

Individual Lab Report #02

Progress Review

February 20th, 2020

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Pit Navigator

Team G: The Pit Crew: Awadhut Thube, Justin Morris, Alex Withers

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Individual Progress

Pit Navigator

Camera Selection

For the Pit Navigator project, I have come up with a metric that we can use to define what set of camera and lenses that the PitRanger can use on the moon to take images of the pit. I defined this metric as pixels per square meter of opposing wall. This metric defines the level of detail on the wall, how much data needs to be stored to provide what image of the wall, and the resolution and focal length of our camera. Additionally using similar triangles, I can use our test data of modeling the pit in Utah to determine what that resolution of the opposing wall was and the quality of the results of the modeling that come from it.

Our camera needs to be rad hardened, provide the pixel density near to the Utah pit images, light, and fit into our electronics architecture. I found Malin Space Science Systems who make the majority of cameras that go on the Curiosity and 2020 Martian rovers. They have 2 standard cameras available, and I found that if we combine the C50 camera with the narrow field of view lens, then we could get the 3/4s of the pit wall pixel density compared to the Utah images. The camera and lense weigh less than 400 grams, which leaves plenty of space for the pan tilt mount. This is the closest camera to come to these two most important requirements. The E50 camera is shown in the figure below.

ECAM-C50

Color CMOS Camera, 5 Megapixel



ECAM-C50 Alternate Mounting Configurations

Figure 1: The Malin Space Science Systems Camera C50

Testing Site

The MoonRanger team has acquired another test site, Gascola. This site is available whenever we need it, under minimal supervision so we can nearly test whenever with minimal notice. This is ideal for our project because we may not know that we need to go out until the day before or need to test at night. I visited the site with them and determined 2 good cliffs that can serve as pit edges. I am continuing the process of gaining a pass to the main facility so that our team can use the bathroom if we need it. We can also remove shrubbery and trees smaller than 3 inches around to make the test site more moon-like.

Simulation

I have been working on getting the previous team's Simulation going on another computer and am recording the steps that I take to build it. This simulation will be beneficial to testing our project before going out to the field and working on a real robot. We will be able to test our detection algorithms and planning algorithms faster than real time in sim. I have not gotten it to build quite yet and am continuing to do that.

Challenges

Pit Navigator

Gathering Resources

The sheer number of resources available are overwhelming, and none work right out of the box. It takes a significant effort to get these resources to build and to run on another machine when there are no instructions to do so. While these resources might be sound, unless our team can use them, they are worthless. So figuring out what to use, what to fix and what to discard has been a significant challenge.

Simulation

We have the most information on the previous team's simulation and it seems to have the most out of box potential, so I am doing my best to get that sim to build and run on our machine, however it has been quite the challenge to find and install all the hidden dependencies and file locations that need to be moved.

Teamwork

Pit Navigator

Individual	Main	Sub	Description
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Alex W.	Simulation	Getting Resources, Looking for cameras	I have been responsible for gathering all the resources at our disposal and getting the simulation up and running. Looking for cameras is something I picked up as a third while the others are working with cameras
Awadhut T.	Detection	Camera control and camera mount	Determining the best way to detect pit from afar, and controlling the camera. Like getting stereo matching
Justin M.	Get Data	Robot control	Main job is getting the different pit models and camera images, while getting access to physical robot to figure out the hooks

Plans

Pit Navigator

Testing Site

I am obtaining the pass for the testing site and will come up with the testing plans to run once we have the resources running to do so.

Simulation

I will build the simulation and get it running, then attempt to add into the sim, the different pit models that we have access to. Then add other code like Neil's brinkmanship to determine if we can stop at the pit edge.