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CATEGORISATION OF FUTURE APPLICATIONS FOR AUGMENTED REALITY IN HUMAN LUNAR EXPLORATION

Abstract

The European Space Agency (ESA) has a clear mission to go forward to the Moon in preparation of human presence on Mars. One of the technologies looked at to increase safety and efficiency of astronauts in this context is Augmented Reality (AR). This technology allows digital visual information to be overlaid onto the user's environment through some type of display or projector. In recent years separate studies have been conducted to test the potential value of AR for astronauts by implementing a few functionalities on an AR display followed by analogue testing.

One of the groups contributing to these investigations is Spaceship EAC (SSEAC). SSEAC is a group of interns and trainees at the European Astronaut Centre (EAC) which is focused on emerging technologies for human space exploration.

This paper presents an outcome of SSEAC's activities related to AR for lunar extravehicular activities (EVAs), in which an approach similar to design thinking was used to explore, identify and structure the opportunities offered by this technology. The resulting categorisation of AR applications can be used to identify new functionalities to test through prototyping and usability tests, and can also be used to relate individual studies to each other in order to gain insight into the overall potential value AR has to offer to human lunar exploration.

The approach adopted in this paper is based on the Fuzzy Front End (FFE) model from the innovation management domain. Utilising a user-driven instead of technology-driven method resulted in findings that are relevant irrespective of the hardware and software implementation. Instead, the outcome is an overview of applications in which some type of AR system could provide value by contributing to increased astronaut safety, efficiency and/or efficacy.

As part of FFE's early-phase problem and opportunity identification steps, an initial overview of stakeholders, needs and interesting AR functions was created based on existing literature. These were expanded on through a multidisciplinary brainstorm within SSEAC. The next step in FFE - structuring of opportunities - was conducted through a clustering activity which resulted in a categorisation of potential AR applications. The categories were then tested by asking employees, interns and trainees at the EAC for potential AR functionalities, and seeing if the categories were able to represent all ideas.

The following categories were defined: EVA navigation, Sample Site Selection, Sample Collection, Maintenance Repair and Construction, Logistics and Inventory Management, Medical Procedures, Biomedical Monitoring, Collaboration and Support.