

**Abstract ID:** 11136

**Title:** A Game AI Approach to Autonomous Control of Constructive Characters

**Subcommittee:** Simulation

**Abstract Text:** There is a strong need to develop artificial intelligence (AI) for constructive characters which is:

- Autonomous – able to function effectively with little or no human input at runtime
- Reactive – aware of and responsive to the evolving situation and the actions of the trainees
- Nondeterministic – doesn't always act in the same way
- Believable – culturally accurate, and acts in a believably human way

This could greatly reduce the cost of training, increase the accessibility of training, and perhaps even improve the consistency of training.

As one aspect of the Future Immersive Training Environment (FITE) Joint Capabilities Technology Demonstration (JCTD), we created the "Angry Grandmother," a constructive character portraying the elderly grandparent of an insurgent whose home is entered and searched by the trainees. She needed to be believable, nondeterministic, and reactive within the limited domain of the scenario. In addition, she needed to be capable of autonomy, but also reactive to direction from the instructor/operator when appropriate.

The last 10 years have seen a dramatic improvement in the quality of the AI found in many video games; in our opinion, game AI technology has reached a level of maturity at which it is applicable to immersive training. Accordingly, we based Granny's AI on a hybrid architecture which draws heavily from widely used architectures such as Behavior Trees (BTs) and utility-based approaches. The approach is based on techniques from several extremely successful video games, including the Zoo Tycoon 2 franchise, Iron Man, and Red Dead Redemption.

This paper will present the AI architecture which we used for the Angry Grandmother, compare and contrast it to relevant game AI approaches, and discuss its advantages particularly in terms of supporting rapid development of autonomous, reactive characters, but also in terms of enabling that crucial dichotomy between autonomy and operator control.

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

**Discussion Points:**

1. Artificial Intelligence
2. Game AI
3. Behavior
4. Constructive Characters

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**Biography:**

Kevin Dill is a staff software engineer at the Lockheed Martin Advanced Simulation Center. He is a recognized expert on Game AI and a veteran of the game industry, with seven published titles under his belt. He was the technical editor for Introduction to Game AI and Behavioral Mathematics for Game AI, and a section editor for AI Game Programming Wisdom 4. He has taught classes on game development and game AI at Harvard University, Boston University, and Worcester Polytechnic Institute.

**Status:** APPROVED

### I/ITSEC ABSTRACT SCORING FORM

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**Title:** A Game AI Approach to Autonomous Control of Constructive Characters

**Primary Author:** Dill

**Committee:** Simulation

Simulation: The science of modeling and simulation, including simulation architectures or techniques, and the representation of synthetic entities or environments for use in simulation, training, rehearsal, gaming or analysis.

This subcommittee is seeking papers on the theory and application of M&S, including development, work processes, technical challenges, lessons learned, and innovations associated with creating, interacting with, and maintaining models and simulation systems. Typical topics of interest include: the evolution of M&S technology; the use of hardware-in-the-loop; the interoperability of heterogeneous simulations; and the methodology used to create and present physical and behavioral representations of entities and environments within live, virtual, and constructive simulations.

#### 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