SPACE OPERATIONS SYMPOSIUM (B6)
Human Spaceflight Operations Concept (1)

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VR/AR TOOLS TO SUPPORT ON ORBIT CREW OPERATIONS AND P/LS MAINTENANCE IN THE ISS PRESSURIZED MODULE COLUMBUS

Abstract

Aerospace industries have largely benefited from technological advances in VR/AR simulation, visualization, interaction and mixed reality in various applications areas. Within this contest, the sharing knowledge between technology developers, on ground mission support teams (flight and engineering support teams) and on orbit crew may increasingly drive the definition of future usage scenarios, including systems and payloads maintenance and experimental activities. This approach will also enable the assessment of the overall performance of innovative VR/AR tools to increase the effectiveness of operations in the challenging environment of a human spaceflight. This paper illustrates the "3D immersive virtual scenario" mock up developed by TAS-I as part of VRLAB at the COSE Centre (CDF) Concurrent Design Facility. The VR-LAB is a multi-software virtual environment which allows VR stereoscopic immersive visualization in a complex environment (currently a dedicated COLUMBUS Virtual Architecture Stage is being set up). The selected case studies are based on the TAS-I experts team activities in the frame of Columbus Element Level analysis for the Space Station increment 19-20. Focused tasks are on "on-orbit" maintenance assessments and stowage analyses in response to ad-hoc requests for newly developed or updated procedures, this enabling to collect important feed-back on tools usability by various experts. The main goal is to enhance the tool suite usability by integrating the software (v-CAST software and c-CAST software) already used for soft stowage analysis, interfacing a digital mock-up (e.g. JACK 4.1 mannequin) with human motion simulation software (e.g. ART tracking system). Additonal functions and features have also been added e.g. high quality textures extracted from pre-flight, on-orbit and on-ground imagery, automated interference detection, etc.

The cross-assessment between the "virtual" and the "real" environment reflected by of the on orbit operational tasks, plays a key role in capturing additional knowledge to increase 3D models fidelity and to contribute in modeling and designing tasks in VR/AR, e.g. Task Analyses and Modeling of the Operational Process.

Finally, the on-going collaboration between the on-orbit WEAR experiment (Wearable Augmented Reality) developers and the TAS-I team involved in the operational scenario definition and crew interfaces identification (i.e. parts and inventory items labeling) is also addressed.