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**Title: Virtual Reality-Driven Design of Augmented Reality Technologies for Extravehicular Activities**

In the context of future crewed planetary missions, such as those to the Moon and Mars, environmental and operational complexities present substantial challenges to astronaut safety and performance during extravehicular activities (EVAs). Although Augmented Reality (AR) Head-Up Displays (HUDs) have been posited as a potential mitigating solution, their suitability for these missions remains largely unexamined. To address this research gap, we have created a high-fidelity virtual reality (VR) model of the lunar landscape, serving as an experimental platform for investigating prospective operational scenarios with astronauts and aerospace experts.

In this presentation, we reflect on the results of two user studies conducted at the European Astronaut Center, involving astronauts and domain experts as participants. Our research substantiates the utility of AR-enabled HUDs in this specialized context in various use cases, including, for instance, risk awareness and the improvement of work procedures. However, it also uncovers critical design considerations, including the risks of information overload, the importance of astronaut autonomy, and the necessity for system transparency and explainability.

Drawing upon these insights, we reflect on the use of AR for EVAs and the use of VR as a testing ground for the exploration of AR interfaces. Additionally, we propose topics for future research focused on the development of AR-based assistive technologies tailored to planetary EVAs.