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DESIGN AND DEVELOPMENT OF A SPACE SUIT MOCK-UP FOR VR-BASED EVA RESEARCH AND SIMULATION

Abstract

Earth-based EVA simulation has always been the subject of study by space agencies aimed at reproducing the most accurate experience for astronauts. Challenges and limitations are many and not limited to the natural Laws; the space suit system, integral part of the successful EVA, must present the same conditions to the user as it would in the environment of operation. NASA is the most prominent example of a long tradition for a faithful simulation of the outer space in which astronauts operate during EVAs: the Neutral Buoyancy Lab at Johnson Space Center in Houston still represents the standard when it comes to providing astronauts with a realistic experience. However, such infrastructures can be difficult to access, considering the renewed interest in space, this time advocated by new private players, who are looking into LEO access in the short to medium term. Virtual Reality (VR) provides the users with new, flexible and relatively inexpensive ways of simulating the space environment during an EVA, without the need to build large scale pools and mock-ups of vehicles. In this paper, it'll be shown how the Sasakawa International Center for Space Architecture (SICSA) at the University of Houston is working to provide students and researchers with a VR-based infrastructure to simulate EVAs and Space Architectures, which are also designed in-situ. As essential component to achieve realism of experience is the design and construction, done entirely in-house, of a mock-up of the latest NASA Artemis xEMU space suit, to recreate the physical constraints that such a garment imposes to astronauts, and which cannot be entirely simulated with VR. It'll be shown how this space suit replica substantially enhances the accuracy of the experience, by replicating the mechanisms of the xEMU suit, complementing the virtual experience provided at the same time.