

**Abstract ID:** 11363

**Title:** Markerless full body tracking: Depth sensing technology within virtual environments

**Subcommittee:** Emerging Concepts and Innovative Technologies

**Abstract Text:** We discuss three potential applications of the new depth-sensing camera technology from PrimeSense, the camera used in the popular Microsoft® Kinect. The paper will outline the technology underlying the camera, the development of our open source middleware allowing developers to make applications, and provide examples of applications under development that enhance interaction within virtual environments and game-based training/rehabilitation tools. The use of keyboards, mouse and gamepads to interact with virtual environments limits the sense of presence and immersion. The ability to physically interact within virtual environments increases presence and performance. To date, tracking devices have been limited to expensive hardware or tools that track limited points. The PrimeSense, along with our open source middleware, provides markerless full-body tracking on a conventional PC using a single plug-and-play USB sensor. This technology provides a fully articulated skeleton that digitizes the user's body pose and directly quantizes their movements in real time without encumbering the user with tracking devices or markers. We have explored the integration of the PrimeSense system and middleware within three applications: 1) virtual environments, 2) gesture controlled PC games, 3) a game developed to target specific movements for rehabilitation. The benefits of implementing this tracking in these three areas provide needed applications for modern-day warfighters. Examples of how the system increases the sense of presence and satisfaction will be demonstrated in World of Warcraft and Second life environments. By configuring the device to drive any PC game based on designated physical activities of users, we provide more realistic training options for warfighters. We will present a game-based rehabilitation tool that elicits specific therapeutic motions when controlling a virtual avatar pursuing in-game goals. Initial user-testing and implications for rehabilitation of warfighters with injuries such as TBI and spinal cord injury will be demonstrated.

**Will this paper have one or more authors from outside the U.S.?** No

**Discussion Points:**

1. Motion Capture
2. Immersive training
3. Virtual Environments
4. Microsoft Kinect

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**Biography:**

Belinda Lange, PhD received her PhD and degree in Physiotherapy (with Honors) from the University of South Australia and her Science Degree from Flinders University of South Australia. She is currently a Senior Research Associate at the Institute for Creative Technologies and holds a Research Assistant Professor in the School of Gerontology at the University of Southern California. Her research interests involve the use interactive video game and virtual reality technologies for cognitive assessment, motor rehabilitation, exergaming, postoperative exercise, pain distraction during medical procedures and virtual human character interactions. Belinda was on the conference program committee for Meaningful Play conference in 2008 and 2010, co-chaired the Presence 2009 conference and is the Workshop Chair for the upcoming international Virtual Rehabilitation conference in Zurich in 2011. She is also a co-founder of [www.games4rehab.org](http://www.games4rehab.org), a non profit social network that brings together individuals with disabilities and those undergoing rehabilitation with researchers, clinicians and game industry professionals.

**Status:** APPROVED

**I/ITSEC ABSTRACT SCORING FORM****Abstract ID REF:** 11363**Title:** Markerless full body tracking: Depth sensing technology within virtual environments**Primary Author:** Lange**Committee:** Emerging Concepts and Innovative TechnologiesEmerging Concepts and Innovative Technologies: Papers describing Emerging Concepts or Innovative Technologies founded in scientific principles.

This subcommittee is seeking papers that discuss emerging and innovative technologies, methodologies, or concepts associated with training, simulation and education. Candidate papers should thoroughly describe a concept, methodology or technology and the challenges that it is intended to address. In reviewing these papers, this subcommittee is especially interested in understanding how this concept or technology advances the state of the art, and how it demonstrates or acknowledges prior related work in the subject area, rather than its use in a specific application for training, education or simulation. Special consideration will be given to papers that incorporate solid research principles while presenting results of this research and providing detailed conclusions/recommendations.

**Evaluation**

Substance. The controlling idea and the support for it. The total concept the author wants to present. A good idea can survive mechanical flaws, but perfect spelling and grammar can't save poor ideas.

Originality. A new concept that furthers the evolution of the committee's subject area. A repeat of past theories that add nothing to the community of knowledge are generally unacceptable, unless the prospective abstract/paper promises to impart knowledge that may be of substantive value to a novice audience.

**Acceptance**

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**Key Words or Concepts****Other Comments/Remarks**