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DEVELOPING AN ASTRONAUT TRAINING TOOL FOR REMOTE MANIPULATOR SYSTEMS IN VIRTUAL REALITY

Abstract

Humanity's pursuit of exploring celestial bodies beyond Earth necessitates innovative approaches to astronaut training. This project, undertaken by the 1st generation of the new Spaceship ECSAT Team at The European Space Agency (ESA), stands at the forefront of this endeavour. Inspired by the pioneering work of the JIVE/GRAVI-T project at ESA's XR Lab in Cologne, this project focuses on adapting astronaut training tools for remote manipulator systems. Specifically, it aims to transform a VR simulation into a bespoke training module for ESA's robotic arm system in the Vulcan Test Facility in Harwell, UK – by utilising the latest advanced applications of Unreal Engine to create the scenes and modelling the systems in Blendr. Powered by the cutting-edge Varjo XR-3 Virtual Reality Headset, this project aims to create immersive training environments that faithfully replicate the challenges of operating the robotic arm in outer space environments.

The project holds significant educational and operational implications for the future of human and robotic exploration. It serves as a vital educational resource, enabling astronauts to familiarise themselves with the intricacies of robotic arm manipulation in simulated environments. Moreover, it directly addresses the operational requirements of future space missions, positioning astronauts for success in critical tasks such as sample collection and experimentation. The adaptability of the training tool allows for specialisation into specific mission scenarios, such as lunar sample return or for future Mars exploration, thereby ensuring its relevance and applicability to evolving space exploration needs. Additionally, the project's cost-effectiveness enhances its utility, as it eliminates the need for expensive and resource-intensive traditional training methods. Astronauts can engage in VR training sessions anywhere and anytime, allowing for repeated practice and refinement of skills at a fraction of the cost of traditional training methods.

By presenting the project at the International Astronautical Congress (IAC), the aim is to engage the global space community in discussions on the future of astronaut training. Through collaboration and sharing knowledge, the goal is to propel humanity's journey towards the Moon and beyond, guided by a shared commitment to excellence in astronaut training and education. This abstract serves as an introduction to the ongoing project, with further developments and insights anticipated post-completion. As the project embarks on the next phase of development, the team remains dedicated to refining and expanding the training tool, ensuring its readiness to meet the challenges of future space exploration missions.