Individual Lab Report
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Team E
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Individual Progress

Over the last few weeks I have been working to complete the simulation goals that are necessary for completing our new minimally viable product.

The first task I completed was confirming that the full extent of the shelf design would be within the reach of the robotic arm. I reused a good deal of code to check the configuration space of the UR10 with slider. I modified and old script for generating points of interest and verified that the extreme locations of each bin could be reached with the current setup. This involved some back and forth with Akshay and Mike to pin down the best shelf dimensions. At this point we have chosen 80 cm by 62.5 cm as our bin bounding box. This will likely shrink a bit due to the need to fit some april tags and supports into the bin.

Once these values were agreed upon, I created a working planning scene that includes everything necessary to begin real world testing. This planning scene can be seen in Figure 1.

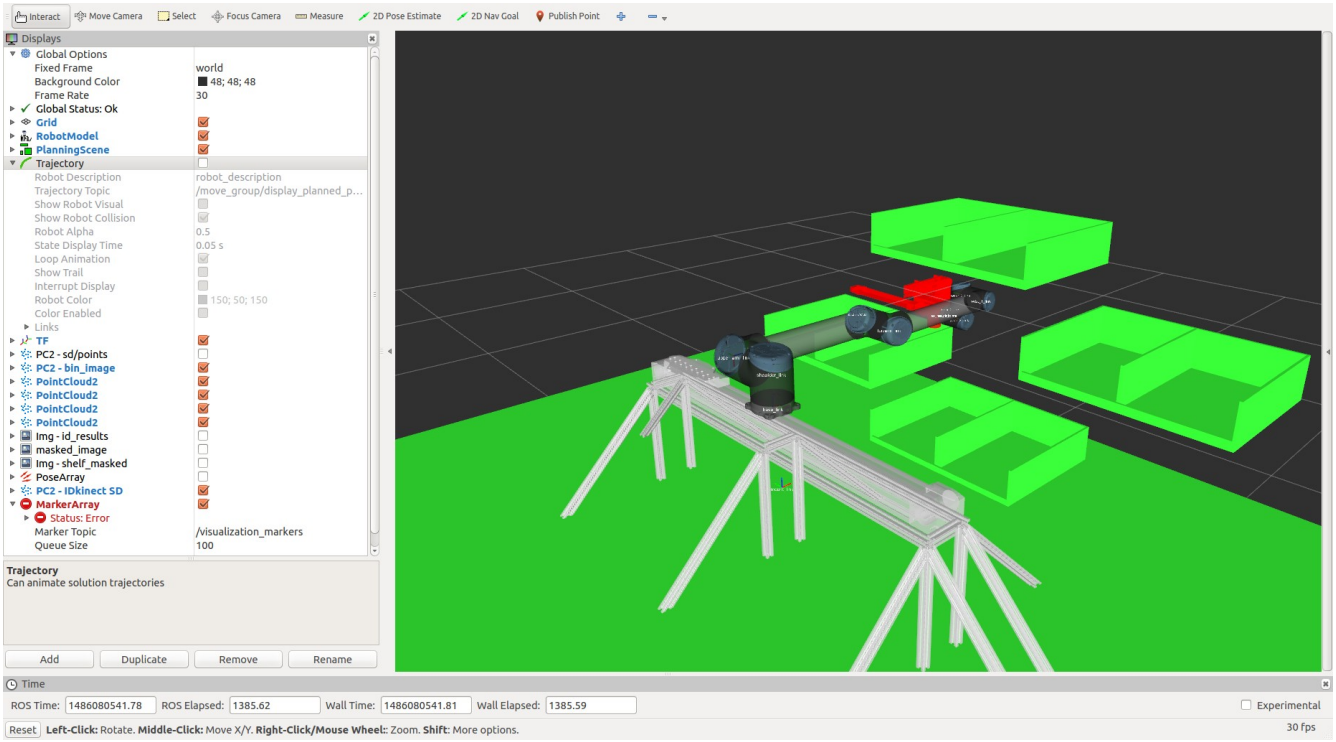

Figure 1. A planning scene that represents our mockup shelf.

I also worked on simulating the new slider with the UR10. I modified the URDF in order to add the new STL and joint, and I modified the UR10 moveit config to reflect those changes. I then began to makes some changes to the ur5_spbl_interface_config package, so that it would work with the now higher dimensional arm. Once all of that was done. I made slight modifications to my launch files and verified that everything was running correctly. Figure 2 shows a plan made with the Egraphs planner.

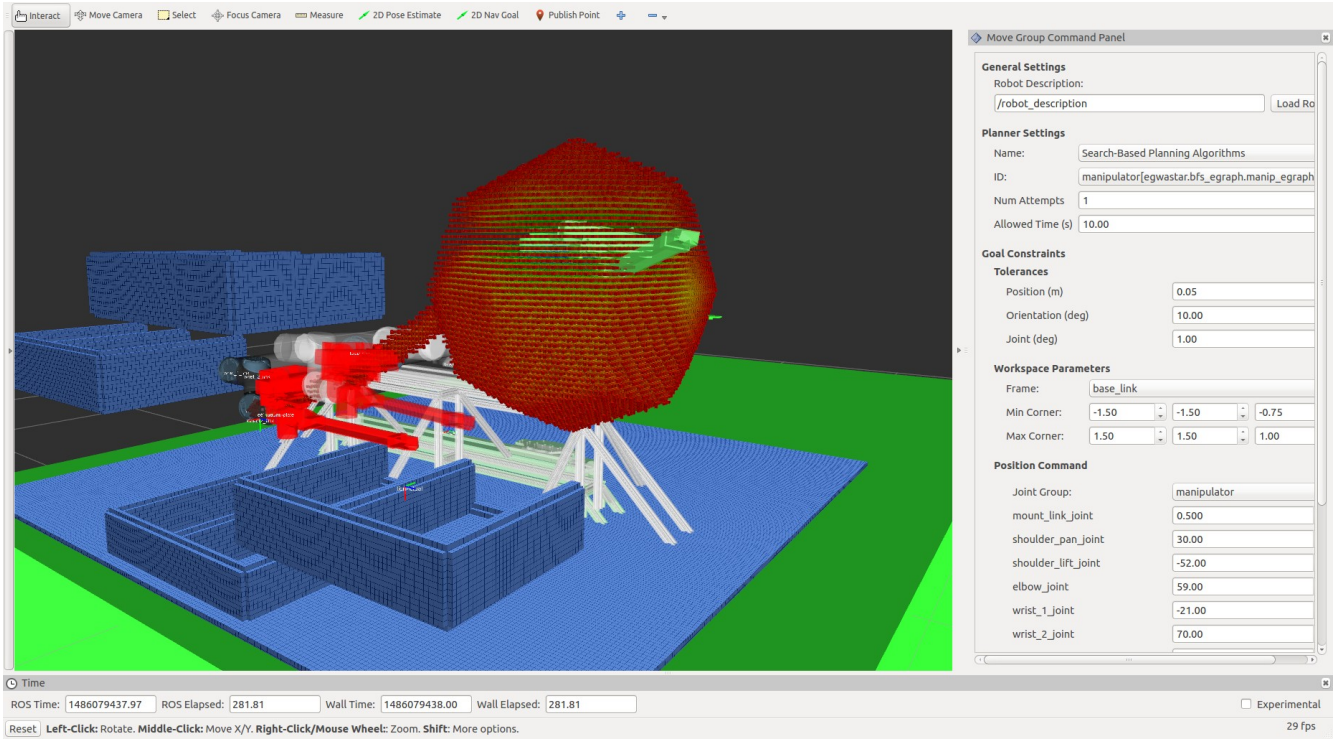

Figure 2. A visualization of the egraph heuristic with a cached trajectory.

I also verified that we are able to control the UR10 arm, but currently the linear slider is not fully controlled.

More recently I have completed the construction of our teams server rack, which will be important for transportation to Japan. With a help from Alex I specced out all the parts we needed and began construction on their arrival. Both computers are functional and able to communicate via ROS in a convenient way.

In the last couple days I have been working with the very frustrating Festo motor controller for our linear slide. At this point the controller has some basic functions working (homing and relative movement).

Challenges

I had some challenges configuring the egraph interface for the new hardware. I spoke with Andrew, the author of the egraph planner, and he was able to find the source of my problem relatively quickly. There were a few issues with certain branches no longer being maintained and a new naming style being put into use.

When putting together the server rack, a piece of ram became dislodged from one of the computers. I struggled to find the issue for a while, until I tried to diagnose the issue using beep codes. I installed a peizoelectric speaker and was able to determine the source of the error.

I also struggled with the byzantine and occasionally contradictory manuals from Festo about their motor controller. I spoke to a technician who was apparently new and did not now much about our current setup. I ended up getting the controller working by trying all the strategies proposed by both the tech and each of the manuals. Finally something worked, and I know which manual to trust in the future.

Teamwork

Jin has been working with a kinect in an older bin mockup. She has been collecting and annotaing images of contest items in a setting that is indicative of contest conditions. She is now able to superimpose kinect data over cad models in rviz.

Akshay has gotten FCNN working on our lab machine. He feed Jin's gathered data into the CNN and has been able to classify items correctly. He has now begun work on a much larger data set provided by MIT.

Leo was able to setup and verify the master-slave relationship between our compuiters. He also ran some tests to determine the amount of computing power needed to run five kinects at once. Leo made the vision architecture and is able to run some basic scenarios in PERCH.

Mike has made a schedule for that spans up until the competition. He has fabricated the shelf and frame mockup. He also helped me with the motor task.

Future Work
I will be going full steam ahead on the motor controller for the slider. It is the last piece in our MVP, so it is pretty critical right now. I can already foresee some difficulty interfacing this slider with ROS, but I am in the process of forming a plan of attack with Mike. At this point it is definite that we will need a new micro controller, and it may be beneficial to spin another PCB.

I also want to start working with Mike on the grasping code from last year, and getting some basic grasps working on the UR10.