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SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
Interactive Presentations (IP)

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THE MARS LAB: AN IMMERSIVE MARS ANALOGUE EXPLORATION MISSION TO PROMOTE STEM EDUCATION FOR SECONDARY SCHOOL STUDENTS

Abstract

The Mars Lab is an immersive educational experience that aims to promote and lift participation rates in Science, Technology, Engineering and Mathematics (STEM) for secondary school students. This is achieved in the form of a robotic planetary analogue exploration mission where student participants look for evidence of extraterrestrial life and geological processes. The experience sees students remotely control research-grade robotic rovers in a purpose-built 140 square meter scientifically accurate Mars Yard. Based on a curriculum integrated program of geology and astrobiology that they have been following in the weeks leading up to their mission, students remotely log in to the Mars Lab from their classroom and work as a "ground control" team to accomplish their mission goals. The program brings an inquiry-based approach to learning. Students generate their own research questions and formulate a plan on how they will conduct their experiments. From their classrooms, students are given an authentic, immersive and interactive experience where they control physical robotic systems. These systems include two Mars analogue rovers along with a virtual rover simulation software called the Virtual Mars Yard (VMY). The two rovers are called the Continuum and MAMMOTH rovers and offer students a variety of mobile tools to explore the Mars Yard. Using the VMY software, students first learn how to safely operate the robotic platforms before being given control of the actual rovers to conduct scientific investigations. The VMY offers a realistic simulation of the rovers interacting with an accurate virtual Mars Yard terrain model. During the mission, students are broken up into different teams, where each team member records their observations using purpose-built software called Mars Yard Maps (MYM). MYM features a 3D reconstruction of the Mars Yard on which students can place markers indicating sites of interest and associated observations. MYM is also used to plan out candidate rover paths by the placement of waypoint markers. At the conclusion of the program, students are asked to present their findings to the class and reflect on their experience. Additional video conferencing with practitioners in the fields of science, engineering and mathematics is included in the Mars Lab program to complement both the preparations for the student missions and post-mission reviews. Qualitative evidence of the effectiveness of the Mars Lab program along with a statistical breakdown of student participation over the four years of the Mars Lab's operation is presented.