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14. ABSTRACT

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as of 03-Mar-2022

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Final Report for Period Beginning 15-Aug-2019 and Ending 14-Aug-2021

Title: Building Laboratories Without Limits: Bringing Behavioral and Neurophysiological Measurement to Real and Virtual Environments

Begin Performance Period: 15-Aug-2019

End Performance Period: 14-Aug-2021

Report Term: 0-Other

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Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees:

STEM Participants:

Major Goals: The major goal of the project was to purchase equipment to form the foundation for a new lab called IMMERSE (Ideas for Merging Measures in Enhanced Reality and Social Environments). IMMERSE is intended to

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support use-inspired research and educational experiences by employing the latest generation of ambulatory behavioral and neurophysiological measurement tools to study humans where they exist: either in the physical world itself, or in very close approximations to it. Importantly, the equipment purchased through the grant to construct IMMERSE was chosen not only with the intent of studying humans acting in isolation, but also in small groups, as they do in a range of situations, including many that are relevant to military contexts. Combined, IMMERSE facilities provide for an unprecedented level of operational emulation in the research and educational domains to explore questions related, but not limited, to human-human teams, human-machine/unmanned teams (MUM-T), robotics, warfighter effectiveness, cybersecurity, and mental health.

Accomplishments: To meet the major goal of the project we renovated lab space with support from the University of Central Florida to house the following equipment, which was purchased, installed, and is now operational. Due to numerous challenges arising from the COVID-19 pandemic, final installation of all equipment was only recently completed during Summer of 2021.

- Four (4) fully mobile Tobii Live Pro Glasses 2 Eye Tracking systems and three (3) fully mobile CGC Mobile-64 EEG systems. The Tobii Live Pro Glasses 2 Eye Tracking systems allow for wireless recording of eye movement data at 100hz in any environment and include scene cameras to record the environment and microphones to record auditory information. Importantly, these eye trackers are designed for research where participants are mobile and unconstrained, such as when in the real world. The CGC Mobile-64 EEG systems allow for wireless EEG recording of up to 64 channels of data. Given its small and light form factor it is ideal for research where participants are mobile and unconstrained, such as when in the real world or in virtual environments. Together, these eye tracking and EEG systems allow for the combining (through co-registration) of eye movement and EEG data in fully realistic environments and across multiple people simultaneously – something that to our knowledge has never been done before but is now possible with equipment acquired through this grant.
- Four (4) BioNomadix portable physiological measurement systems. Each of these systems allow for wireless recording of up to 14 physiological measures, including pulse, cardiac output, heel & toe strike, clench force, acceleration, respiration, and temperature, in any environment. Importantly, these systems are designed for research where participants are mobile and unconstrained, such as when in the real world or in a virtual environment setting.
- Four (4) WorldViz VizMove head-mounted display (HMD) virtual reality (VR) Headsets with integrated Tobii eye trackers, one (1) WorldViz VizMove Projection VR system, one (1) Worldviz Coalescence Mixed Reality System, and associated software development packages. These systems allow researchers to design and implement experiments and educational content in immersive virtual reality environments that approximate the real world while still affording a high level of control over the visual information presented and other research-relevant parameters. Importantly, these VR systems are specially designed to work in conjunction with each other, allowing up to four individual users to interact in the environment simultaneously. Tobii-integrated eye trackers in each HMD allow for full tracking of eye gaze information in the virtual environment. Fully compatible with the BioNomadix measurement systems, the fully immersive and customizable systems allow students and researchers to explore questions that are vital to human behavior, both individually and in teams. The Coalescence system is a state-of-the-art mixed reality system capable of merging the participant's real-world view with a synthetic virtual environment providing a seamlessly enhanced, mixed reality experience. To our knowledge, at the time of installation UCF was (and remains) the only university in the country with this new system, allowing researchers to construct virtual environments with unprecedented levels of realism and immersion.
- Four (4) Magic Leap Augmented Reality (AR) head-mounted display systems. These systems allow for wireless, self-contained delivery of digital content viewed as overlaid on the natural environment. Critically, users can also interact with digital content, allowing for novel approaches toward facilitating performance in a variety of real-world contexts. These systems are inherently designed for research where participants are mobile and unconstrained, such as when in the real world.
- Three (3) Dell laptops. These laptops run the CGC Mobile-64 systems.
- Four (4) Microsoft Surface Pro laptops. These laptops run the Tobii Live Pro Glasses 2 Eye Tracking systems.
- Four (4) Lenovo ThinkPad P71 laptops. These laptops are run the Biopac BioNomadix physiological recording systems.

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- Two (2) CyberPowerPC workstations. These workstations support content development for multiple systems.

Training Opportunities: July 2021 - WorldViz Virtual Reality Equipment Two Day Training Workshop

This in person workshop was held at the University of Central Florida to provide training on the VizMove, VizMove Projection, and Coalescence virtual reality systems and associated software purchased under the grant award. The workshop was administered by WorldViz and attended by grant associated faculty and graduate students.

August 2021- Tobii Eye Tracker Training Workshop

This in person workshop was held at the University of Central Florida to provide training on the Tobii ProGlasses 2 portable eye trackers and associated software purchased under the grant award. The workshop was administered by Tobii and attended by grant associated faculty and graduate students.

Results Dissemination: Nothing to Report

Honors and Awards: Dr. Corey Bohil:

2019 University of Central Florida Teaching Incentive Program Award

Dr. Mark Neider:

2021 University of Central Florida Research Incentive Award

Dr. Amie Newins:

2020 American Psychological Association Rising Star Award

2021 University of Central Florida Research Incentive Award

Dr. Mindy Shoss:

2019 Fellow, Global Labor Organization

2021 American Psychological Association Gwendolyn Puryear Keita Award for Social Justice and the Welfare of Working People

2021 University of Central Florida Research Incentive Award

Protocol Activity Status:

Technology Transfer: Nothing to Report

Partners

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I certify that the information in the report is complete and accurate:

Signature: Mark NEider

Signature Date: 11/3/21 11:47AM

Nothing to Report.