ILR02 - Progress Review 1

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Team G: The Pit Crew

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1 Individual Progress

I have continued to familiarize myself with the rover Blue, which we intend to use for much of our real-world testing in the coming months. I have spoken with several of the students who have worked with Blue as part of the MoonRanger project, and they provided some insights as to which ROS packages already installed on Blue would be most useful to us in our work. Code has already been written to allow Blue to be teleoperated and to operate the RealSense camera. We will use this code to perform early tests, and we can tweak it to our preferences as necessary.

2 Challenges

Thus far we have had some difficulty accessing the resources (like Blue) that we share with other people involved in MoonRanger. However, this should become less of an issue now that the MoonRanger team has completed assembly of the PowerRanger surrogate, which they intend to use as their test platform going forward.

Another issue is that we require data that was not collected during the Utah trip, most notably an image set which depicts the camera moving from far away from the pit to near the edge. We will need to collect this data for ourselves, which means bringing a camera and most likely a robot out into the field to perform some tests. Luckily, several viable sites for this sort of testing have been identified, and we should be able to have more access to Blue going forward.

3 Teamwork

After our previous conclusion that using image processing to detect pit edges was not an effective solution, Awadhut has turned his attention to developing a stereo reconstruction pipeline using the stereo pair on the RealSense camera. Since this is the same camera that is mounted on Blue, our intention is to feed this stereo depth reconstruction into the brinkmanship code that we inherited from Neil Khera. The depth readings will take the place of the sensor data from the RealSense depth sensor, since this sensor will not be available on the flight rover. Awadhut has already seen significant success in this approach, and is able to produce accurate depth measurements using the RealSense stereo in lab conditions.

Alex has not yet been successful in running the simulator on his own computer, due to version incompatibilities. However, he has been working hard with Himil from the previous year's MRSD team which developed the simulator, and through these efforts he has learned more about the inner workings of the simulator. In addition, we now have access to the lab PC that last year's team was using, and we can run the simulator on there until we find a way to overcome the issues Alex has encountered. Alex also did an assessment of the camera used to capture data at the Utah pit, and determined an analagous space-rated camera that would provide similar image results in lunar conditions.

4 Plans

Our plans are much the same as those detailed in the previous ILR, due to the relative lack of time we have had to make progress in those areas.

We will continue to develop the simulator, and construct an environment in which a simulated robot can navigate around a lunar pit and collect images of its surroundings. This will involve running the existing WeBots simulator and assessing its usefulness for our needs, and possibly selecting a different simulator if we decide it is not viable. In particular, we need a simulator into which we can load a detailed 3D model of the pit.

Our other plan is to construct a software pipeline which takes stereo images from the RealSense camera, performs a depth reconstruction, and then provides the resulting data to the brinkmanship routine, which can override the robot motion if it detects that safety thresholds have been exceeded. We will then test this pipeline on Blue in order to demonstrate that each component is working as intended.