

Augmented Reality Tool for Operationally Relevant 3D Sensorimotor Assessments

Active Technology Project (2023 - 2023)



Project Description

This project will leverage existing capabilities of an augmented reality (AR) sensorimotor assessment tool. Currently, the tool mimics the capabilities of validated 2-dimensional (2D) assessments. While this modality is well-aligned with seated interactions with flight-deck displays, extravehicular activity (EVA) tasks will require full body mobility wherein astronauts reach and bend in a 3-dimensional (3D) space. These types of motions, naturally including head movements, are known to elicit experiences of disorientation. Thus, sensorimotor assessments that include these stimulations and larger movements are important for understanding astronaut readiness prior to initial EVAs. The proposed effort will extend the current 2D eye-hand coordination task in AR to a 3D task designed to evaluate dynamic balance and eye-hand-body coordination. The new module will extend the range of motion and interaction space such that it better aligns with operational task needs for astronaut readiness evaluation.

Anticipated Benefits

The objective of this project is to develop an augmented reality (AR) sensorimotor assessment tool for astronaut self-readiness evaluation. AR headsets are easily deployable, enable the user to see their physical environment for safety in confined spaces, and are multifunctional for assessments and operational tasks. AR operational tools have been in development for Lunar and Martian missions; however, there have been no developments for medical protocols using AR when communication with ground support may be limited or delayed. Current medical assessments require interaction with flight surgeons for interpretation, but this may not be possible for Lunar and Mars missions. Hence the AR is a favorable wearable sensor tool.

This project seeks to address research gaps identified in the Human Research Roadmaps (SM-202) on the development and validation of potential countermeasures for sensorimotor monitoring and addresses exploration capability gap ID 1075 Disorientation Countermeasures and Assessment Tools. The development of AR applications would enhance capabilities of a current HRP project, "Development of Sensorimotor Assessments Using Ground Analogs" (PI: Moudy), to validate sensorimotor assessments under various analog conditions such as simulated Lunar

G. In discussions with Flight Operations Directorate, they have recommended sensorimotor assessments mimicking operational tasks such that crew can self-assess their potential ability to complete mission tasks. The development of the proposed tool is directly in line with this recommendation by enabling assessments in a 3D framework.