



Lunar Outpost's Rover HIL Box

Jeffrey Stenerson, Software & Electrical Engineer, (jeff@lunaroutpost.com)

Joshua Rands, Software Engineer, (josh@lunaroutpost.com)

Company Background:

Lunar Outpost Inc. is an advanced technology company with a focus on developing technologies that have both terrestrial and space applications. Comprised of engineers with experience working on NASA, defense, and commercial programs, Lunar Outpost is engaged in contracts with the U.S. Department of Defense, NASA, local and state government organizations, and leading research institutions. Other ongoing projects include development of the MAPP rover, a robotic prospector designed to map resources and carry payloads on the lunar surface; deployment of the Canary environmental monitoring system in the energy sector and municipalities across the continent; and contribution to the Mars Oxygen In-Situ Resource Utilization Experiment (MOXIE) onboard the Perseverance rover.

Description of Work to Be Done:

The goal of this project is to build a hardware-in-the-loop (HIL) box that acts as the bridge between Lunar Outpost's rover simulations and the rover's physical hardware. Students will be challenged to create a ROS node that translate signals from an embedded application and convert them to acceptable ROS messages that can be utilized to interact with a simulation. This HIL box will be utilized to control the rover in simulation from hardware and obtain various sensor data from simulation to make logical actions. This is a multidisciplinary project, and will require interaction with embedded platforms, robotics systems, and Linux environments.

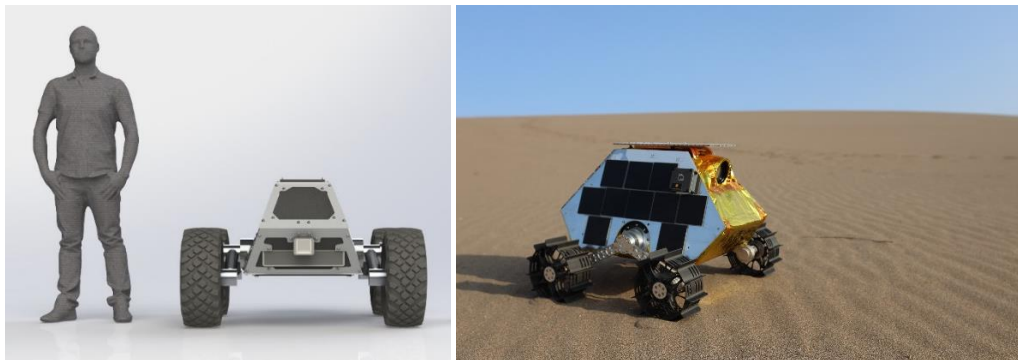


Figure 1: HL-MAPP for Earth based Applications and MAPP being tested at the Great Sand Dunes.

Students will focus their efforts on three specific areas:

1. Create/Utilize Linux drivers to interpret embedded signals from hardware
2. Create a ROS node that translate the embedded signals to ROS messages that can be utilized by simulations
3. Interreact with simulations by transmitting and receiving data from an external platform

The students will be involved in every phase of the project 'from design through implementation'. During the design phase the students will interact with Lunar Outpost engineers to see what will provide value for operation. From there, the project overview will be created, and the work divided into tasks. As a final product, the Field Session team will develop a HIL Box that acts as the bridge between simulation and hardware.

Jeffrey Stenerson, Software & Electrical Engineer and Joshua Rands, Software Engineer at Lunar Outpost, will be managing this project on the Lunar Outpost side. Both Mr. Rands and Mr. Stenerson have extensive software development and project management experience and can help mentor the student team throughout this course.

Desired Skills for Students:

- C/C++
- Python
- ROS & Gazebo
- Linux

We understand not all the students in the group might have the desired technical skills. However, if they can problem solve and have a willingness to learn, they can excel in this project with the help of our talented engineers.

Preferred Team Size: 3-4 students

Given the scope of this project a group of 4 students is preferred but 3 students could also excel given they are willing to problem solve and learn.

Internships at the End of the Course:

We are happy to consider offering internships at the end of the course.

Location Where Work Would Be Performed:

We have offices in Golden and in Arvada, CO. The office in Golden, CO is located at 17700 S Golden Rd Unit 102 and has space for a student team. This office is less than a 5-minute drive from CSM campus and should provide a convenient location for the students to meet. We also provide free beverages and snacks to keep the team fueled throughout the day.