Laavanye Bahl

Team D: CuBi

Teammates:
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Individual Progress

The main focus for this week was to dive deeper into understanding, visualization and implementation of object detection with point clouds. Mainly I worked on the following:

- Learning more about the PCL library. Trying out some tutorials and examples.

- Removing outliers from the initial point cloud by statistical outlier removal algorithm which measures the mean distance of all the neighboring points and removes that point if it does not satisfy some threshold.

- Down-sampling the dense point cloud output from the stereo camera by using voxel filters.

- Refining my ground plane segmentation by using RANSAC to fit a plane and calculate the inliers and then combine the subset returned by the best set of inliers (maximum in number) to form a plane and then remove the plane from our current scene.

- Using euclidean clustering to divide the segmented objects into clusters and assign each of them with a different color.
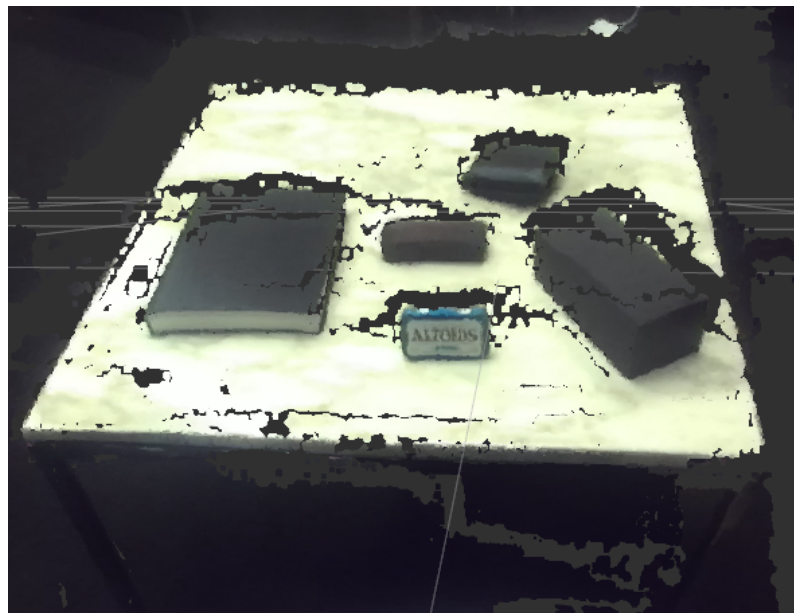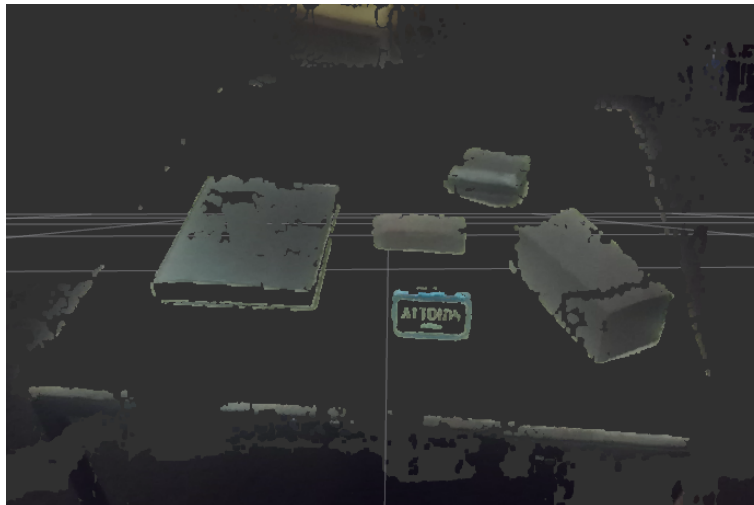

Fig 1) a) 3D point cloud output

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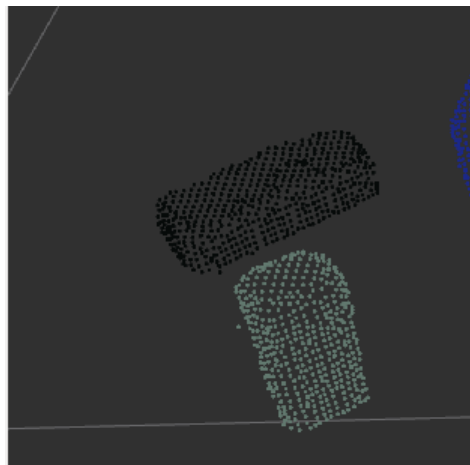**Fig 1) b) Segmented Objects along with plane segmentation**

Fig 1) b) Euclidean clustering

This is a continuation to last few weeks' work:
- Sensor trade study and selection of final sensors for different applications like object detection and SLAM.
- Figuring out the right places to mount the sensors.
- Research work for object detection such as PCL clustering.

Challenges

- Broken dynamixel servo motor. We did not check the motor in advance when we procured it from the inventory.
- Better time division and advance planning. Lots of assignments for MRSD project and other courses.
- Make vision pipeline more robust. Right now works well with certain conditions.
- Older firmware of the dyanamixel.
- Network issues with Jetson TX2.
- Finalizing sensor placement.
- Other teams picking things from tables of different teams without informing.

Teamwork

Paulo:
- Worked really hard and fast on a newer version of the gripper.
- He 3d designed and printed the actuator, mounts, support rods and connectors between gripper and arm.
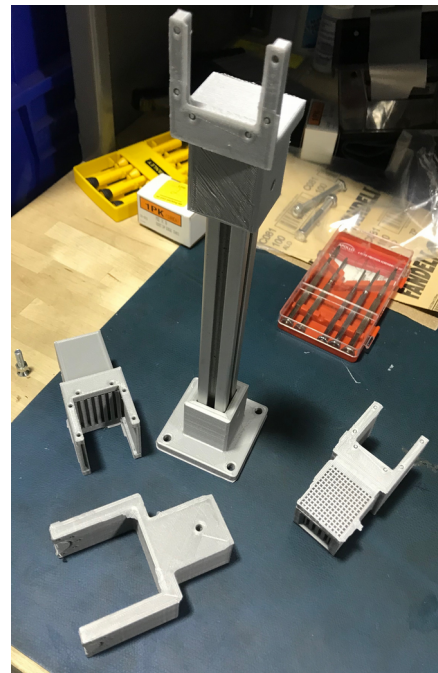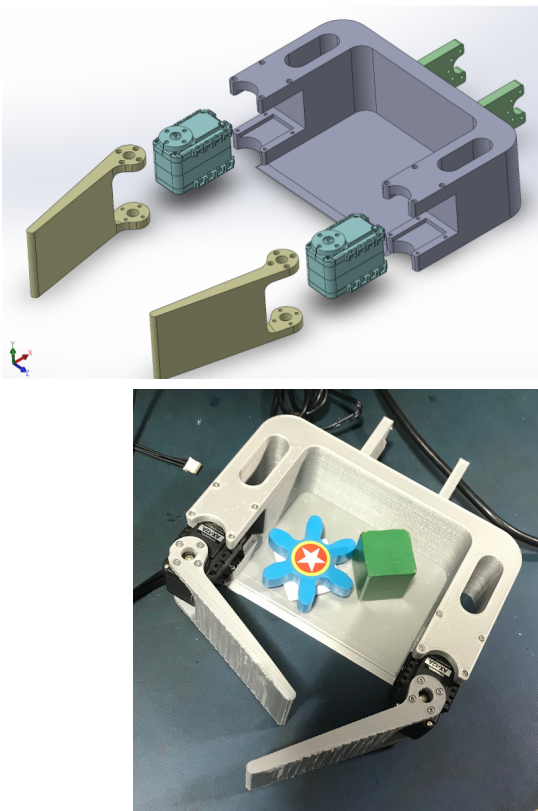- He did a great job with the placement of holes for screws.

Fig 2) Gripper 3D design and result after printing

Bobby:

- Bobby has been previously working on the assembly of the turtle-bot, hardware integration and setting up the PC and made improvements on it.
- Made a better controller for driving the robot with joystick with continuous speeds instead of discrete ones.
- He optimized the placement of of various parts on the turtle-bot.
- Solved issues with Intel NUC.

Fig 3) Mobile base with various components placed

Jorge:

- Worked on making the schedule better.
- Made a proper Gantt Chart.
- Worked with Nithin to attach the servo motors on the gripper and started the work for controlling the servos with the computer.

Nithin:

- Worked with Jorge to attach the servo motors on the gripper and started the work for controlling the servos with the computer.
- Took lead on other group assignment for Robotics Business leaving more time for other team members.
- Worked on updating the website.

Future Plans

- Finish the manipulator design and replace the broken motor.
- Work on combining the current vision programs into an end-to-end pipeline and make it real-time and robust.
- Start research on object size estimation.
- Control the manipulator with ROS on Ubuntu.
- Solve issues with Jetson TX2.
- Assemble the whole manipulator.
- Design and 3D print mount for the stereo camera.