ONR Warfighter Performance

From Adaptive Training to Multi-Target Cueing
Using Augmented and Virtual Reality

AT A GLANCE

ADAPTIVE TRAINING USING COGNITIVE LOAD THEORY

WHAT IS IT?

We use cognitive load theory to optimize Virtual and Augmented Reality training material. These technologies will continue to expand in US Navy cases and training in general.

HOW DOES IT WORK?

We vary the complexity of instructions and how they are presented to measure learning outcomes and performance. Measurements include physiological measurement (e.g., brain activities, such as functional near-infrared spectroscopy (fNIRS) and electro-encephalogram (EEG)), performance metrics (time, accuracy), and self-reported workload.

WHAT WILL IT ACCOMPLISH?

This effort will (1) manage learners' cognitive workload without compromising overall retention, (2) lead to faster training cycles so sailors/marines can be deployed sooner, (3) reduce the potential for skill decay during lengthy training programs, and (4) optimize training time so personnel can focus more on mission-critical tasks.

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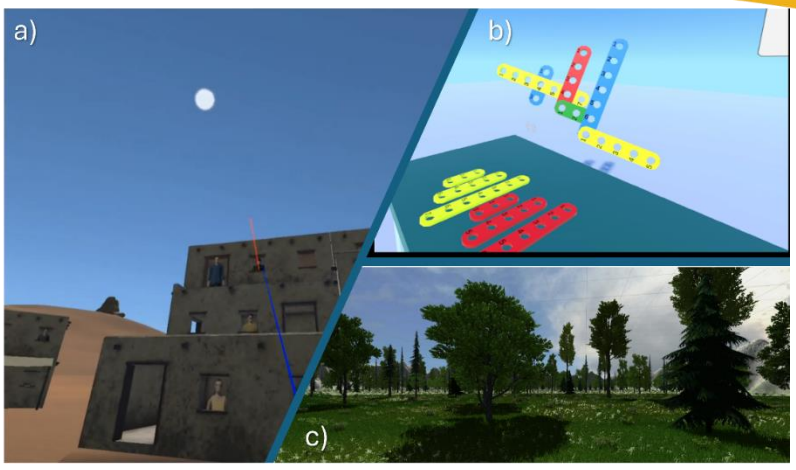

Figure 1: Some of the demos we will showcase. (a) Multi-target cueing for visual search using VR. (b) Adaptive training while understanding cognitive load theory in VR. (c) VR Forest Bathing for reduction of stress and increase of attention.

We will showcase various efforts using virtual reality (VR) and augmented reality (AR) funded by the Office of Naval Research.

1. **Adaptive Training**: We are investigating how varying cognitive load, intrinsic, extraneous, and germane, affects learning efficiency and retention during a shape assembly task in VR (see Fig. 1.b). In this work, we are varying instruction properties and measuring learning outcomes and performance to improve future training systems.

   Demo: Assembly tasks with varying instructions (VR).

2. **Guided Attention**: We are researching how to improve user's performance in sustained attention tasks, such as visual search and cardiac arrest management (CPR). For visual search, we have investigated cues for single and multiple targets (See Fig. 1a) to determine the user's performance in target acquisition. When using cues, we have considered different properties, such as clutter. Another example is notifications and timers that can enhance situational awareness and aid users in complex tasks.

   Demo: Virtual Kitchen with Notification (AR), CPR Timers (AR), Visual Cues for multiple targets (VR).

3. **VR Forest Bathing**: Forest bathing is an evidence-based practice involving immersing oneself in nature to improve well-being. We are looking into how to transfer this practice to be used in VR for people who lack access to nature for different reasons (e.g., mobility). We have found evidence that VR forest bathing can reduce stress and improve executive function, which the latter has been linked to delaying Alzheimer's disease.

   Demo: VR Forest Bathing (and videos of other environments).

Research Challenges and Opportunities:

- Researching state-of-the-art foundational science with the technology of tomorrow to maintain the relevancy of the US Navy.
- Improving training using adaptive techniques measuring cognitive load theory.
- We hope to find partners to collaborate and continuing doing our work.
- Receiving feedback from Sailors, Marines, and Civilians.