Rover Mission Control

Luke Bowersox, Senior Robotics Engineer Lunar Outpost, (Luke@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. Air Force, NASA, local and state government organizations, and leading research institutions. Other projects currently in development include the MAPP rover, a prospector designed to map resources and carry payloads on the lunar surface; a prototype life support system for Lockheed Martin's Lunar Habitat module; the Bloomberg Mayor's Challenge; Denver's Smart Cities Initiative and more…

Description of Work to Be Done:

The goal of this project is enabling rover command and control through a web-based interface. Lunar Outpost develops several types of rovers for terrestrial and lunar applications. One such rover is HL-MAPP, a 300Kg robot designed to carry large payloads over extended distances. This project will be focused on creating an interface for users to interact and direct their autonomous rovers that are deployed in the field.

Once a rover has been deployed it is unlikely that the user will be able to directly interact with it through a LAN connection for a variety of reasons. This makes it difficult to command the system via conventional means such as SSH or SFTP. Therefore, it is necessary to create a system that allows the rover to receive commands and data from external internet connections. In this project students will build a web application and API to interact with the rover through a web-based platform. The system will need to enable the following: teleoperation, setting of goals/modes, collection of rover status/telemetry data, and control of rover payloads. This project will push students to learn skills required to be successful in an increasingly remote world and introduce them to the command and networking issues faced daily by robotics professionals.
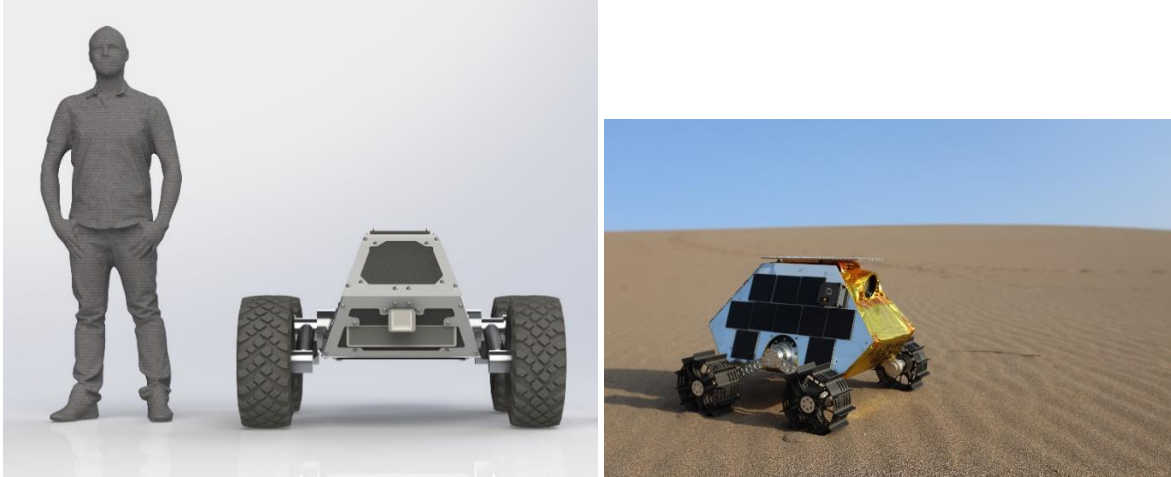
Figure 1: HL-MAPP for Earth based Applications and MAPP being tested at the Great Sand Dunes.

In designing the Command Interface, students will focus their efforts into two specific areas:

1. Developing a web application and associated API that can be integrated into Lunar Outpost's database to operate a rover in simulation.
2. Creating a networking solution to enable remote access to a rover located in a remote setting.

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 an all-in-one solution that incorporates the web application into the Lunar Outpost data base and control a rover located at our offices.

Luke Bowersox, the Senior Robotics Engineer at Lunar Outpost, will be managing this project on the Lunar Outpost side. Mr. Bowersox has extensive software development and project management experience and can help mentor the student team throughout this course.

Desired Skills for Students:

- C++
- ROS/Gazebo
- PHP
- HTML/JS/CSS
- Networking

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: 4-5 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.