

Individual Lab Report 8

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Team B: Space Jockey

With Brian Boyle, Ardyia Dipta Nandaviri, Songjie Zhong

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1 Introduction

For team B, the last two weeks have been primarily focused on mechanical design and assembly of our robot's chassis. Although we are still behind on our progress in that arena, I believe that we are making good progress, and should be on track for our next few milestones. In the future, we will be finishing the mechanical design of our robot, attaching it to the wall, and developing our software framework for planning, localization, and inspection.

2 Individual Progress

The majority of my efforts were focused on fabrication and assembly of our chassis components. Since the demonstration of our last prototype, I have done two more design revisions of our linear actuators, resulting in additional size (and corresponding printing time) and weight savings. Compared to our actuator enclosures from last semester, the current design is roughly one third the size, and only 20% of the weight. The addition of positioning tabs and additional screw mounts around the linear bearings, the current actuator is also very rigid, with no noteworthy tolerance issues, vibration, or flexing during actuation.



Figure 1: Chassis Detail, showing completed linear segments.

Although our linear actuators are complete, we are still a bit behind on our chassis design, as I have not yet finalized the center segment design, which is one of the most complex components, due to its small size, and number of degrees of freedom, and wiring passages. With continued design effort at the current rate, I anticipate that this segment should be

integrated and functional in the next week. The currently completed chassis components may be seen in Figure 1.

This week, we also received all of the components of our new power distribution board. Brian and I worked together to assemble and test these. Both boards passed our tests and are functioning as designed. In practice, the new board is half the size, and half the weight of our previous design. A size comparison of the two boards may be seen in Figure 2.

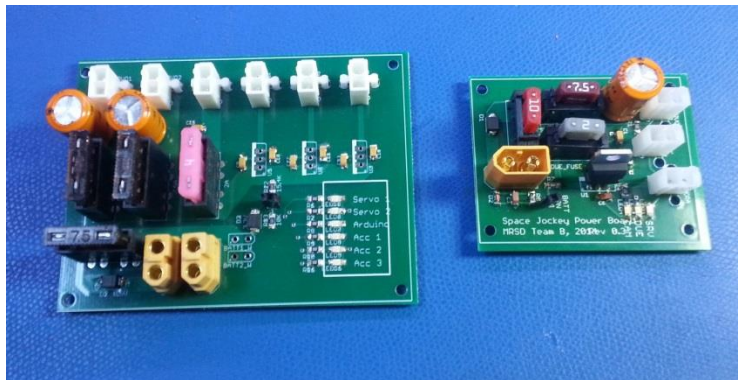


Figure 2: Comparison of power distribution board size, Old board (left) and new (right)

Once the two linear actuators and power distribution board were assembled, I integrated them together for our demo, which showed all components operating together under ROS control, with the servo motors for the unfinished segments on the bench by themselves.

In addition to my construction efforts, I spent some time working on some code review and refactoring of our code base. Particularly, I am focusing on refactoring and modularizing our Arduino firmware, to make future development and debugging easier to perform. However, I also spent some time developing a ROS launch file to make running our control system easier. I expect this effort to increase in the next three weeks, as we further integrate Dipta and Songjie's April tags code into our ROS environment, and begin implementing our path planner.

3 Challenges / Issues

One of the chief issues this week was the use of a bad roll of natural ABS filament on the Makerbot. This bad filament would often stop extruding randomly. We found that cleaning out the extruder rollers helped with these issues somewhat, but in the end, we had to switch to different rolls of material (Green and Red) to manufacture successful components for our chassis. This is why our robot now looks like Christmas.

In addition, with Spring break looming and the end of Mini-3 courses, these two weeks have been very strained time-management wise, rendering full team meetings and group work sessions harder to arrange, which has delayed our development schedule somewhat. I believe

that the worst of these deadlines are behind us, so we should be able to get our schedule back on track in the next three weeks.

4 Efforts by Team Members

In the last two weeks, Songjie has been working on the ROS integration of the april tag telemetry data. He also did the machining for our linear actuator shafts. Dipta has been working on reading the camera data from our Wi-Fi camera, and piping it into the april tag pipeline. Finally, Brian has been working on designing our hand-held prototypes for the magnetic attachment mechanism, and assisted in the assembly of our power distribution board.

5 Future Plans

For our next progress review, our goal is to have the entire chassis fabricated and integrated, with the center segment and magnetic feet integrated and attached. I will be continuing my previous work on chassis design and assembly; collaborating with Brian on the foot mechanism. We plan to demo the robot walking horizontally and statically adhering to a vertical surface. Our stretch goal is to have the robot walk on a vertical surface, but we are worried there may be unforeseen difficulties with the robot dynamics when moving in the vertical plane.

In addition, Dipta will be integrating our IMU into the robot, and adding ROS support for it. He and Songjie will also continue to use their computer vision experience to develop our image comparison algorithms for inspection. On the other software side, Brian and I will begin to develop our path planning framework, and I will continue to review and clean up our code base.