ILR03 - Progress Review 2

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Team G: The Pit Crew

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1 Individual Progress

Following the first lecture by Ron Lachell, I concluded that our team had not been demonstrating good project management practices. I believed this was due to the fact that we had not assigned the role of project manager to a particular person, and therefore nobody felt the responsibility to enforce those proper practices. In order to help get us back on track in that regard, I offered to take on the project manager role. We conducted a retrospective, made some alterations to our meeting schedule, and I created a new Trello board to track ongoing work and deadlines.

I communicated to other individuals involved in the MoonRanger/PitRanger project that our team needed full-time access to Blue or another rover platform in order to test effectively. They were unable to promise this, but they did provide me with a parts list for Blue. From this list, I identified the components that were already in the MRSD inventory, and those which we would need to order. I also obtained an offer of help from Neil Khera, a graduate student who has worked with Blue and has written code that we are using for our project, to help us assemble the new copy of Blue (henceforth referred to as Blue2) once all the parts arrived.

Lastly, I was able to secure temporary usage of Blue during an evening when no other people were using it. I reached out to the head of the MoonRanger software team, and she gave me information on the code that had already been created for operating Blue. Based on her explanations, I was able to identify the most useful packages for teleoperated driving and operation of the RealSense camera.

2 Challenges

As stated previously, we struggled to attain access to any of the rover surrogates used by the MoonRanger team (see Figure 1) for any significant period of time, which hampered our ability to become familiar with existing code and build upon it. Our initial thought had been that once the MoonRanger team completed construction of their surrogate rover, PowerRanger, they would have less use for Blue and it would become available for our use. Unfortunately, that did not come to pass, at least not on the schedule we required for our project. Ultimately, we resolved the issue by ordering parts and securing assistance to build Blue2.
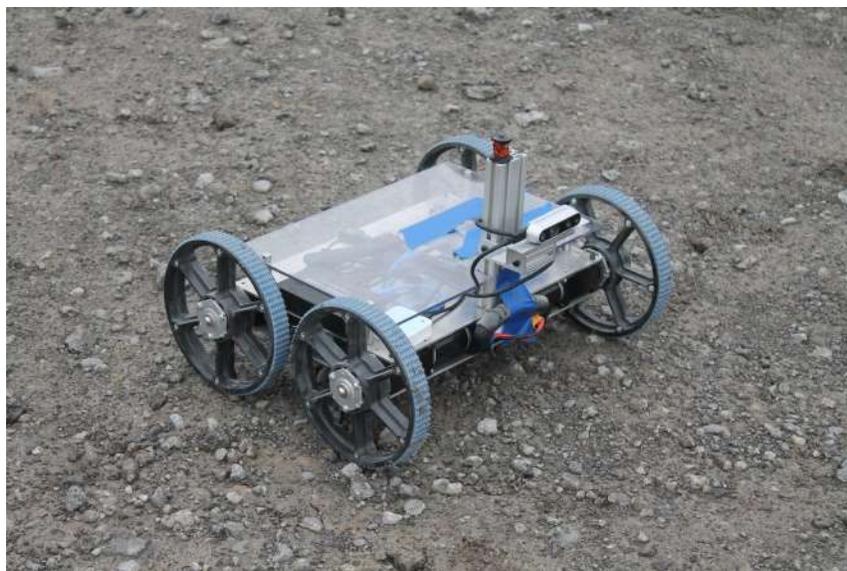

Figure 1: Blue being operated in the field, which does us no good and also caused significant damage to the rover.

Another challenge has also been revealed in the wake of the Planetary Caves Conference, which several PitRanger-affiliated people attended in February. Thus far, we have been operating on the assumption that the area around the pit would be approximately flat, much like the pits that have been used for testing on Earth. However, the consensus is that lunar pits tend to have a steep sloped area around the edge of the pit, which would be extremely difficult for a wheeled rover to traverse. While this issue of traversal on slopes is not the primary focus of our project, we do intend to perform risk assessment of pit edge conditions, and this feature of the pit edges changes that calculation significantly. It may be that we do not confront this issue as part of our MRSD project, but in order for our final program to be as useful as possible to the PitRanger mission we will need to maintain awareness of this reality as we move forward with our development.

3 Teamwork

Although I have taken on the role of project manager, I have made an effort not to be unilateral in my decision-making about how to manage the project. In that spirit, the entire team participated in and contributed to the retrospective and other conversations about how to manage our progress in efficient and effective ways. Their insights were greatly appreciated.

During the evening when we were able to work with Blue, Awadhut and I worked together to determine which ROS launch files and packages we could use to operate Blue. We were able to power on Blue, send commands to its four motors, and collect a rosbag file of data from the RealSense cameras of the rover moving toward the edge of one of the lab tables. This rosbag may prove useful for future testing of the stereo brinksmanship functionality until we have an opportunity to take Blue2 out into the field.

Meanwhile Alex has continued to focus on setting up the WeBots simulator. I was impressed that he was able to convert an existing 3D model of a pit (called King's Bowl) into a format that could then be imported into WeBots. Since the previous MRSD team was not able to find a method of accomplishing this, and had to resort to merely uniformly lowering the height of a section of terrain, this will provide a significant improvement to our simulation capabilities without requiring us to create a simulation from scratch. Our conversations with other parties involved with PitRanger, including NIAC, have indicated that a working simulation of a pit being a high priority for them, so this progress has been very valuable.

4 Plans

My highest priority in the coming week is to ensure that all components for Blue2 are gathered properly, and then to assemble Blue2. Once we have a rover that is ours to use whenever we wish, that will open up many possibilities for future testing. Our first priority will be to run the stereo brinksmanship pipeline on Blue2. Since the brinksmanship routine is intended to stop the rover from moving if it detects the presence of a dangerous edge, we will need to set up some edge for Blue2 to detect. We will start by using a lab table, and if that is not sufficient or if we exhaust the progress we can make in that environment then we will move to outdoor testing at Gascola or another site. In order to ensure the safety of Blue2 during these tests, we will secure the rover with a rope so that if the brinksmanship code fails to stop Blue2 moving it will not fall over a cliff edge and break.

As stated in Section 3, we believe it is a high priority to develop a simulation in which a rover can drive around a facsimile lunar pit. We will fully establish the WeBots simulator and initially use the code developed by the previous MRSD team to navigate around the pit circumference. From there, we will add additional navigation functionality to align with the deliverables of our project. Our intention is to develop the simulator in parallel with our real-world features.