DSA Intelligent Transformational Systems Real-time Individualized Training Vectors For Experiential Learning

LDRD
LABORATORY DIRECTED RESEARCH & DEVELOPMENT

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Research Problem

Problem:
No quantitative measures of learning in military game-based training systems. No metrics, individualized diagnostics, or personalized content based on identified needs.

R&D Approach:
Verify whether knowledge capture technologies and individual learner models can together perform real-time in-game diagnostics of cognitive agility and quantitative assessments of experiential learning.

Why pursue at national lab level?
Adaptive, self-paced and customized "anytime-anywhere" training in intercultural human interaction is one of the top five priority U.S. Army Future Force warfighter outcomes.

WILL THE QUALITY OF OUR TRAINING TODAY BE REMEMBERED ENOUGH TO SAVE A LIFE TOMORROW?

Theoretical Framework
• Social Learning Theory (Bandura, 1977); Experiential Learning Theory (Kolb, 1984); Frame Analysis (Goffman, 1974), Coordinated Management of Meaning (Pearce & Cronen 1979)

Research Questions
RQ1: Can we identify an individual's visual learning strategies (observation) for accelerating novice threat detection accuracy of still images taken from the game-based environment DARWARS Ambush NK?

RQ2: Can we identify an individual's interaction strategies for accelerating novice performance on a variety of tasks while role-playing in the game-based environment DARWARS Ambush NK?

RQ3: Can we identify an individual's behavior modeling and new interaction strategies for accelerating novice performance on a variety of tasks while observing and evaluating others' role-playing in the game-based environment DARWARS Ambush NK?

RQ4: Does the process of learning vary when subjects are either executing complex tasks themselves or observing others executing tasks in a multi-player game-based training environment?

Key Results and Accomplishments First year
Goal: Conduct Human Subject Experiments for Identifying Training Vectors

– Technologies used in study include Sandia Real-Time Feedback & Evaluation (Army SF, DARPA, PEO-STRI), DARPA DARWARS Ambush NK, and Accelerated Learning (DARPA).
– Two studies: single-player & multi-player
  – Single player illuminates neuroscience study performed at MIND.
  – Multi-player reflects VUCA (volatile, uncertain, complex, ambiguous) task environment used in virtual training.
– Studies explore knowledge capture to identify competent & novice levels in experiential learning environments.
  – Investigate the role of observation in learning and performance
  – correlate demographic information, state traits, and in-game evaluation against performance.
  – In Year 2, use vectors to provide targeted feedback/mediation to improve skills for task.

User testing DARWARS Ambush! NK Observer/evaluator interface

DARWARS Ambush! NK Instructor Interface

Key Results and Accomplishments First year

Study Results: _Preliminary results_ collected from 90 participants indicate that trainees who observe interaction strategies (whether the behavior is modeled or not) perform better than those who do not observe first, supporting the notion that in-game roles for observation/evaluation exercise metacognitive regulation skills in experiential learning environments.

Goal: Assemble external advisory board of military, industry, DOE

Results: external advisory board consists of Army, USMC, LM, TPLD, and DOE representatives.

Goal: Identify transition partner

Results: US Army Armor Center Directorate of Training, Doctrine, Combat Development, and Experimentation at Ft. Knox identified as transition partner.

Significance of Results

LDRD results would enable investment area WFO customer funded projects/ programs (DARPA, JIEDDO, USMC, Army, SOF, and Navy) and DOE to further meet needs by transitioning a truly adaptive training system that quantitatively assesses the efficacy of game-based training for honing cognitive agility. As this effort has never been transitioned to an operational environment to date, success would position Sandia as a leader in adaptive training systems and training performance assessment R&D.

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