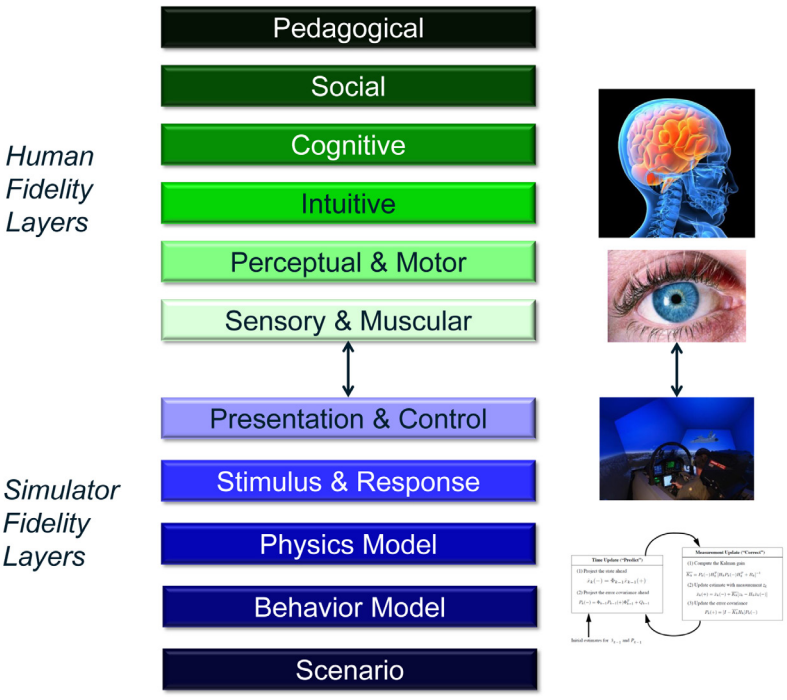
CFSE

2016

COGNITIVE FIDELITY IN SYNTHETIC ENVIRONMENTS

Providing empirical evidence relating to simulator design and fidelity improvements.

The Cognitive Fidelity in Synthetic Environments (CFSE) project is the Virtual pillar in ONR's LVC research portfolio. It provides empirical evidence relating to simulator design and fidelity improvements that will have a large impact on F/A-18 training effectiveness. In 2013, the CFSE team developed a framework – called the Layered Fidelity Framework (LFF; Stacy, Walwanis, Wiggins, & Bolton, 2013) – for organizing and measuring the impact of simulator fidelity on training effectiveness.



The Layered Fidelity Framework

OVERVIEW OF LAYERED FIDELITY

Typical fidelity discussions about visuals concern things like pixel density, contrast ratios, latency, and field of regard; if they are about motion, the topics of latency, frequency, and degrees of freedom often come up; and for audio, it's common to discuss frequency response and dynamic range. These are good and important subjects, but there are other important aspects of fidelity.

These other aspects are the target of the LFF. The layers can be dichotomized into one set describing the training environment and another set describing the human who is using the training environment. Each layer in the human set has an associated set of techniques for measuring learning.

//EXPERIMENT 1

CARRIER QUALIFICATION (CQ) SKILLS

During Experiment 1 (2013-2014), the CFSE team investigated the effects of improved visual and motion cues (the Stimulus & Response layer) on learning the perceptual-motor skills (the Perceptual & Motor layer) for Carrier Qualification. We conducted a rigorous scientific experiment that involved 15 F/A-18 pilots, each of whom flew 24 simulated landings over the course of two days.

The results showed that the improved visual and motion cues initially perturbed novice learners' performance. This is due to the fact that they received no explicit instruction in how to use these landing cues. However, the novices quickly recovered, and eventually reached expert-like levels of proficiency (Beaubien, Stacy, Wiggins, Keeney, Bolton, Grubb, Walwanis, Priest, & Riddle, 2015). The CFSE team is currently working with the Naval Aviation Proficiency Model (NAVPM) team to integrate these experimental findings into their predictive models of aviator proficiency.

//EXPERIMENT 2
AIR-TO-AIR SKILLS

During Experiment 2 (2015-2017), the CFSE team is investigating the effects of instructional quality (the Scenario layer) on the learning of decision-making skills (the Intuitive and Cognitive layers, respectively) for air-to-air combat. For this experiment, instructional quality is being manipulated as either "baseline condition" (i.e., each training scenario is followed by an instructor-led debrief) or "experimental condition" (i.e., pairs of "contrasting" training scenarios are followed by a learner-led debrief). Based on previous research using the contrasting cases instructional method, we hypothesized that the experimental condition will result in higher levels of skill transfer. The experiment is currently being designed, and data collection will begin in Spring 2017. As in Experiment 1, the CFSE team is currently working with the NAVPM team to integrate these experimental findings into their predictive models of aviator proficiency.

PARTNERS

The CFSE project supports the following Navy programs (in alphabetical order):

- Office of Naval Research (ONR)
- Office of the Chief of Naval Operations, Director, Air Warfare (OPNAV N98)
- Naval Aviation System Program Office (PMA-205)
- Naval Air Warfare Center Training Systems Division (NAWCTSD)
- Naval Air Warfare Center Aircraft Division (NAWCAD)

OPERATION BLENDED WARRIOR (OBW) PARTICIPATION

The CFSE team is using an automated performance measurement tool to measure and visualize OBW pilot performance on a timeline in real-time as the vignette progresses. Summary measures will also be provided.

For further information on this exhibit, or business opportunities with ONR, please contact the Training S&T Program Officer, Human & Bioengineered Division, Warfighter Performance Department, Office of Naval Research at (703) 696-4501, or by mail at Office of Naval Research, 875 N. Randolph St., Arlington, VA 22203.