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TRAINING FOR LUNAR EVA EXPLORATION: VIRTUAL REALITY VISUALIZATION OF EARTH'S LAVA TUBES, GUIDING 3D MODELING FOR LUNAR LAVA TUBE MISSION TRAINING AND SIMULATION

Abstract

This study details the meticulous methodology employed by teams within the International Institute of Astronautical Sciences (IIAS) as part of a Lunar Geology class, for mapping lava tubes in Jordan and Arizona. Utilizing a comprehensive array of tools including infrared (IR) imaging, Light Detection and Ranging (LiDAR) technology, off-the-shelf drones, GoPro 360 cameras, and advanced 3D modeling software, these teams constructed detailed 3D models of terrestrial lava tube networks. These models are integral components of immersive virtual reality (VR) environments, essential for astronaut training and preparation for extravehicular activity (EVA) missions within lava tube environments. Through VR simulations, astronauts gain valuable insights into lunar surface scenarios, including navigation, geological features, and potential hazards. Furthermore, these simulations facilitate collaborative training exercises, fostering effective team coordination in simulated lunar conditions. This interdisciplinary approach underscores the vital role of leveraging advanced technology within the educational setting of IIAS, bridging the gap between terrestrial fieldwork and lunar mission training. By integrating VR visualization, this study emphasizes the importance of enhancing astronaut preparedness for the challenges inherent in exploring lava tubes on the Moon, thus laying the foundation for the success and safety of future lunar missions.