Sinna Lindquist
Swedish Defence Research Agency
Stockholm, Sweden

Peter J. Lindskog
Swedish Armed Forces
Enköping, Sweden

This paper describes a concept and initial experiments regarding modelling and simulation as a service (MSaaS) for semi-automatic production of reports in computer assisted command post exercises (CAX).

Timely and accurate information is a critical resource in decision-making. In a wartime situation information is provided to a military staff by its subordinates. In training and mission rehearsal situations, real subordinates are often not present. The lower command is acted by a small group of personnel, whose major role, in a training situation, is to create the human to human interaction with the superior command in the staff. Adequate tools for supporting this staff is crucial, since high workload and competency requirements set constraints on the amount of information objects as well as quality of the products produced, in this case produced reports. Computerized systems play an important role to fulfill this need.

The aim has been to develop a tool for report generation as a service, independent of what simulation system used, in a way that the tool can generate reliable and believable textual reports as if they were produced by a human-manned staff, both in terms of their quality and quantity. Today several services, such as simulation systems for computer generated forces, are networked together in an information sharing federation. The prototype for the report generation service uses information from the federation and produces textual reports about the situations and activities in the simulated environment. These reports are expressed using standard formats and are to be automatically fed into the command and control system used by the trained staff.

Initial experiments at a staff exercise demonstrate validity and usefulness of the concept. The paper discusses methodological and technical requirements, such as information needed, additional federated services, and requirements on simulation systems, and points out important issues for further investigation.

THURSDAY, 30 NOVEMBER, 2017 ROOM S320B

S10 Information and Data Management

0830
Army Training Data Management Using a Product Line Approach (17093)

0900
Information Management: A Core Enabler of the MSaaS Ecosystem (17061)

0930
Operational Data to Stimulate Simulation Systems and Enhance Training (17107)

Notes

ARMY TRAINING DATA MANAGEMENT USING A PRODUCT LINE APPROACH

2017 IITSEC Paper No. 17093

Roy Scrudder, Kevin Gupton
Applied Research Laboratories
The University of Texas at Austin
Austin, Texas

Dr. Rob Cox, Paul Dumanoir
PEO Simulation, Training, and Instrumentation
Orlando, Florida

The Program Executive Office for Simulation, Training & Instrumentation (PEO STRI) Project Manager Integrated Training Environment (PM ITE) fields a wide variety of virtual, constructive, and gaming (VCG) simulations, that operate both in stand-alone and integrated modes. As with most simulations systems, these VCG simulations are largely data driven—both in data that is engineered into the capabilities when they are delivered (e.g., equipment characteristics), and data that is developed for use of these systems (e.g., terrain and scenarios). Although there is a great amount of overlap in the data these systems require and manage, each has its own data management capabilities (e.g., scenario generation). In addition to the stand-alone data management capabilities for these VCG simulations, there are separate capabilities for federations in which these VCG simulations are integrated.

PM ITE conducted an analysis of a subset of the current data management capabilities, specifically those integrated via the LVC Integrating Architecture (LVC-IA), and then developed a proposed architecture and transition strategy for how data management could be conducted in a more efficient and effective manner, with improved data quality. This paper describes the "as-is" analysis of the data management capabilities and identifies the common requirements and overlapping capabilities. It then presents the proposed "to-be" architecture. This "to-be" architecture aligns with the newly adopted ITE software product line methodology, in which shared assets are identified, managed, and incorporated into multiple products. In the case of data management, these shared assets are not only software, but encompass data exchange agreements, common requirements, common architecture design, and data interchange formats. Although the analysis described in this paper focused on a subset of the systems in the ITE, the analysis approach and many of the architectural recommendations are applicable to the full range of the ITE portfolio, and to other Army, Service, and even national capabilities for simulation data management.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

INFORMATION MANAGEMENT: A CORE ENABLER OF THE MSAAS ECOSYSTEM

2017 IITSEC Paper No. 17061

L. Stewart
Systems Engineering & Assessment Ltd
Bristol, UK

B. Mason
Envitia Ltd
Horsham, UK

The concept of Modelling and Simulation as a Service (MSaaS) has been a topic of investigation for the global modelling and simulation community in recent years, due to the potential it offers for the delivery of flexible, modular simulations in which services and resources can be re-used to deliver many different applications. Rapid reconfiguration of existing resources to provide new capability has value to many different simulation stakeholders, and service-oriented architectures offer a novel approach to achieving this goal.

In order to deliver the MSaaS vision, a move to a new architecture is required in which individual simulation services and resources exist independently and are used to compose a wide range of simulation systems. This type of architecture delivers an ecosystem. A core enabling technology for the implementation of an MSaaS ecosystem is a comprehensive and flexible information model underpinning all participation by services, resources and human actors. This information model must support and enable many different types of components in accordance with many different standards in order achieve the required levels of interoperability and re-use.

This paper presents a high-level, implementation-independent approach to information management for MSaaS, based on a developed multi-layered information model. This model contains an information layer, defining the information and data that exist within the ecosystem, a metadata layer, and a registry layer, which defines a structure for a searchable registry in which data and metadata, and their associations, are catalogued and managed. The paper then specifies how and why this type of approach to information management is a pre-requisite for achieving all of the benefits that MSaaS has to offer.

OPERATIONAL DATA TO STIMULATE SIMULATION SYSTEMS AND ENHANCE TRAINING

2017 IITSEC Paper No. 17107

Jesper Borg
Danish Army Simulation Center
Oksbøl, Denmark

Emilie A. Reitz
Leidos
Norfolk, VA

For years, the use of simulation by smaller countries has been marked by the saying, “it is very expensive to be poor.” In contrast to the larger coalition partners or the budgets of a potential adversary, smaller countries have fractional military budgets; this makes it difficult to acquire the same assets as larger partners. When it comes to training, the utility of simulation is acknowledged, but spending, particularly in smaller countries, is often appropriately prioritized elsewhere. This leads to an approach where simulation is expected to alleviate training constraints, but must do it from a fixed amount of limited funds. Though this approach results in an inherent drawback based on the amount of resources used to setup and execute the training as well as to connect virtual / constructive simulation models to existing Command and Control (C2) systems. This requires trained technicians, and trained support personnel, all of which can exceed the number of personnel in the training audience.

This support staff-heavy model can be changed. This paper will describe techniques to utilize existing data previously generated by the training audience to enhance their training potential, while actually minimizing the amount of support personnel required for a training instance. It will additionally describe a recent use case where the Danish Army, during a military demonstration and assessment, tested the first steps in merging the C2 real world with simulation, going from live to virtual and back. Although not fully scaled, it showed how to merge live and virtual in a cost effective way. Executed successfully and at a larger scale, similar techniques will lead to a future where information flows freely between tactical C2 systems and virtual/constructive simulation models. This will create better, more affordable, solution-focused training that will benefit future soldiers in a practical and measurable way.

THURSDAY, 30 NOVEMBER, 2017 ROOM S320B

S11 Test and Analysis

1030
Discrete Event Logistics System Model: Calculating Simulator Remaining Useful Life (17154)

1100
Using Business Technologies to Cut Simulation Support Costs (17031)

1130
LVC Environment to Support System-of-System Cyber Testing (17094)

Notes

DISCRETE EVENT LOGISTICS SYSTEM MODEL: CALCULATING SIMULATOR REMAINING USEFUL LIFE

2017 IITSEC Paper No. 17154

Corey T Hendricks
Raytheon
Orlando, Florida

Marilyn Zett
Raytheon
Dulles, Virginia

The US Army formally announced in 2015 that less funding will be applied to the development of new simulators and that the sustainment of the existing systems will need to be extended further. This decision made urgent the need for the development of a practical Discrete Event Logistic System (DELS) model to calculate remaining useful life for simulators and their subordinate components. As an initial approach, a two phased Remaining Useful Life (RUL) calculation using a DELS framework based upon single point failure analysis was developed. However, the premise for the two step RUL calculation is based upon having a prognostic health management (PHM) system in place to support condition based maintenance activities. This paper discusses and implements modifications to the two step RUL calculation to fit the current US Army fielded Training Aids, Devices, Simulators, and Simulations (TADSS). Multiple domain specific variables are introduced such as utilizing inherent system availability to identify the simulator's initial point of failure in place of an arbitrary selection in remaining useful life calculation (RUL1). Failures-In-Time (FIT) are identified using work orders in the maintenance management component of the Integrated Logistics System to identify achieved system availability utilized in updating the second remaining useful life calculation (RUL2). Introduction of a Rate of Occurrence of Failure (ROCOF) methodology accommodates for the lack of available system utilization data by basing simulator utilization on contracted scheduled training hours. In introducing the ROCOF methodology, a time based Non-Homogeneous Poisson Process (NHPP) is used to describe the distribution of failures. The modifications defined in this model supports the military's objective to continue delivery of world class simulation systems beyond its planned lifecycle by deploying a dynamic discrete event logistics system.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

USING BUSINESS TECHNOLOGIES TO CUT SIMULATION SUPPORT COSTS

2017 IITSEC Paper No. 17031

Richard Crutchfield, Adam Heeren
The MITRE Corporation
Orlando, Florida

Paul Dumanoir
U.S. Army PEO STRI – PdM WTI
Orlando , Florida

The use of simulation to achieve training and test and evaluation goals requires technical support staff to execute complex processes and complicated, labor-intensive activities. The need for support increases as the Army interoperates live, virtual, and constructive simulations together.

Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI) developed an enterprise architecture, the Live-Synthetic, Training, and Test and Evaluation Enterprise Architecture (LSTTE EA). One of the goals of this enterprise architecture was to allow stakeholders from the training and test & evaluation communities to manage the linkages between the Technical Reference Architecture (TRA), business processes and governance structures and to facilitate discussions within the Modeling and Simulation (M&S) community. Toward that end, PEO STRI developed a Proof-of-Concept (PoC) software implementation of the LSTTE EA technical reference architecture, also known as the LSTTE Infrastructure Architecture (LSTTE IA). This paper describes our use of Infrastructure as Code (IaC) and business process modeling in the PoC implementation of the TRA, and how it reduces the need for technical support and expertise. We give an overview of the LSTTE EA and the LSTTE IA and a detailed explanation of the framework that includes the IaC and the business process modeling. Using this approach, we can capture processes and automate the execution of tasks today performed by "touch" labor and technical experts. This is not to say we eliminate all human tasks. Certain tasks require direct human decisions or input and are not fully automatable. In our experience, these decisions are generally operational in nature and do not call for great technical expertise in the underlying training simulation systems. The paper presents a comparison of the technical support and expertise needed to conduct training today and how the PoC reduces the need for this technical support and expertise, thereby also reducing cost.

LVC ENVIRONMENT TO SUPPORT SYSTEM-OF-SYSTEM CYBER TESTING

2017 IITSEC Paper No. 17094

Michael J. O'Connor
Trideum Corporation
Huntsville, AL

Dr. Kenneth G. LeSueur
US Army Redstone Test Center
Huntsville, AL

Justin R. Novak
Space and Missile Defense Command
Huntsville, AL

Carl N. Blair
Kratos Defense & Security Solutions, Inc.
Huntsville, AL

Much of the cyber simulation investment has been focused on the training community. The goal of the cyber training environments is to present the training audience with the effects of cyber-attacks. This is often done by white carding the effects or by using simulations to model the effects. This approach does not work well for testing cyber-attacks against systems. Testing requires actual cyber-attacks. Penetration testing is performed against individual systems and can be used to find many attack surfaces. However, another set of attack vectors can be uncovered when the systems are operated in an operationally realistic environment. Creating a cyber systems-of-systems test environment requires simulation of multiple data feeds to the systems under test. These data feeds must be consistent with each other and at the correct scale to provide a realistic load on the system. This can be done with a mixture of tactical systems and simulations. The other challenge is to establish networks and processes that allow the introduction of live cyber-attacks. A group of organizations located at Redstone Arsenal teamed together to create an environment for cyber testing systems developed by the team using a LVC distributed systems-of-systems approach. This required creating a set of processes to allow collaboration across the different organizations to document and plan the cyber test activities. The organizations had to standup a new network that allowed for the introduction of cyber-attacks. Additionally, the team integrated a set of simulations to stimulate the systems under test with the required tactical information exchanges. To prove out the concept the organizations created a verification event to test the environment. This paper will document the challenges and solutions the team encountered in the development of the test environment as well as the results from the event.

THURSDAY, 30 NOVEMBER, 2017 ROOM S320B

S12 Standards and Networks

1330
Quality of Service for Distributed Simulation Environments (17278)

1400
Compressed DIS (17074)

1430
Establishing a HLA Certification Process in NATO (17058)

Notes

QUALITY OF SERVICE FOR DISTRIBUTED SIMULATION ENVIRONMENTS

2017 IITSEC Paper No. 17278

Eberhard K. Kieslich
ARCIC/JAMSD
Fort Knox, KY

Diana Pineda
ARCIC/JAMSD
Orlando, FL

This paper summarizes discoveries and remedies of simulation protocol data loss across the Battle Lab Collaborative Simulation Environment (BLCSE) Wide Area Network (WAN). The use case for a network supporting large-scale constructive simulation, combined with other traffic, carries special requirements outside the typical boundaries for normal systems administration of a WAN. Understanding the challenges and solutions involved is certainly not mundane. Simulation data losses in excess of 1% can impose compounded causal effects that will easily jeopardize the analytical benefit of an experiment. The possibility of data loss must be vigilantly monitored and vigorously interdicted. One root cause of packet loss is network congestion. Congestion occurs at chokepoints, which exist in nearly all network topologies where a number of hosts on a local network aim to connect to resources at remote destinations via a shared infrastructure. Another, unanticipated cause of loss is technology integration conflict, based on original design assumptions. Finally a more surprising and insidious cause is the burstiness of simulation traffic in which High Level Architecture (HLA) packet loss occurs at utilization levels far below the bandwidth threshold (i. e. without congestion). Over time, the approach of the Cyber Enterprise Support Center (CESC) and Army Capabilities Integration Center (ARCIC)/Joint Modeling and Simulation Divisions' (JAMSD) management of the BLCSE network has evolved from reaction, to monitoring, to deliberate stimulation and most recently to the intentional, governing configuration and application of the Cisco IOS Quality of Service (QoS) technology. The hard-felt experiences of the BLCSE community, as well as the powerful off-the-shelf and custom technologies used will provide a tremendous value to the greater modeling and simulation community, and should be seriously considered for other wide-area simulation environments.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

COMPRESSED DIS

2017 IITSEC Paper No. 17074

Lance Call, Scott Swigert, Mitchell Zamba
L3 Technologies
Mesa, AZ

David Noah
Air Force Research
Dayton, Ohio

Radio Frequency (RF) networks have a limited bandwidth compared to landlines. Therefore, when operating over RF, it is desirable to use the available bandwidth with the greatest efficiency possible. The Compressed Distributed Interactive Simulation (C-DIS) standard developed by the Air Force Research Laboratory (AFRL) is a compressedformat version of the IEEE 1278.1-2012 Distributed Interactive Simulation (DIS) standard that significantly increases transmission efficiency. It is a government owned, non-proprietary standard. C-DIS is a bit-oriented data standard that reduces the size of DIS packets by 50-to-70 percent, effectively more than doubling the bandwidth of a network. The C-DIS standard will be used on the 5G-Advanced Training Waveform (5G-ATW) RF network as part of the Secure Live Virtual Constructive Advanced Training Environment (SLATE) Advanced Technology Demonstration (ATD).

C-DIS maintains all of the currently used DIS Protocol Data Unit (PDU) fields, concepts, approaches and enumerations, making translation from DIS to C-DIS and from C-DIS back to DIS efficient and accurate. It is intended to be used as a transport-level compression that allows DIS data to be readily compressed by transmitters and decompressed by receivers. C-DIS supports current standard SISO and CAF DMO enumerations and values and allows for future enumeration growth.

In addition to standard DIS messages, C-DIS also supports compression of the CAF DMO-defined messages used for Active Electronically Steered Antenna (AESA) Radars and Advanced Jammers. These messages include the Radar Track Report, Jammer Report Record, and Jammer False Targets Record. This enables the modeling of Electronic Attack and Jamming over the limited bandwidth RF network available for Live Virtual Constructive operations.

This paper discusses C-DIS compression techniques, message formats, usage rules, and performance results.

ESTABLISHING A HLA CERTIFICATION PROCESS IN NATO

2017 IITSEC Paper No. 17058

Horst Behner
Bundeswehr Joint Material Office
Koblenz , Germany

Björn Löfstrand
Pitch Technologies
Linköping, Sweden

NATO relies on standards and agreements. Especially in distributed simulation, standards are evident e.g., AMSP01, NETN FAFD, STANAG 4603 and many more. There had been the HLA Federation Compliance Test Tool (FCTT), provided by the USA, but since 2004 there were no more updates available. The NATO Exploratory Team (ET-035) concluded in 2014 that HLA compliance testing is still important and that it needs to be extended beyond the HLA interface and data exchange testing and to address more complex federation agreements and requirements. In conjunction to the development of a new certification tool there is a need to maintain and update the NETN FAFD, as well. The NATO Modeling & Group (MSG-134) began its work in October 2015 and will deliver an Integration, Verification and Certification Tool (IVCT), a Concept of Operation and an updated NETN FAFD in October 2017. During the development of the open source tool, it will be tested in a real use-case of CWIX 2017 at JFTC, in June 2017. The expectation is the broad use of IVCT in NATO and on national level in the procurement process of simulators and by industry during the development process of simulators. Testing and certifying of systems and issuing badges (according on the requirements) will result in an increased interoperability of simulators in distributed networked simulation systems.

TUESDAY, 28 NOVEMBER, 2017 ROOM S320E

T1 Optimizing Team Performance

1400
Increasing Cognitive Readiness in Joint Command Battle Staffs (17048)

1430
Assessment Instruments in Support of Marine Instructor Development (17180)

1500
Systematic Team Assessment Readiness Training: Live, Virtual, Constructive Distributed Missions (17229)

Notes

INCREASING COGNITIVE READINESS IN JOINT COMMAND BATTLE STAFFS

2017 IITSEC Paper No. 17048

Jacob D. Biever
Northrop Grumman
Suffolk, VA

Emilie A. Reitz
Leidos
Norfolk, VA

This paper builds on the three year research and development project for Joint Continuum of eLearning (Fautua et al, 2014) and discusses the Joint Staff J-7's (Joint Training) initial effort last year to develop measures and assessments of cognitive performance among cross-functional staffs and planning teams in Joint Force Commands (Reist et al, 2016).

We will first review the initial results that indicated (but not conclusively) staffs and teams increased cognitive readiness using the joint blended learning training methodology; namely, by integrating online courses (and metrics) to achieve a declarative learning baseline; tailoring classroom discussion to address identified knowledge gaps based on the embedded course metrics; and small group scenario-based problem sets that stressed the staffs/planning teams to perform under calibrated duress. The most important aspect of this approach was the addition of a facilitated/guided after action review/reflection on the team's cognitive performance (i.e. review of the staff's ability to frame the problem and demonstrate specific aspects of higher order skills, like critical thinking, problem solving, anticipation, agility, and adaptiveness.). The challenge remains to create a valid, reliable collection tool that, while adapting existing theories and frameworks of problem-solving process and social dynamics that affect performance and group cognition, is accessible to trainers. We will discuss how to arm trainers with the theories, frameworks, and collection tools necessary to evaluate a training audience from a cognitive perspective and collecting data using the TEIR concept. TEIR stands for triggering, exploration, integration, and resolution, and the associated framework provides insights into group performance. Finally, we will discuss the process of decoding speech, analyzing data, and drawing conclusions from seven small group training events, which shows promise for helping staffs gain higher-order knowledge, skills and abilities like anticipation, problem solving, and adaptiveness.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

ASSESSMENT INSTRUMENTS IN SUPPORT OF MARINE INSTRUCTOR DEVELOPMENT

2017 IITSEC Paper No. 17180

Jennifer K. Phillips & Karol G. Ross
Cognitive Performance Group
Orlando, FL

Patrick J. Rosopa
Clemson University
Clemson, SC

Marine Corps instructors typically serve three-year assignments with no prior teaching experience. Although they may be subject-matter experts, the ability to pass knowledge to others is a distinct skill set and the training they receive to do so varies greatly. To maximize instructor performance, there is a need to accelerate the development of their teaching proficiency. To address this need, our team developed a mastery model for USMC instructors which describes the desired performance and provides a roadmap for development (Vogel-Walcutt, Phillips, Ross, & Knarr, I/ITSEC, 2015). The model was adopted as the basis for a new Training and Readiness Manual for instructors and as part of staff and faculty development policy. This paper reports on the next step, application of the model to develop and validate a Marine Instructor Assessment Toolkit. Assessment tools were developed to support the formal schools in accelerating instructor development with feedback-oriented instruments. They include an Observation Rubric for instructional settings, a Supervisor Rating Form for holistic instructor performance, a Self-Reflection Tool, and a Situational Judgment Test. The tablet- and web-based tools were field tested to gather user input at formal schools, and data were subjected to psychometric analysis which found the Observation Rubric and Supervisor Rating Form to be reliable and valid instruments. After field testing, the tools were finalized based on the psychometric analysis and user input. As the front end of transition to the formal schools, a baseline of instructor proficiency is currently in process to include a sample of up to 300 instructors. The baseline will serve as comparison data for future instructor performance measurements after full implementation of the instruments across the formal schools. Transition efforts following establishment of the baseline will consist of train-the-trainer workshops to familiarize the formal schools with the mastery model and the assessment tools.

LIVE, VIRTUAL, CONSTRUCTIVE DISTRIBUTED MISSIONS: RESULTS AND LESSONS LEARNED

2017 IITSEC Paper No. 17229

Robb Dunne, PhD
Zenetex, LLC
Orlando, FL

LtCol. Scott Harris (Ret)
UCF IST
Orlando, FL

Alexander Arrieta
TECOM
Quantico, VA

Scott Tanner
NAWCTSD
Orlando, FL

Brett Vonsik, Jonathan Lalor, Shawn Muir
Lockheed Martin Rotary and Mission Systems Innovation and Demonstration Center
Orlando, FL

A Capabilities-Based Assessment chartered by the Commanding General, Training and Education Command identified the Live, Virtual, Constructive – Training Environment (LVC-TE) capabilities required by the United States Marine Corps (USMC). These capabilities enable the LVC-TE to create a common environment for units to train across LVC domains as though located in the same battlespace and, "provide the means to conduct realistic, collaborative training and exercise of warfighting functions" (Initial Capabilities Document, USMC, 2010).

Subsequently, Training and Education Command (TECOM) required assessments be conducted for simulation training systems used in an LVC-TE intended to address recommendations identified by Marine Requirements Oversight Council Decision Memorandum and developed further by an LVC-TE Working Group. Special Operations Command followed on these recommendations and consequently requested that Headquarters, Marine Corps include the Marine Corps Special Operations Command requirement for Special Operations Terminal Attack Controller training in this effort. Thus, through collaboration with Program Manager Training Systems (PM TRASYS), TECOM, Naval Air Warfare Center Training Systems Division (NAWCTSD), Marine Corps Tactics & Operations Group, Lockheed Martin (LM), and Instructional Systems and Engineering contracted support, a team was assembled to design, develop, implement and evaluate a unique and ambitious Distributed Mission Training Environment (DMTE).

This paper first describes the three currently fielded training devices whose capabilities to support training objectives (tasks associated to Training and Readiness events) were assessed to determine suitability for inclusion in the DMTE then the methodology of the DMTE evaluation. This paper then details the Systematic Team Assessment of Readiness Training (START) process that was employed to confirm and illustrate the capability of the training devices to provide value added training in the DMTE. Results, analysis and the most salient lessons learned are then presented. Finally, the projected movement forward of this DMTE effort is briefly described.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320E

T2 Training Optimization

0830	0900	0930
Holistic Environment Generation and Multi-domain C2 Training (17165)	Optimized Pilot Training for Combat Aircraft (17199)	Using Innovative Systems Thinking to Optimize Royal Navy Training (17084)

Notes

HOLISTIC ENVIRONMENT GENERATION AND MULTI-DOMAIN C2 TRAINING

2017 IITSEC Paper No. 17165

Lt Col Aaron Hatch & Maj Chris Bulla
United Stated Air Force
Nellis AFB, NV

Advancing command-and-control capabilities is one of the United States Air Force Chief of Staff's top priorities, and has charged the U.S. Air Force with answering the question: "How do we get to a point where we are…operating at a speed of decision making and force movement that our enemies can't counter?" Answering this question and preparing U.S. and coalition forces for tomorrow's fight requires the ability to project power and create seamless effects in air, space, and cyberspace while denying the adversary the ability to do the same. In the challenging threat environment of the future, the U.S. may not enjoy the same asymmetric technological advantages it's relied on in the past. Our ability to gain and maintain multi-domain superiority will depend less on stove-piped capability advantages and more on our ability to integrate capabilities across all domains though multi-domain command and control (MDC2). Training to fight against a 5th generation-capable adversary in any domain, let alone all, is not possible solely in a live training environment, rather, it requires live, virtual, and constructive (LVC) elements woven together into a realistic, holistic training context. Currently, there are no training ranges that blend LVC across all the domains in a truly comprehensive manner; however, future warfighter readiness demands progress towards this goal. Premier combat air forces exercises have begun to address MDC2 requirements; however, they still face limiting factors such as a lack of range-to-range integration and the need for tightly choreographed white force actions that are manpower intensive and prone to human error and effects latency. The purpose of this paper is to highlight gaps in technology and policy that impede progress in meeting CSAF's intent and to provide recommendations for improving advanced readiness training that presents a holistic, integrated, realistic training environment—including LVC and MDC2—for US and coalition forces.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

OPTIMIZED PILOT TRAINING FOR COMBAT AIRCRAFT

2017 IITSEC Paper No. 17199

Guro K. Svendsen, Idar Ulvestad Haugstuen, & Ole Martin Mevassvik
Norwegian Defence Research Establishment (FFI)
Kjeller, Norway

Henning Rorvik
Norwegian F-35 Program,
Norwegian Defence Materiel Agency
Kjeller, Norway

Training of combat aircraft pilots is a complex task, with available time being one of the main challenges. The pilots train on a set of missions according to a comprehensive training programme, with formations of various sizes. Required training currency for the different missions implies that it is challenging for the pilots to train sufficiently within available time. In addition to live training in the aircraft, simulator training will also be an important part of the future Norwegian training concept for combat aircraft pilots and is integrated in the training programme.

To support the Norwegian F-35 Program, the Norwegian Defence Research Establishment (FFI) performs analyses on the training system planned for the F-35. Here, we present the simulation tool TREFF2. The tool has been developed to analyse how realizations of possible training concepts affect training efficiency. One important factor is the qualification of the pilots, which limits the possible positions they can fill in a formation. Another important factor is the distinction between planned pilot and aircraft availability, and the actual resources in use. The training system must have enough flexibility to handle unexpected events like pilot absence and sortie cancellations. TREFF2 simulates scheduling of pilots to training missions for a given planning horizon, and also the daily training utilizing the actual available resources.

TREFF2 can be used to analyse the training system and identify possible bottlenecks, taking into consideration the qualifications of the pilots in the squadron and the available number of aircraft and simulator sorties. TREFF2 provides insight into the number of sorties needed to complete the training program and whether or not there is sufficient time available for the pilots to complete their training.

USING INNOVATIVE SYSTEMS THINKING TO OPTIMISE ROYAL NAVY TRAINING

2017 IITSEC Paper No. 17084

Lt Andrew Christie, Lt Cdr Robert Floyd, & Cdr Steve McLaughlin
Royal Navy
Portsmouth, United Kingdom

While the Royal Navy (RN) has long recognised the opportunities presented by innovative training technologies and methodologies, current generations have inherited a training model that remains predicated on formal, instructor-led residential training. As the RN is looking to embrace more agile manning solutions, it is essential that the Service has mechanisms for delivering training to match.

To address these challenges, Project OPTIMUS was established to determine a more sustainable, effective and efficient system of generating People Capability through active exploitation of innovative learning theory, technology and practice. Its key argument is that new technologies, processes or ideas will only effectively root in training systems from a more collaborative approach between Service and Industry based on mutual incentives for coherent innovation.

However, discrete modernisation efforts have historically failed once local advocacy has subsided. Conversely, enduring innovation has arrived in the form of 'stove-piped' training solutions to support new equipment, or has been imposed by Defence programmes seeking localised efficiencies.

Theory of Constraints (TOC) has been used to model the complex reality of the naval training system and to gain new insights: a Current Reality Tree (CRT) was constructed and used to identify core problems and 'vicious cycles' impeding innovation. Consequently, a strategy was developed to target points of leverage and create favourable conditions for stakeholder collaboration.

This paper outlines the technique used to model the extant naval Training and Personnel systems and summarises the findings from this modelling stage. It links the findings to the subsequent strategy, shows how the resulting package of actions was developed and will be implemented, including a description of the challenges faced, and evaluates the extent to which the work has shaped the conditions for successful optimisation of RN training.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320E

T3 Measures Developed for Team Performance

1030
JTAC/JFO Team Training Effectiveness in a Simulation-based Environment (17036)

1100
Using IoT Sensors to Enhance Simulation and Training in Multiteam Systems (17064)

1130
Measuring Team Performance and Coordination in a Mixed Human-Synthetic Team Training Environment (17301)

Notes

JTAC/JFO TEAM TRAINING EFFECTIVENESS IN A SIMULATION-BASED ENVIRONMENT

2017 IITSEC Paper No. 17036

Chantale Wilson, Lon Hopson
Air Force Research Laboratory
Dayton, OH

Ashley Wade
Leidos
Beavercreek, OH

Caitlan Rizzardo
Aptima
Fairborn, OH

Joint Terminal Attack Controllers (JTACs) sometimes have to rely on trained Joint Fires Observers (JFOs) during combat to provide them with timely and accurate targeting information in support of close air support operations. Simulator-based training capabilities are available to most JTACs and JFOs but they do not often train together in such environments. Therefore, a key question is the extent to which simulation-based training (SBT) can enhance the operational effectiveness of JTAC/JFO teams. Our research addresses this question by developing a first-ever JTAC/JFO integration study to examine the effectiveness of integrated training via multiple objective and subjective measures. Because this was the first study of its kind, we conducted a preliminary evaluation as an initial step to explore the possibility of effectively training JTACs and JFOs together in a simulation-based environment. Sixteen Air Force JTACs and five Army JFO personnel participated in week-long team training research trials. Training was conducted via the Joint Terminal Attack Controller Training Rehearsal System simulator (JTAC-TRS) to provide simulated scenario training experiences. Objective measures of performance were collected throughout the training week via the Performance Evaluation Tracking System. Subjective measures of mission effectiveness were collected via observation and evaluation by researchers and JTAC instructors. JTAC/JFO teams rely heavily on verbal communication and coordination to accomplish mission objectives. Therefore, this study also tested innovative methods for measuring team effectiveness reflecting these unique communication and coordination activities. As expected, results from this study found that JTAC/JFO team performance improved significantly from pre- to posttraining. More importantly, JTAC and JFO participants reported that this training was both valuable and necessary. This suggests that training in a simulation-based environment for JTAC and JFO personnel at the team level can significantly enhance training outcomes, including learning, performance, and overall mission effectiveness or transfer.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

USING IOT SENSORS TO ENHANCE SIMULATION AND TRAINING IN MULTITEAM SYSTEMS

2017 IITSEC Paper No. 17064

Samantha Dubrow[1], Christian Dobbins[1], Brenda Bannan[2], Stephen Zaccaro[1], Nathalia Peixoto[3], Hemant Purohit[4], Mohammad Rana[4], Michael Au[3], Jeff Segall[5]

George Mason University, Fairfax Virginia Industrial-Organizational Psychology[1], Instructional Design and Technology/Learning Technologies Design Research[2], Electrical and Computer Engineering[3], Information Sciences and Technology[4]

InFlow Interactive LLC Washington, DC[5]

The vast amount of data being collected by sensors and wearable devices in healthcare simulations has yet to be harnessed to improve our understanding of teamwork and coordination between teams. For instance, a recent paper argued that several constructs serve as essential indicators of the quality of between-team activities including coordination, boundary spanning, and adaptation (Lazzara, Keebler, Shuffler, Patzer, Smith, & Misasi, 2015). This is a valuable theoretical insight, but the key to unlocking the full potential for real-world application in training and simulation is dependent on our ability to find proxies to measure those phenomena. Sensors that record proximity, position (GPS), and speech pattern data have been used as proxies for coordination, communication, and other team processes, including task management, situational awareness, and decision-making (Feese, Burscher, Jonas, & Tröster, 2014; Rosen, Dietz, Yang, Priebe, & Pronovost, 2014). Generally, data are gathered throughout an entire simulation, without a focus on which team inflection points and performance episodes are most important to capture. Moreover, emergency response scenarios are often handled by a complex system of teams varying in their betweenteam interdependencies. These systems are referred to as multiteam systems (MTSs), which are made up of two or more teams that work together interdependently toward a common goal, while separately working toward more proximal goals (Mathieu, Marks, & Zaccaro, 2001). In this paper, we review the data sources being used to describe team behaviors, discuss how to make decisions about data collected during MTS scenarios, and the importance of the data validation process. Two case studies (one Healthcare and one Fire and Rescue scenario) are reported to demonstrate the use of various sensors during simulations. Finally, directions for reporting data in after action reviews and the implications for training using an event-based approach are provided.

MEASURING TEAM PERFORMANCE AND COORDINATION IN A MIXED HUMANSYNTHETIC TEAM TRAINING ENVIRONMENT

2017 IITSEC Paper No. 17301

Robert K. McCormack, Tara A. Brown, Kara L. Orvis, & Samantha Perry
Aptima, Inc.
Woburn , MA

Christopher Myers
Air Force Research Lab
Dayton, OH

The Air Support Operations Center (ASOC) is a complex sociotechnical system. It manages routine events and crises by processing a massive flow of information that originates from a variety of external agencies via numerous communication channels and procedures and across a variety of classification levels. To address the challenge of training individuals and teams to face the complexities of the ASOC environment and to learn how to effectively coordinate, the Air Force has developed the Joint Air-to-Ground Simulation System (JTAGSS). JTAGSS provides ASOC operators with the opportunity to train as a team and to encounter realistic scenarios presented in operational contexts. To achieve this training opportunity, while maintaining current support of operations, work is currently underway to apply a combination of both human and synthetic agents to fill the variety of ASOC positions (Myers, et. al., 2016). Effective training in any environment, and particularly in an environment that requires close coordination across heterogeneous entities, requires effective measurement. To realize the impact of training on the operational environment, trainers must know what to measure, how to measure it, and how to communicate the results. Currently, there are no reliable measures of performance (MOP) and measures of coordination (MOC) that trainers can utilize to ensure progress in teams within the JTAGSS. The purpose of this research was to develop and validate measures of team coordination for mixed human and synthetic teams. The researchers applied the Rational Approach to Developing Systems-based Measures (RADSM) approach (Orvis, DeCostanza, & Duchon, 2013) to develop and validate the coordination measures. The coordination measures were based on virtual communications data and validation was accomplished through a Monte Carlo simulation which utilized representative training data. This study provides evidence of the use of communications-based data in measuring performance related to team coordination.

WEDNESDAY, 29 NOVEMBER, 2017 ROOM S320E

T4 Life in the Big Sim

1600
Creating Data Driven Training Scenarios (17203)

1630
Advanced Readiness 2025: Balanced Investments Across Live, Virtual and Constructive (17241)

1700
Toward Augmenting Army Aviation Collective Training with Gamebased Environments (17282)

Notes

CREATING DATA DRIVEN TRAINING SCENARIOS

2017 IITSEC Paper No. 17203

Webb Stacy, John Colonna-Romano, Georgiy Levchuk, Brent Fegley
Aptima, Inc.
Woburn, MA and Orlando, FL

J.T. Folsom-Kovarik, Charles Newton
SoarTech, Inc.
Orlando, FL

We live in a virtual explosion of data. The Internet generates an estimated 2.5 quintillion bytes of data every day. Though the data from instrumentation on aircraft, vehicles, ships, autonomous systems, simulators, and, increasingly, humans themselves does not reach this scale, its volume is significant and increasing. It is natural to want to use this wealth of data to build realistic training scenarios. The chief difficulty is that, whatever events were recorded, they represent only one path through the world. This makes the recording suitable for replay, but a recording cannot give students the chance to make choices in the simulated world that would take them down different paths. Recordings cannot be directly used for training scenarios unless additional steps are taken. This means that accommodations must be made, through subject-matter expertise, machine learning, or both, to synthesize the data into realistic entity behaviors in a scenario. In this paper, we discuss our experiences building several systems that take these additional steps, which generally involve machine learning and intelligent agents, and we discuss in detail an effort that focuses on creating realistic constructive maritime patterns of life from real-world data. We conclude by discussing the training value of learning patterns of life from real world data, and lessons learned that will be useful to help other training professionals create realistic data-driven training scenarios.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

ADVANCED READINESS 2025: BALANCED INVESTMENTS ACROSS LIVE, VIRTUAL AND CONSTRUCTIVE

2017 IITSEC Paper No. 17241

Lt Col Jacob Hammons
United States Air Force
Nellis AFB, NV

Since the last training paradigm shift in 1972, the Air Force introduced additional mission and new capabilities which cumulatively adds significant warfighting capability. While our training strategy has evolved to prepare warfighters to conduct current overseas contingency operations, our infrastructure has not kept pace with near-peer adversaries' technology advancements, resulting in the inability to train effectively to Anti-Access/Area Denial scenarios. The correct mix of Live (L), Virtual-Constructive (Synthetic), and Synthetic into Live (Blended) Training can be optimized across AFI 11-2-MDS Vol 1 series and Ready Aircrew Program (RAP) Tasking Messages to prepare tomorrow's Air Force to win in air, space and cyber unit's Designed Operational Capability Statements through targeted investments in these training methodologies. The Air Force needs to rebalance L, V, and C methodologies to ensure Operational Training and Test investments are prioritized appropriately. It is hypothesized that a greater percentage of integrated synthetic test/training is required to be ready for Anti-Access/Area Denial scenarios than what is currently prescribed. This paper presents the findings of warfighter surveys conducted across the United States Air Force Warfare Center subject matter experts to identify gaps between 4th and 5th generation test and training requirements and what is actually being accomplished via RAP Tasking Documents and Mission Design Series Vol 1 requirements. The survey findings show the Air Force's need to improve L, V, and C infrastructure and methodologies to maximize warfighter readiness. From these results, the paper presents a proposed strategy of test and training best done or only done in Live fly versus test and training events best done or only done in the Synthetic environment, and where Blended Live Training might provide a cost-beneficial capability.

TOWARD AUGMENTING ARMY AVIATION COLLECTIVE TRAINING WITH GAME-BASED ENVIRONMENTS

2017 IITSEC Paper No. 17282

Lauren Reinerman-Jones, Martin S. Goodwin,
Andrew J. Wismer, & Brian F. Goldiez
University of Central Florida
Institute for Simulation and Training (UCF IST)
Orlando, FL

Robert A. Crapanzano
U.S. Army Program Executive Office for Simulation,
Training, and Instrumentation (PEO STRI)
Orlando, FL

Maintaining the highest levels of training and readiness is an ongoing concern for today's warfighters. A rapidly evolving threat landscape, ever-present fiscal concerns, and the move toward virtualization are driving the need for more efficient training methods. The U.S. Army is addressing this need by investigating the potential of game-based systems to augment traditional simulation-based aviation collective training. Game-based training is one component of the U.S. Army Aviation Combined Arms Training Strategy (2016), which highlights the use of Training Aids, Devices, Simulations, and Simulators (TADSS) as key, low-cost tools to prepare Army aviation forces for future combat. However, the effectiveness of game-based training requires further investigation, and its use as an adjunct to aviation collective training has not been adequately evaluated. The goal for the present study was to determine the potential for the low physical fidelity Virtual Battlespace 3 (VBS3) games-for-training system to augment aviation collective training conducted in the medium physical fidelity Aviation Combined Arms Tactical Trainer (AVCATT). Evaluation efforts focused on the cognitive fidelity of these training systems. Twenty-seven expert pilots participated in a realistic collective air assault mission scenario first in either the VBS3 or AVCATT training environment and then in a high fidelity Operational Flight Trainer (OFT) serving as a real world analog environment. Each environment was evaluated in terms of presence, simulation sickness, workload, performance, and HRV. The cognitive fidelity of the OFT corresponded more closely with the AVCATT than VBS3. Objective performance was comparable between the AVCATT and VBS3 and did not lead to performance differences in the OFT. This paper concludes by discussing potential ways to augment collective aviation training with lower fidelity game-based systems and by proposing design improvements for simulated collective training environments.

THURSDAY, 30 NOVEMBER, 2017 ROOM S320E

T5 What Works in VR?

0830
Enhancing Maintenance Simulation Training Devices and Their Application Through Verification and Validation (17056)

0900
Using Virtual Reality for Training Maintenance Procedures (17108)

0930
Rapid Prototyping Innovative Virtual Worlds that Include the WOW Factor (17123)

Notes

ENHANCING MAINTENANCE SIMULATION TRAINING DEVICES AND THEIR APPLICATION THROUGH VERIFICATION AND VALIDATION

2017 IITSEC Paper No. 17056

Dr. Manfred Roza, M.Sc. &
Anneke Nabben, M.Sc.
Netherlands Aerospace Centre NLR
Amsterdam, The Netherlands

Dr. Jeroen Voogd
TNO Defense, Safety and Security
The Hague, The Netherlands

Lt.Cdr. Frank Müller
Netherlands MoD,
NH90 Project Office
The Hague, The Netherlands

Over the last decade simulation training devices have made their entrance into the aviation maintenance world. Various Maintenance Training Organizations (MTOs) have acquired Maintenance Simulation Training Devices (MSTD). However, the effective usage of such devices as an integrated part of a maintenance type training program is not always evident. Such usage is further complicated by the fact that user and aviation authorities' acceptance of these devices is not well supported and lacks clear requirements. Mid 2013 a MSTD for the NH90 helicopter was delivered to the Royal Netherlands Air Force (RNLAF) Helicopter Command called the NH90 Virtual Maintenance Trainer (VMT). During the introduction in the NH90 maintenance type training in the year thereafter, the RNLAF experienced similar issues regarding the NH90 VMT training effectiveness. To gain insight in the source of these issues and enhance the effective usage of the NH90 VMT, the RNLAF requested the Netherlands Aerospace Centre NLR, to conduct a Verification and Validation (V&V) study of the NH90 VMT and its usage within the current training program. This paper will present the V&V study approach and activities. The study comprised two complementary parts. The first part focused on assessing the level of fidelity, and the functional capabilities and limitations of the NH90 VMT, and how these affected the effectiveness and efficiency of the NH90 maintenance type training. The second part directly evaluated the training effectiveness and efficiency of the NH90 VMT usage within the current and future type training program. In addition to the NH90 VMT findings and conclusions, general applicable guidelines and recommendations for the effective development and application of MSTD will be provided.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

USING VIRTUAL REALITY FOR TRAINING MAINTENANCE PROCEDURES

2017 IITSEC Paper No. 17108

Shannon K.T. Bailey, Cheryl I. Johnson, & Matthew D. Marraffino
Naval Air Warfare Center Training Systems Division
Orlando, FL

Bradford L. Schroeder
StraCon Services Group, LLC
Orlando, FL

In light of rapid technology advances and budget declines, the Navy is exploring innovative training solutions though initiatives such as Sailor 2025 and High Velocity Learning, which call for more hands-on, learner-centric training. Consistent with these initiatives, virtual reality (VR) offers a low-cost alternative to traditional methods of training by offering Sailors interactive and immersive 3-D simulation environments to train critical skills. Indeed, theoretical research predicts that such immersive training will result in better learning outcomes for training a procedural task than traditional computer-based training, yet there are few systematic experiments examining how and why VR may be effective for training. We conducted an experiment to: 1) test whether VR is as effective for training a military-based task as desktop-based training, and 2) compare two different input methods for interacting within the VR environment. Eighty-three participants were trained on maintenance procedures for the E-28 arresting gear, a system that hooks aircraft and rapidly decelerates them as they land. Participants were assigned randomly to one of three training conditions: Desktop-based simulation, Gesture-based VR, or Voice-based VR. A written recall test served as our measure of learning outcome. We analyzed the errors that trainees made during training and found differences between the conditions that suggest that Desktop training may be less efficient than VR training: The Desktop group committed more procedure-based errors, while the VR-Gesture group committed more gesturerelated errors (indicating they understood the procedure but had issues with using the system). This experiment addresses a critical gap in VR research by examining characteristics that may contribute to VR training optimization. Furthermore, these results demonstrate the potential of VR to provide ready, relevant training to the Fleet.

RAPID PROTOTYPING INNOVATIVE VIRTUAL WORLDS THAT INCLUDE THE WOW FACTOR

2017 IITSEC Paper No. 17123

Leslie A. L. Mazzone
Submarine Learning Center
Groton , Connecticut

Steven Aguiar
Naval Undersea Warfare Center
Newport, Rhode

Submarine Learning Center (SLC) and Naval Undersea Warfare Center (NUWC) have been implementing virtual world environments to deliver US Navy courses to sailors at SLC learning sites. For these courses, minimal course design changes were made to prepare them for delivery. The courses were based on design principles that modeled traditional Navy Schoolhouse classroom delivery. The traditional training classroom design has proven to be successful in getting these courses transitioned and implemented into the virtual world environment rapidly. However, student feedback has indicated that students want future virtual environments to leverage innovative virtual world capabilities that are not possible in the traditional training classroom. Based on student feedback, SLC and NUWC reviewed the literature on virtual world design solutions, and established a creative team of sailors to design virtual environments that include designs that reward student achievement, maintain engagement, and improve instructor to student interactions. This paper will describe design solutions, the process implemented to train the sailors, and the results of working with innovative designs using rapid-prototyping during the instructional design process. This paper will make two important contributions. First, it will demonstrate how implementing rapid prototyping during the instructional design process when building virtual world environments can lead to the WOW factor by enabling flexibility during the process, leading to improved designs in less time. Second, it will provide a process that others can implement to develop designs for virtual world environments using a team-based approach.

THURSDAY, 30 NOVEMBER, 2017 ROOM S320E

T6 VR the World!

1030
Collaborative Helmet and Weapon Tracking for Augmented Reality based Training (17163)

1100
Development and Analysis of Virtual Reality Technician-Training Platform and Methods (17211)

1130
Developing an Immersive Virtual Reality Aircrew Training Capability (17319)

Notes

COLLABORATIVE HELMET AND WEAPON TRACKING FOR AUGMENTED REALITY BASED TRAINING

2017 IITSEC Paper No. 17163

Supun Samarasekera, Rakesh Kumar, Taragay Oskiper, Zhiwei Zhu, Glenn Murray, Kevin Kaighn, Nicholas Vitovitch, Andy Coppock, Ali Chaudhry
SRI International
Princeton, NJ

Frank Dean, Pat Garrity
U.S. Army Research Laboratory, Human Research and Engineering Directorate, Advanced Simulation Technology Division (ARL-HRED-ATSD)
Orlando, FL

There is a need within the military to have increased levels of warfighter proficiency and readiness by providing realistic training scenarios for complex urban combat at forward and home locations. Currently, elaborate infrastructure and supporting actors are needed to create training scenarios, and record and review training sessions. Live ammunition training is limited to Force on Target training with extremely limited scenarios (no movers, same old targets); while laser-based training does allow Force on Force training, it is limited by the scheduling of exercises, range time availability and scenarios possible with live forces.

The key emerging innovative technology that addresses these shortcomings is precision mobile Augmented Reality (AR). The AR system precisely tracks actions, locations, and head and weapon pose of each trainee in detail so the system can appropriately position virtual objects in the trainee's field of view. Synthetic actors, objects and effects are rendered by a game engine on the eyewear display. Synthetic actors respond in realistic ways to actions of the trainee, e.g., taking cover, firing back, or milling as crowds. The AR-weapon can be used to fire simulated projectiles at real or synthetic entities.

This paper describes improvements made to a prototype AR system based on live testing with warfighters at a Military Operations in Urban Terrain (MOUT). We present a method for joint tracking of the helmet worn and the weapon attached sensors in a collaborative fashion in which the wearable unit on the helmet aids the weapon unit by sharing visual landmarks along with 3D location estimates in the scene. These are stored in a dynamic map on the weapon processor and continuously matched against to obtain weapon poses consistent with the head pose to provide accurate aiming capability. We also present solutions to miniaturize the system using mobile processors and smartphone sensors.

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

DEVELOPMENT AND ANALYSIS OF VIRTUAL REALITY TECHNICIAN-TRAINING PLATFORM AND METHODS

2017 IITSEC Paper No. 17211

Jeffery W. Smith & John L. Salmon
Department of Mechanical Engineering
Provo, Utah

As companies continually create products and offer services of increasingly greater complexity, the need for enhanced technical communication and training is becoming more prominent in the workplace. On the factory floor, it is especially difficult, costly, and time-consuming for technicians to successfully operate on systems and assemblies when their technical understanding of a procedure is limited due to unclear information or a lack of instructions. Virtual reality (VR) training methodologies have the potential to enable technicians to transfer their skills into the real world more effectively than traditional training methods such as written, video, and live training used today. This research explores VR training techniques to increase time savings, reduce error rate, and enhance the VR user experience. A group of 30 participants were randomly assigned to either VR training instructions, or control groups without VR training using written instructions and 2D photos or video instructions. All subjects were trained to assemble a 17-part mechanical assembly. The specific target criteria measured were the amount of subjects' time spent learning from the instructions, their amount of time spent assembling the physical mechanical assembly model, the number of solved and unsolved errors committed in the physical model, the number of times the participant performed an assembly step out of indicated order, and the user preference towards the training systems. Survey results indicate that over 85% of the participants preferred the visual, 3D walk-through instructions offered with VR, especially if the assembly procedure was more complex and involved. Results show that users adapted to the VR training platform as easily as the other training methods regardless of their academic background or exposure to VR. Results suggest there was no loss in time nor accuracy for the VR trained students when assembling the physical model as compared to the non-VR trained students.

DEVELOPING AN IMMERSIVE VIRTUAL REALITY AIRCREW TRAINING CAPABILITY

2017 IITSEC Paper No. 17319

Dr. Eric Sikorski
Combating Terrorism Technical Support Office
Alexandria, VA

Ms. Amanda Palla
Vertex Solutions
Urbana, IL

Dr. Linda Brent
The ASTA Group LLC
Pensacola, FL

The Combating Terrorism Technical Support Office (CTTSO) and the Air Force Special Operations Command (AFSOC) are assessing the training effectiveness of an immersive virtual reality part task trainer (vrPTT) for AC -130 cockpit familiarization. AFSOC wants to move AC-130 checklist procedures and cockpit familiarization training from low-density/high-demand weapons system simulators to a widely available, low-cost vrPTT, while simultaneously migrating the tutorial courseware and instructor-led portions of the course to a higher fidelity, more immersive environment. This blended learning vrPTT will allow pilots to receive instruction and immediately proceed to practicing scenarios in a highly realistic, immersive Virtual Reality (VR) environment. It also reduces time in the simulators by allowing pilots to learn the procedures and develop muscle memory. The vrPTT was designed and developed from an extensive front-end analysis, including task performance interviews with AC-130 pilots and instructors. The system consists of a 3D VR representation of the AC-130 cockpit viewed through an Oculus Rift head-mounted display (HMD) and underlying equipment behavior models that produce appropriate responses to pilot inputs. Pilots interact with the virtual control systems via the integration of a Leap Motion infrared sensor that tracks the position and motion of all ten fingers. Tutorial content is laid over the equipment simulation, and an integrated intelligent tutor provides adaptive feedback during a scenario and to adjust the initial instruction for future exercises. This paper describes the front-end analyses performed to create the measures for the intelligent tutor, approaches to overlay courseware in a VR HMD environment, and the overall system required to achieve acceptance by the pilot user group. It also details future phases of this program, including a training effectiveness study comparing a control group of students in the simulator who have not used the VR system to those who have used the VR system.

THURSDAY, 30 NOVEMBER, 2017 ROOM S320E

T7 Team Rediness

1330	1400	1430
Enhancing Strategic Thinking in Army Leaders through Skill-building Exercises (17167)	Military Team Training Utilizing GIFT (17286)	Point of Injury Training with Two and Three Dimensional Wounds (17270)

Notes

ENHANCING STRATEGIC THINKING IN ARMY LEADERS THROUGH SKILL-BUILDING EXERCISES

2017 IITSEC Paper No. 17167

Anna Grome	Angela Karrasch	Beth Crandall
TiER1 Performance Solutions	U.S. Army Research Institute	Crandall Consulting
Covington, KY	Ft. Leavenworth, KS	Yellow Springs, OH
Anna Sackett	James K. Greer	Ellen Goldman
MDA Leadership Consulting	ALIS, Inc.	George Washington University
Minneapolis, MN	Kansas City, MO	Washington D.C.

The complexity and volatility of today's operating environments require that Army leaders have advanced cognitive skills. It is no longer sufficient for officers to be technically and tactically proficient (Gurney & Smotherman, 2009). As tactical, operational, and strategic environments become increasingly intertwined, the Army needs leaders who can develop a holistic understanding of multi-dimensional problems, visualize ways to shape potential future states, and anticipate second-and third-order effects of decisions and actions. Recent research conducted by Sackett, Karrasch, Weyhrauch, & Goldman (2016) found that more and different strategic thinking development is required. The research found that the Army's current education and training system provides limited opportunities for developing leaders to practice the skills that underpin strategic thinking and complex problem-solving. This paper describes research to test methods for improving current and emerging Army leaders' ability to think strategically by providing them with opportunities to practice advanced cognitive skills. Specifically, the paper describes the development and formative evaluation of four practical exercises – for use in operational and/or classroom settings – designed to build and reinforce cognitive and behavioral skills that underpin the ability to think strategically. These exercises give participants the opportunity to practice and receive feedback on skills including: systems/holistic thinking, synthesis, questioning and information-gathering, reflection, thinking in time, and strategic foresight. A preliminary evaluation of the exercises was conducted with two groups: a Brigade and Division of the 1st Infantry Division at Ft. Riley and faculty members in the University of Foreign Military and Cultural Studies. The evaluation elicited feedback on 1) the value of the exercises for developing skills associated with strategic thinking, 2) ease of use of the facilitator materials, and 3) suggestions for improving the exercises. Findings are being used to revise the exercise materials.

Key Words: Strategic thinking, advanced cognitive skills, skill-building exercises, Army leaders, complexity

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

MILITARY TEAM TRAINING UTILIZING GIFT

2017 IITSEC Paper No. 17286

Desmond Bonner, Stephen Gilbert, Eliot Winer, Michael Dorneich,
Anastacia MacAllister, Adam Kohl, Kaitlyn Ouverson, & Anna Slavina
Iowa State University
Ames, Iowa

Anne M. Sinatra
Army Research Laboratory
Orlando, Florida

In 2015, the U.S. Army identified intelligent tutoring as a crucial resource for effective training of soldiers. Specifically, team training is essential as military missions are usually team-based and require extensive coordination. Intelligent Tutoring Systems (ITS) review actions taken by the user and provide dynamic instructions to teach subject matter to an individual. A team ITS assesses the performance of the teams' individuals, their overall performance as a team, and the interactions of that team to provide dynamic instructions. While extensive work has been conducted regarding single person ITSs, work regarding team-based ITS is limited. A team ITS is difficult to design as the tutor must account for the actions of multiple individuals and their team interactions. The tutor must teach task skills for completing the objective, and team skills for how a team works to meet the objective.

This paper describes the implementation, development and evaluation of a Team Intelligent Tutoring System for military teams. We faced challenges such as defining the appropriate levels of cognitive load and team communication required to be successful. The goal of the work was to evaluate an ITS's effectiveness in a simple team training scenario, a two-person surveillance task in which participants signaled each other using keystrokes. The scenario was constructed using Virtual Battle Space 2.0 (VBS2), and the tutor was built using the Generalized Framework for Tutoring (GIFT). Sixteen two-person teams were run through the study in one of three feedback conditions (individual feedback, team feedback, or no feedback). Their individual and team performance within the task were assessed. We found that participants in the feedback conditions had fewer extraneous keystrokes in the task than those without feedback.

POINT OF INJURY TRAINING WITH TWO AND THREE DIMENSIONAL WOUNDS

2017 IITSEC Paper No. 17270

M. Beth H. Pettitt
Army Research Laboratory
Orlando, Florida

A considerable amount of research and development has already occurred to increase the fidelity of simulated wounds during training, primarily at the point of injury. As materials and techniques mature and as more relevant data is collected on tissue properties, it is worth examining what fidelity is really required for medical training at the point of injury. The basic hypothesis for this effort is that at the point of injury, a two dimensional (2D) tattoo wound provides the same immersion, sense of urgency, and visual cues as a three dimensional (3D) silicone wound of the same injury.

Using a between subjects design, this effort assesses the differences in trainee treatment time and perception of the simulated wound when treating a 3D silicone wound and a 2D tattoo wound. A pilot test was completed in October 2016 ($n = 16$) and a large experiment was completed in November 2016 ($n > 150$). Participants were exposed to either a silicone or tattoo representation of a bullet wound and asked to assess and care for the wound. The time to complete treatment was also recorded. Afterwards, participants completed a survey assessing perception of depth cues, sense of urgency, and immersion.

Early user testing indicated there was a difference in how participants respond to the 2D tattoo and 3D silicone wounds. The findings from this complete research study showed that at the point of injury, there was very little difference in how 2D tattoo and 3D silicone wounds were perceived by the test subjects. A summary of the complete analysis will be presented and discussed.

PDF FILES OF THE 2017 TUTORIAL PRESENTATIONS ARE INCLUDED ON THE PROCEEDINGS CD. PLEASE SEE THE TUTORIALS SECTION OF THIS BOOK FOR SCHEDULE AND SYNOPSES DETAILS.

NOTES

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2017 may also be ordered through the www.iitsec.org portal.

TABLE OF AUTHORS

Abbott, Debra, 13
Aggarwal, Varun, 65
Aguiar, Steven, 21, 91
Alban, Angela, 74
Allen, Joseph, 46
Anania, Emily, 41
Anderson, Clinton, 35
Arrieta, Alexander, 83
Au, Michael, 87
Bagnall, Timothy, 50
Bagrodia, Rajive, 68
Bailey, Grant, 58
Bailey, Shannon, 91
Baker, John, 11, 59
Balasubramian, Ashwin, 41
Balogh, Imre, 57
Bannan, Brenda, 87
Barr, Avron, 47
Beaty, James, 33
Beaubien, Jeffrey, 49, 52
Behner, Horst, 81
Bentley, Kevin, 25
Bergenthal, Jeffery, 54
Berking, Peter, 19
Biagini, Marco, 39
Bieber, Chad, 45
Biever, Jacob, 82
Bilinski, Mark, 25
Birtwhistle, Marcus, 35
Blair, Carl, 79
Bogler, Cory, 27
Bolton, Amy, 51
Bonner, Desmond, 95
Borg, Jesper, 77
Brazell, Philip, 70
Brent, Linda, 93
Brisson, Monique, 29
Brou, Randy, 23
Brown, Tara, 87
Buchanan, Laurie, 14
Bulla, Chris, 84
Call, Lance, 81
Camp, John, 29
Campbell, Julia, 20, 35
Canberi, Haluk, 71
Cardwell, Chad, 20
Carlin, Alan, 33
Carlson, Justin, 75
Caserta, Abigail, 49
Castillo, Juan, 59
Caulkins, Bruce, 27
Cerri, Tony, 53, 73
Chan Ho, Jung, 69
Chaouachi, Maher, 44
Chapman, Stephen, 17
Chaudhry, Ali, 92
Chavez, Jose, 68
Cheikh, Ben, 34, 61
Cheng, Huaining, 29
Cheng, Zhiqing, 29
Chester, David, 31
Christie, Andrew, 85
Cisneros, Jamie, 59
Clouse, Richard, 31
Cobbins, David, 20
Cohen, Michael, 36
Colonna-Romano, John, 88
Converse, Patrick, 51
Cook, Jeramy, 20
Coppock, Andy, 92
Corona, Fabio, 39
Coulter, Jordan, 74
Cox, Rob, 76
Crandall, Beth, 94
Crapanzano, Robert, 89
Crush, Daran, 58
Crutchfield, Richard, 79
Cybyk, Daniel, 33
D'Angelo, Denise, 33
Daiello, Christopher, 62
Daly, Tarah, 35
Davies, Paul, 45
Davis, Dan, 17, 35, 57
Davis, Mark, 57
De la Cruz, Julio, 67
De Souza Dorneles, Cristiano, 21
Dean, Courtney, 55
Dean, Frank, 92
DeCapite, Anthony, 20
Degnan, Edward, 57
Dempsey, Dafna, 71
Derrick, Douglas, 46
Dettmering, Chad, 41
Dias Neto, Rodrigo, 21
Diedrich, Frederick, 24
Diem, John, 73
Dobbins, Christian, 87
Dorneich, Michael, 95
Dubin, Ariel, 9, 42
Dubrow, Samantha, 87
Dukstein, Greg, 65
Dumanior, Paul, 65
Dumanoir, 76
Dumanoir, Paul, 27, 54, 79
Dunne, Robb, 83
Elliott, Lawrence, 63
Ellison, Leah, 51
Ellsworth, Jonathan, 33
Elstad, Erik, 17
Emanuel Neves, Victor, 21
Emond, Bruno, 47
Eversen, Per-Idar, 40
Fabiano, Gregory, 49
Faillace, Christian, 39
Faubert, Jocelyn, 8
Faye, Jean-Pierre, 71
Fegley, Brent, 88
Fifer, Matthew, 33
Flanagan, Scott, 24
Fleener, Graham, 27
Fleenor, Hillary, 23
Flint, Jesse, 43
Floyg, Robert, 85
Folsom-Kovarik, JT, 47, 88
Forconi, Sonia, 39
Forero, Pedro, 68
Fragomeni, Gino, 53
Freed, Michael, 15
Frolund, Gro, 22
Fry, Trevor, 51
Fuller, Jessica, 25
Gallagher, Shane, 47
Gallant, Scott, 55
Garrett, Timothy, 45
Garrity, Pat, 11, 37, 59, 92
Geddes, Allen, 63
Gervasio, Melinda, 15
Giambarberee, Sam, 71
Gibert, Stephen, 45
Gilbert, Stephen, 95
Goldberg, Stephen, 20
Goldiez, Brian, 27, 67, 89
Goldman, Ellen, 94
Goodwin, Martin, 89
Grabowecky, Marcia, 36
Grattan, Max, 29
Greer, James, 94
Greunke, Larry, 25
Griffith, Tamara, 53
Grome, Anna, 94
Guerrero, Michael, 31
Guillemette, Pascal, 34, 61
Gupton, Kevin, 73, 76
Guthrie, Pierce, 31
Hale, Kelly, 43
Hall, Gary, 27
Hall, Steven, 73
Halverson, Kent, 33
Hammar, Peter, 75
Hammons, Jacob, 89
Hancock, Kyle, 62
Handelman, David, 33
Hannigan, Frank, 35
Harkins, Homer, 13
Harris, Scott, 83
Harrison, Cynthia, 53
Harvey, Edward, 16
Hatch, Aaron, 84
Haugstuen, Idar Ulvestad, 85
Heeren, Adam, 79
Helge Bentsen, Dan, 40
Hendricks, Corey, 78
Hernandez, Andy, 73
Hibberts, Mary, 51
Hill, Michala, 25
Hodgins, Mark, 54
Hodhod, Rania, 23

Hoke, Jaclyn, 8, 71
Holub, Joseph, 45
Homeyer, Liam, 49
Hoover, Melynda, 45
Hopson, Lon, 86
Hulme, Karen, 49
Hulme, Kevin, 49
Hunt, Jodie, 31
Huster, Todd, 29
Ide, Robert, 33
Immeker, Daniel, 41
Isaacson, Paul, 66
Isaksen, Geir, 19
Jackson, Jack, 28
Jin Seok, Oh, 69
John, Brendan, 33
Johnson, Andrew, 73
Johnson, Cheryl, 91
Johnson, Mark, 25
Johnson, Scott, 11, 59
Johnston, Joan, 53
Jones, Jason, 39
Jones, Nathan, 8
Jones, Paul, 64
Julian, Danielle, 9, 42
Kaighn, Kevin, 92
Kailler Smith, Max, 36
Kaimakis, Nicholas, 35, 57
Karrasch, Angela, 94
Kearl, Leonard, 64
Kelley, Steve, 64
Kelly, Richard, 74
Kery, Sean, 26
Kieslich, Eberhard, 80
Kilic, Yekta, 38
Killilea, John, 41, 55
Kleber da Silva Rodrigues, Carlo, 67
Knapp, Michael, 49
Kohl, Adam, 95
Koldas, Gurkan, 38
Koler, Oren, 61
Kolyno, Kasey, 32
Koterba, Zachary, 33
Krishnamachari, Madhusudhan, 35
Kumar, Rakesh, 92
Laboy, Orlando, 32
Lacks, Daniel, 62
LaFlore, Allan, 49
LaGrotta, Michele, 39
Lajoi, Susanne, 44
Lalor, Jonathan, 83
Lamine, Taieb, 34, 61
Landmesser, John Andrew, 53
Lanman, Jeremy, 53
Laster, Nicole, 73
LaViola, Joseph, 59
Lawrynczyk, Agata, 44
Lemmers, Arjan, 71
LeSueur, Kenneth, 79
Levchuk, Georgiy, 88
Lim, Rachel Su Ann, 49
Lindquist, Sinna, 75
Lindskog, Peter, 75
Liu, Wei, 68
Lloyd, Charles, 56
Lofstrand, Bjorn, 81
Lunsford, Dale, 51
Lutz, Robert, 50, 63
MacAllister, Anastacia, 37, 45, 95
Marchi dos Santos, Osmar, 21
Marinier, Bob, 41
Markovits, Devin, 30
Marnane, Janet, 41
Marraffino, Matthew, 91
Marshall, Henry, 63
Martin, Glenn, 27
Martinez, Alan, 51
Mason, B, 77
Mason, Matthew, 17
Mazzone, Leslie, 21, 91
McAlinden, Ryan, 20
McCormack, Robert, 87
McDonnell, Joe, 55
McDowell, Perry, 31, 57
McEttrick, David, 41
McGlynn, Lana, 55
McGroarty, Chris, 55
McLaughlin, Steve, 85
McLoughlin, Michael, 33
Mercado, Alyssa, 51
Metevier, Christopher, 55
Mevassvik, Ole Martin, 71, 85
Miller, David, 64
Miller, Jack, 37
Miller, Louis, 24
Montariol, Maxine, 8
Moore, Ronald, 25
Moran, John, 67
MtCastle, Timothy, 29
Muir, Shawn, 83
Muller, Frank, 90
Mundy, Daisy, 23
Murphy, Jennifer, 24, 35
Murray, Glenn, 92
Mursia, Agatino, 39
Myers, Christopher, 87
Nabben, Anneke, 90
Neubauer, Catherine, 20
New, Raymond, 20
Newton, Charles, 88
Nicholson, Denise, 65
Nicolescu, Gabriela, 34
Nielsen, Keith, 65
Noah, David, 81
Noever, David, 29, 72
Nolan, Joseph, 57
Norfleet, Jack, 74
Novak, Justin, 79
Numrich, SK, 28
Nye, Benjamin, 35
O'Connell, Ralph, 53
O'Connor, Michael, 79
Odermann, Koren, 8
Okraski, Henry, 7
Oliver, James, 45
Orsua, Benjamin, 64
Orvis, Kara, 87
Oskiper, Taragay, 92
Oster, Evan, 33
Oswalt, Ivar, 57
Ottley, David, 66
Ouverson, Kaitlyn, 95
Pagan, Jennifer, 51
Page, Ian, 58
Palla, Amanda, 93
Pandit, Gayatri, 14
Peixoto, Nathalia, 87
Pepper, Craig, 69
Perlaza, David, 33
Perry, Samantha, 87
Pettitt, Beth, 95
Pfieffer, Dan, 35
Phillips, Jennifer, 83
Piccinini Legg, Andrei, 21
Picollo, Marco, 39
Pike, William, 74
Pineda, Diana, 80
Pino, Johnathan, 33
Pohlmeyer, Eric, 33
Poltrack, Jonathan, 48
Ponto, Shelby-Jo, 51
Postlewate, Andrea, 51
Powers, Faith, 15
Prochazka, Dalibor, 39
Procopio de Castro, Pedro, 21
Purohit, Hemant, 87
Radkowski, Rafael, 45
Rahmes, Mark, 31
Rana, Mohammad, 87
Ratwani, Krista, 24
Raybourn, Elaine, 12
Read, Adrienne, 8
Reber, Paul, 36
Reeh, Jonathan, 41
Regian, Wesley, 29, 72
Reinerman-Jones, Lauren, 89
Reitano, Rachel, 49
Reitz, Emilie, 13, 16, 53, 77, 82
Resnick, Joel, 28
Reuter, Christopher, 8
Reuveni, Ben, 36
Reynolds, Kristy, 33
Rich, Matthew, 33
Richard, Erin, 51
Rizzardo, Caitlan, 86
Robinson, Douglas, 57
Robson, Elliot, 19
Robson, Robby, 48
Rodriguez, Jose, 27
Romeas, Thomas, 8
Rorvik, Henning, 85
Rosopa, Patrick, 83
Ross, Karol, 83
Roza, Manfred, 90
Saadat, Sohaib, 41
Sackett, Anna, 94

Papers are available on the 2017 I/ITSEC CD ROM included in the Conference Attendee meeting bag, or visit the I/ITSEC Website (www.iitsec.org) for ordering information. (Limited numbers of CDs from 1998-2016 are also available.) Individual papers from 1966 through 2016 may also be ordered through the www.iitsec.org portal.

Saffold, Jay, 37
Sahr, Kenneth, 70
Salmon, John, 93
Samarasekera, Supun, 92
Sanders, Tracy, 50
Santiago, Freddie, 67
Scaccianoce, Alfio, 39
Schatz, Sae, 12, 35, 47, 71
Scheeler, Tyler, 41
Scheidt, David, 63
Schermerhorn, Paul, 41
Schlueter, Jonathan, 60
Schnell, Thomas, 8
Scholl, Sarah, 14
Schroeder, Bradford, 91
Sciarini, Lee, 31
Scrudder, Roy, 73, 76
Segall, Jeff, 87
Seiji Oyama, Leonardo, 67
Selvaag, Kristian, 40
Shintel, Tal, 61
Shoaf, Tovar, 37
Sidor, Greg, 64
Sikorski, Eric, 93
Simas Lopes Peres, Sergio, 67
Sinatra, Anne, 95
Slavina, Anna, 95
Sleevi, Neil, 73
Smith, Jeffery, 93
Smith, Roger, 9, 42
Snavely, Jonathan, 45
Sodano, Sandro, 49
Sottilare, Robert, 59
Spalding, Lindsey, 17
Spaulding, Aaron, 15
Squire, Peter, 8
Stacy, Webb, 49, 52, 88
Steinhauser, Natalie, 8
Stensrud, Brian, 41
Stephan, Gina, 49
Stewart, L, 77
Stien, Havard, 40
Stodd, Julian, 13
Stueter, Detlef, 71
Sturim, James, 63
Surdu, John, 62
Svendsen, Guro, 85
Swartout, William, 35
Swigert, Scott, 81
Tamer, John, 54
Tanaka, Alyssa, 9, 42
Tanner, Scott, 83
Tavel, Morton, 30
Telford, Brett, 57
Tenore, Francesco, 33
Terry, Scott, 45
Thomas, CE, 64
Thompson, Joseph, 14
Tindall, Lauren, 15
Tindall, Mitchell, 55
Tolland, Michael, 55
Torres, Tom, 27
Toumbeva, Tatiana, 24
Townsend, Lisa, 71
Tran, Hung, 32, 43
Turkaly, Sarah, 47
Turner, Nathan, 33
Udell, Chad, 35
Vandrovec, Bryan, 50
Vey, Nathan, 63
Vierling, Kendy, 12
Vitovitch, Nicholas, 92
Vogel-Walcutt, Jennifer, 12
Vonsik, Brett, 83
Voogd, Jeroen, 90
Wade, Alexander, 49
Wade, Ashley, 86
Walwanis, Melissa, 51
Ward, Kerry, 46
Watkins, Jon, 67
Watz, Eric, 49
Weaver, Jeff, 68
Wester, Brock, 33
Wheeler Atkinson, Beth, 41, 55
Whelan, Terry, 68
White, Michael, 70
Wiegand, Paul, 27
Wiggins, Sterling, 49, 52
Wildman, Jessica, 51
Williamson, Brian, 59
Wilson, Chantale, 86
Wilson, Darren, 43
Winer, Eliot, 37, 45, 60, 95
Wismer, Andrew, 89
Wojton, Heather, 45
Woods, Kevin, 28
Yarnall, Louise, 15
Yerger, Rodney, 54
YounChol, Cho, 69
Zaccaro, Stephen, 87
Zamba, Mitchell, 81
Zbranek, John, 41
Zett, Marilyn, 78
Zhu, Zhiwei, 92

Interservice/Industry Training, Simulation and Education Conference
The National Training and Simulation Association (NTSA)
An Affiliate of the National Defense Industrial Association (NDIA)
2101 Wilson Blvd., Suite 700 • Arlington, VA 22201
http://www.iitsec.org • (703) 247-2569