Intelligent Story Architecture for Training (ISAT)

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Abstract

The Interactive Story Architecture for Training (ISAT) is designed to address the limitations of computer games for advanced distributed learning (ADL) and to fully realize the potential of games to become engaging and individualized training environments. The central component of the ISAT architecture is an intelligent director agent responsible for individualizing the training experience. To achieve this, the director tracks the trainee's demonstration of knowledge and skills during the training experience. Using that information, the director plays a role similar to that of a schoolhouse trainer, customizing training scenarios to meet individual trainee needs. The director can react to trainee actions within a scenario, dynamically adapting the environment to the learning needs of trainee as well as the dramatic needs of the scene.

Motivation

Advanced Distributed Learning (ADL) technologies are critical for training warfighters in far-flung locales where access to schoolhouses is limited and resources scarce. Immersive computer games are increasingly used as an ADL technology because they provide compelling, engaging learning experiences that have been shown to reduce training time and increase training persistence. Game technology also represents a significant step forward in the "train as we fight" vision of effective, anytime, anywhere training. In virtual environments, the realism of the training experience helps trainees obtain a better sense of "how" and "why" they are learning to perform some task, whether it's a MOUT room clearing exercise, fire training in a shipboard engine room, or an aircraft maintenance scenario.

Lacking in game-based training approaches, however, is the ability to tailor the training experience to the needs of

individual trainees. Human-controlled systems where a trainer actively directs a trainee's experience are the preferred training environment. Human trainers are capable of rapidly adjusting the pace and content of training based on trainee performance and perceptions of trainee understanding. Human trainers, however, are a costly resource and are usually only available at prescribed times and duty stations. These constraints limit the amount of individualized training human trainers actually provide in practice.

ISAT Overview and Demo Description

The Intelligent Story Architecture for Training (ISAT; Magerko, Stensrud and Holt, 2006) is designed to address the limitations of computer games for ADL and to fully realize the potential of games to become engaging and individualized training environments. Seminal to the ISAT architecture is an intelligent story director agent, who serves a role similar to that of a schoolhouse trainer. The director chooses and customizes training scenarios based on information about trainee knowledge and skill. The director then subtly guides the trainee through a scenario by dynamically adapting the environment to the dramatic needs of the scenario and the learning needs of trainee. We initially developed an Interactive Drama Architecture (IDA) for use in drama-based computer games Magerko, 2006). ISAT extends IDA to the requirements of training systems by including a trainee skill model, which allows the director to maintain a quantitative representation of trainee proficiency in each of a set of required skills. These values are then used by the director in real-time to select appropriate responses to trainee skill errors.

Our demonstration is the application of the ISAT system, specifically the director agent, for a combat medic training system called Tactical Combat Casualty Care (TC3). TC3 is a first person simulation, developed by Engineering & Computer Simulations Inc. (ECS), where the trainee is immersed in virtual environments and acts as a squad's

combat medic. As such, the trainee must perform triage of casualties, properly treat them, and also act as a soldier within the squad. The ISAT director sits invisibly within TC3 as the trainee executes a training scenario. During the scenario, the director is responsible for:

- **Story Direction** - managing the execution of each scene within the simulation. This includes coordinating the behaviors of each of the NPCs in the environment and all other scene-specific events
- **Skill-Based Direction**: Directing content within each scene reactively based on the trainee's actions in the world (that are relevant to his training objectives) and the current state of his skill model
- **Reactive Direction**: Directing content within each scene reactively based on the trainee's level of engagement.
- **Scene Selection and Instantiation**: Training scenarios for the ISAT system are composed as a collection of scenes. These scenes are then selected and instantiated by the director according to their dramatic and pedagogical relevance.

In our demonstration, the setting of the training scenario is a Middle Eastern marketplace. As the view fades in, the trainee's squad has just taken several casualties from a roadside IED explosion. The squad leader approaches the trainee and informs him that the area is secure and that he needs to begin treating casualties. This video includes examples of story direction (through the execution of the main plot thread), skill-based and reactive direction. The video's narration guides the viewer through the important actions taking place and the ISAT director's response to those actions (if any).

References

Magerko, B. 2006: Player Modeling in the Interactive Drama Architecture. Ph.D. Thesis, Electrical Engineering and Computer Science Department, University of Michigan, Ann Arbor, MI.

Magerko, B., Stensrud, B. and Holt, L.S. 2006: "Bringing the Schoolhouse Inside the Box," Proceedings of the *25th Army Science Conference*, Orlando, FL.