

ILR #7
Amazon Picking Challenge

Michael Beck
February 16th, 2016

Team E
Michael Beck
Akshay Bhagat
Matthew Lauer
Che-Yen Lu
Jin Zhu

Individual Progress

My primary responsibilities for the last couple weeks entailed keeping the team on track in pursuit of establishing an MVP. In addition I also spent extra time with the SBPL lab to clearly define goals for vision and localization, which I then conveyed to and discussed with my teammates. I also worked to fabricate a final version of the 1-DOF gripper design from Fall, and to procure the 80/20 stand for our system's arm so that we can begin picking from all 4 drawers in our system.

Project Management

As per usual I drafted up a list of tasks to be completed by the team and posted them on Trello. I also worked with my team to specifically lay out dates and times that everyone would be available in order to try and establish an MVP for our system, as the deadline set for establishing the MVP was aggressive. Related tasks included helping out my teammates with their tasks when they were unclear on their goals, or troubleshooting some technical issues.

1-DOF Gripper Construction

The final system gripper design has been pushed back due to not yet receiving the item list for the 2017 challenge. The 1-DOF design from Fall has still been considered an improvement over the current gripper, so establishing it as part of the MVP became a new intermediary goal. Fabrication consisted of creating a vacuum adapter to interface the Anver 1.25" hosing to our current shop vac, and to reprint the suction head so that it had better tolerances within the end effector. I also spent time with Larry Hayhurst and am waiting on him to CNC two aluminum parts out of aluminum plate I provided him with so I can finish fabrication. The newly printed vacuum adapter and suction head can be seen printing in Figure 1.

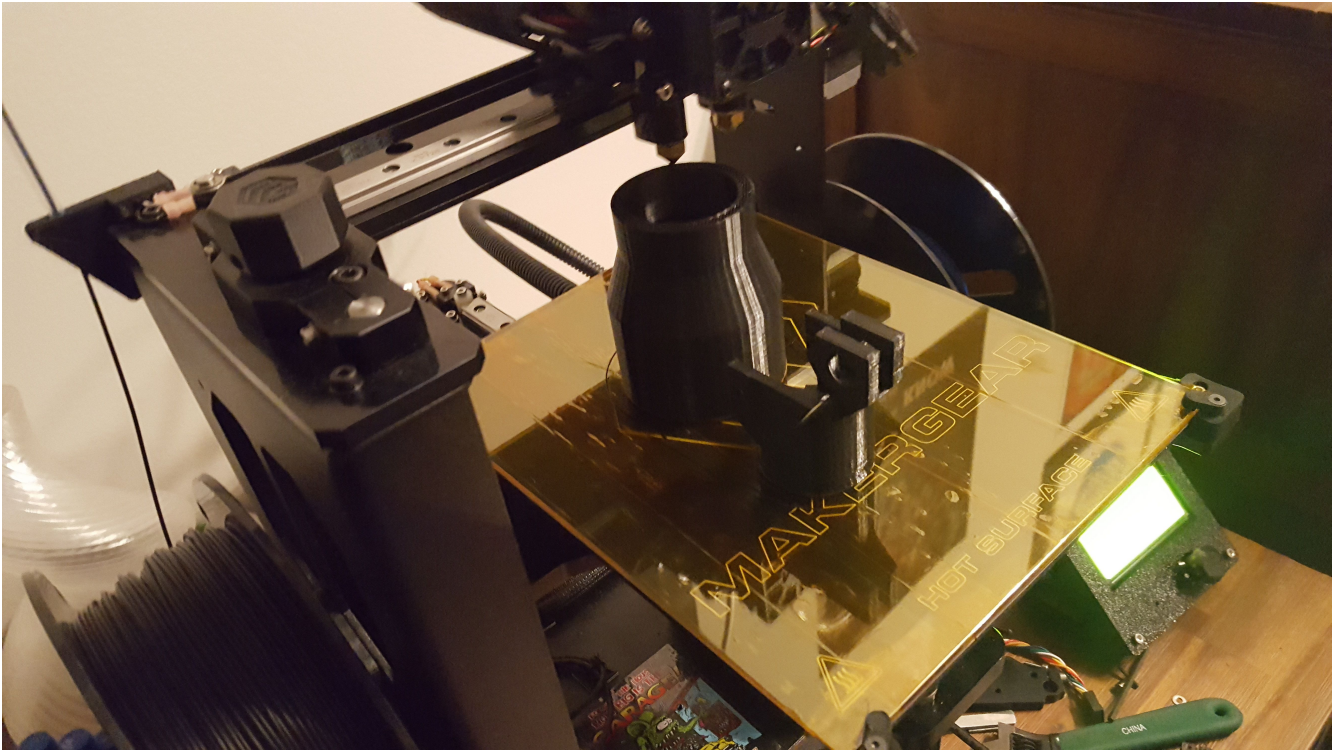


Figure 1: New 1-DOF 3D Print Parts

Both parts were tested and worked as expected, and I was able to lift every item from last year's competition excluding the dumbbell with the setup. Once I receive the aluminum parts from Larry I will weld them to the end effector and mount it to the arm.

Challenges

Hardware Integration

Developing every subsystem for the MVP took a substantial amount of time and testing. It was frustrating for the team to work out all the individual bugs just to hit hardware limitations the day before the PR. Most notably our system currently cannot handle more than one Kinect per PC. We will be working this weekend to resolve this issue asap in order to bring the MVP up, and to better understand hardware needs for the multiple sensors we are intending on using for the project. I discussed this issue with Alex utilizing his knowledge from last year's competition, and have a handful of ideas about how to approach and better understand this problem.

Team Member vs Project Manager

This last week I found myself in an awkward scenario a few times where I was

looking over my teammate's shoulders because I was so invested in understanding how long their work would take and needed to be present for one or two small tasks. The beginning of the semester involved a large amount of organization and scheduling, but there was more of a lapse in that work this past week and I was not as capable as some of my teammate's to contribute since I have not been as technically focused and was not as familiar as they were with system components on the implementation level. Though I am acting as project manager I am intending to move back into a technical role heavier than I have been these past few weeks, so that I can better make use of my time and not helicopter over other people's work.

Teamwork

MVP Progress

I spent large amounts of time with Matt and Leo in order to establish the MVP for our project with the new system setup. I think Matt and I were in the lab for 20+ or more hours this past week specifically for this task. The majority of my contribution was in code/system design and helping troubleshoot system failures, including writing pseudocode, developing system logic, and writing some small code snippets (Matt and Leo had the lion's share of implementation).

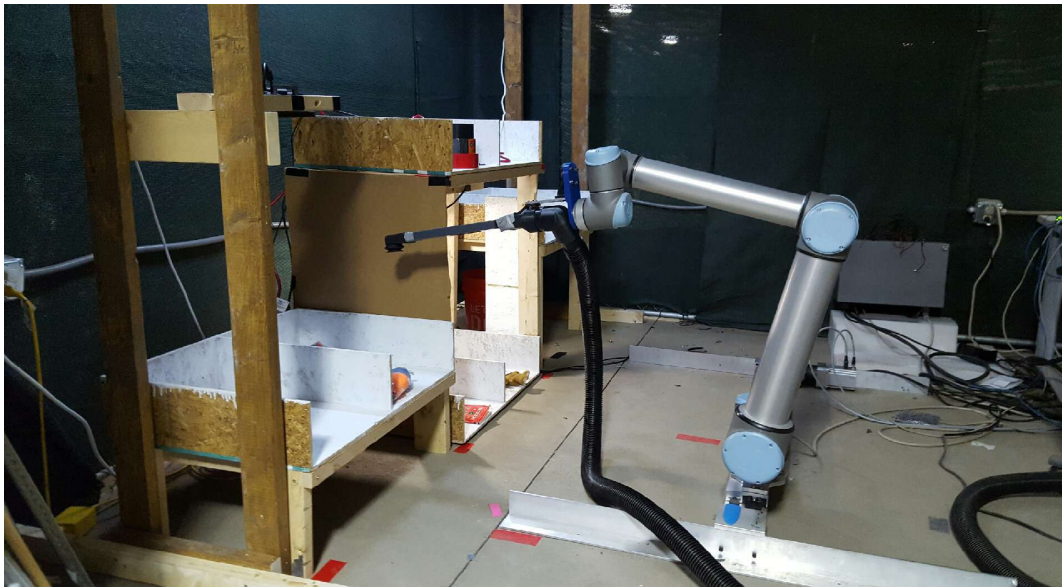


Figure 2: Picking System for MVP

I also worked with Akshay to procure the 80/20 framing needed to lift up our arm so it can reach all of the drawers. There had been a continual miscommunication with Intek regarding frame dimensions that I was finally able to resolve, and we were able to

get a quote within our expected budget for the framing. We should have the framing by the end of next week.

Future Plans

There are three primary tasks for the next couple weeks. We just received the new item list today, so gripper design has now become a forefront task. Implementing grasping for deformable objects is also a current priority, because Alex is a resident expert for that task and will only be available for the next few weeks. Finally the system MVP which we were unable to establish for this PR needs to be finished and running in a robust manner.