



MISSION DESCRIPTION

NASA Spacesuit User Interface Technologies for Students

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National Aeronautics and Space Administration

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NASA S.U.I.T.S.

Background

During a spacewalk, an astronaut's job involves focus, direction, and communication. Currently, an extravehicular activity (EVA) crewmember communicates details about all tasks by means of a voice connection with mission control, an EVA partner, and an intravehicular (IVA) crewmember (an astronaut inside the pressurized spacecraft). For years, voice has been the only means of communicating during a spacewalk. However, NASA is developing helmet-based displays which can perform this function much more efficiently, leading to less voice conversation, and a more efficient system. These displays fall under the Informatics Subsystem of NASA's Advanced Spacesuit.

Objective

Develop a user interface, utilizing the Microsoft HoloLens, which enables astronauts to finish a task more efficiently by providing a set of instructions via the display environment (audibly, visually, etc.). The task requires dexterity, physical activity, and navigation between various points within the test environment.

Assumptions

- The astronaut will not have had extensive training on the task
- There will be a specified communication latency between mission control and the astronaut
- Spacesuit anomalies can arise at any time during the EVA
- Lighting conditions can change during the completion of the task
- The astronaut will wear EVA like gloves but will have no other restrictions

Requirements

1	EVA task instructions shall be displayed
2	The astronaut must be able to access the status of the spacesuit at any time
3	The astronaut shall be able to communicate with the Intravehicular Activity (IVA) astronaut or ground control at any time
4	A caution and warning system must be implemented to inform the astronaut about a spacesuit anomaly
5	In case of an interruption, the astronaut must be able to continue the task on hand seamlessly
6	The user interface shall assist the astronaut during the translation to the worksite
7	All hand gestures must be operable with EVA gloved hands (like heavy ski gloves)

Peripheral Device Requirements

These requirements only apply to the development of peripheral device.

1	Any external or additional device must be approved by NASA prior to the test week
2	The device shall communicate with the Microsoft HoloLens
3	Any removable components shall have a tether attachment point
4	All tools must be operable with EVA gloved hands (like heavy ski gloves)
5	Devices must not have holes or openings which would allow/cause entrapment of fingers
6	There shall be no sharp edges on the tool
7	Pinch points should be minimized and labeled
8	Electrical design must meet the additional requirements (see attachment)

Test Setup

The whole test setup can be seen in Figure 1 and consist of three connecting components. Pre -/Post EVA, Translation to the worksite, and EVA worksite.

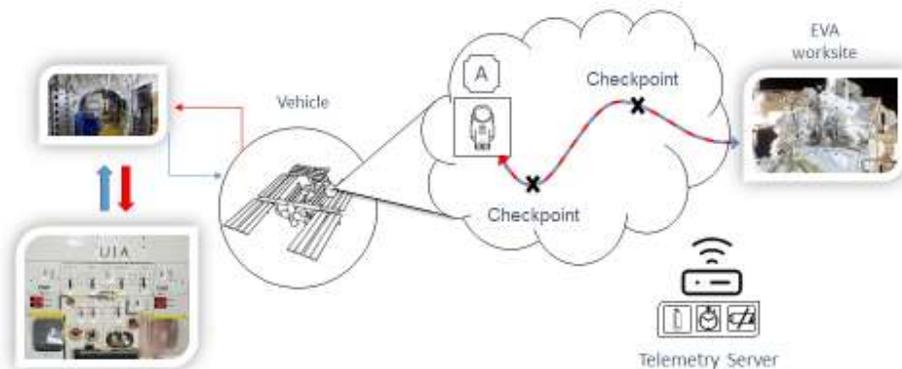


Figure 1 Overview of the whole test scenario