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X-ARM: A ROBUST, COMFORTABLE AND RESPONSIVE ARM EXOSKELETON COMBINED WITH EXTENDED REALITIES TO TRAIN FUTURE ASTRONAUTS

Abstract

The number of space travellers is expected to dramatically increase in the next few decades. However, current tools for astronauts are not well adapted to the needs of mass training for microgravity environments. The X-aRm project proposes a novel immersion experience aimed to prepare future space visitors. It combines eXtended Reality technologies with an arm exoskeleton to provide multi-modal stimuli and increase the feeling of presence during the process. This exoskeleton has been redesigned from previous iterations with a focus on robustness, comfort and responsiveness. A bilateral communication between the exoskeleton and the virtual world lets the users feel the forces involved in different activities of typical Extravehicular Activities such as pushing and pulling from handrails. With the proposed strategy, the movements of the trainees and the constraints of wearing a spacesuit are replicated in real time and assisted by gravity compensation technologies. As a result, the system is expected to require less supervision while also allowing a higher flexibility, scalability, customization, safety and immersion.