A Virtual Game Environment for Learning Initiative-Based Tactics

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Publisher's version / Version de l'éditeur:

Learning Technology, 12, 1, 2010-01-01

Emond, Bruno, Fournier, Hélène, and Lapointe, Jean-François A Virtual Game Environment for Learning Initiative-Based Tactics. IEEE Learning Technology Newsletter - Issue on Game-based Learning, Vol. 12, Issue 1, pp 3-5, 2010.

Virtual Game Environment for Learning Initiative-Based Tactics

Games and simulations play a growing role in interactive learning environments. Advances in computing power and graphical user interface are certainly important determinants of this phenomenon, but innovation in user input methods are also pushing the game and simulation platforms beyond traditional input devices and desktop computer applications.

This paper gives a brief overview of a project aimed at developing a virtual training environment using advanced user input technologies. The main intention is to allow trainees to acquire initiative-based tactics skills in an environment as similar as possible to the operational conditions. This virtual training environment, the Immersive Reflexive Engagement Trainer (IRET) is a collaborative research effort between the Canadian Department of National Defence (DND) and the National Research Council Canada, Institute for Information Technology (NRC-IIT). The purpose of the Immersive Reflexive Engagement Trainer is to blend a number of existing technologies to allow soldiers to train simultaneously within virtual and real environments.

The primary use of the system is to train personnel in the rapid application of judgment to include the application of rules of engagement and the use of force. The system will provide interactive enemy forces that react to the soldiers' actions and movements, challenging the soldiers' skills and judgment. Instructors will be able to select and pace training challenges, assess performance during the simulation, and use "after action review" features to provide soldiers with essential feedback and remediation.

The initial seed for the collaborative project was a laser technology developed at NRC-IIT to interact with large displays (Lapointe & Godin, 2005), which is essential to allow trainees to interact in full body movement with wall-size displays. The Combat Training Centre (CTC)-CFB Gagetown (Canada) had already developed a prototype system for training soldiers in close quarters battle using off-the-shelf game engine technology. Subsequently other NRC-IIT technologies were incorporated with the DND game engine for speech processing, multimodal interaction, and cognitive modelling.

The training system development includes requirements specification and training objectives based on information collected and validated by course instructors and subject matter experts. A systematic requirements specification process will ensure that the training system is designed to meet the desired level of performance and readiness from soldiers. One of the objectives of the IRET project is to build high-fidelity elements such as immersive scene projection on walls, use of realistic laser based weapons (same feel and weight), simulated flash-bangs, feedback vests, and speech and gesture recognition for interactions with cognitively realistic simulated agents.

There is a growing interest in the Canadian Army for using off-the-shelf computer games in training because of the interactivity and engagement they create for the player (Roman & Brown, 2007). However, training simulations and games are designed with different objectives in mind; a game being focused on the entertainment value for the player, and a simulation being focused on the achievement of learning objectives. Roman and Brown present a comparison table of gamers and trainers' preferences (see Table 1), originally presented by Helsdingen (2006). The table shows important and possibly irreconcilable differences between the two points of view.

Table 1. Comparison of gamers' and trainers' preferences (Helsdingen, 2006; Roman & Brown, 2007).

Gamer Preferences	**Trainer Preferences**
Entertainment	Learning Process
Emotion	Structure
Player Control	Learning Goals
Free Play	Instructor Control
Unpredictable Turn of Events	Standardization
Fantasy	Realistic Problems
No Boundaries	Effective and Efficient
Social Interaction	Transfer of Training
Surprise	Validity
Risk	Fidelity
Suspense	
Art and Beauty	

Simulators provide many advantages for training, including high-fidelity to real-world operating environments. The main argument being that the closer the training environment is to the real world, the better will be the transfer of skills and knowledge acquired during training. However, it is now recognized that a simulator's fidelity must be measured not only by the physical appearance but also by its psychological and cognitive realisms from the trainee's perspective (Liu, Macchiarella, & Vincenzi, 2009). Simulators also offer instructors the capacity to select specific training conditions, as well as detailed recordings of a trainee's performance for the purpose of performance comparison, diagnostic, and evaluation (Moroney & Lilienthal, 2009), with the capability of repeating a simulation scenario several times without the cost associated to live simulations. The availability of simulators is crucial to maintain readiness and avoid performance degradation (Gorman, 1990; Proctor & Gubler, 1998).

The R&D project currently underway explores the impact of targeted simulation-based interventions in producing effective training outcomes while future papers will report in depth on the scientific theories and empirical results underlying the IRET system and training program.

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