

Grand Challenge

Submitted in partial fulfillment of the requirements for the course of

ENPM809T – Autonomous Robotics

By

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INTRODUCTION

This is the final grand challenge for the course. Here we integrate –

- *Perception – Rpi Camera and Ultrasonic sensor*
- *Locomotion – H Bridge and Servo Gripper*
- *Localization – Motor Encoders, IMU and Email Communication*
- *Planning and Navigation – HSV Masking, QR Codes*

First, we use these concepts to track the object as we move it around the screen and turn the robot based on the detection. Then we place our object in a cluttered environment and let the robot autonomously detect and retrieve the object and return to its original position

APPROACH

We first use HSV masking to detect the object as we randomly move it around the screen. We use the IMU to turn the robot based on the detection. The setup is described in the video

For the final part, we use the same object detection code with a different mask, to move and autonomously detect and retrieve the object in the cluttered environment and return to its original position.

We shifted the SONAR sensor to the middle, as it gives a better and more robust detection of the object to be retrieved. However, we observed that as the robot gets closer to the object, due to the surface of the sensor being reflective in nature, the sensor is also detected as the object itself. So we added a mask onto the bottom part of our frame to prevent this from happening. Once the gripper was closed (assuming it has some object in its grasp), we remove the mask and stop detection as this speeds up the remaining processes.

CODE AND OUTPUT VIDEO

The entire repository containing the problem statement and the data can be viewed on <https://github.com/adheeshc/raspi-grand-challenge>

The output video can also be viewed on YouTube –

- Object Detection and Tracking – https://youtu.be/Ruo_ljVfs14
- Grand Challenge – <https://youtu.be/ttUbCUTyHck>