ENPM 809T – Autonomous Robotics: Summer 2019

Master of Engineering Program in Robotics

Due Date	Tuesday, July 30th, 2019
Submission Information	• This assignment begins to pull the functionalities built into our robots together in preparation for the Grand Challenge • Submit response to Question #4 via Gradescope by 5:30 pm

Question #1 (nothing to submit)

General reminder to use your phone to record images and 30-60 second video clips throughout the course. Final project videos are due **less than three weeks** from now, on Tuesday August 13th.

Reminder that final project videos must be no less than eight minutes in length and no longer than 10 minutes.

Question #2 (nothing to submit)

The Grand Challenge will be held in the Maryland Robotics Realization Lab (RRL), located in the Engineering Annex in the middle of the AV Williams Building:

https://sites.google.com/site/roboticsrealizationlab/

The primary entrance to the RRL is a single door numbered 0307 and located on the inside of the of the "U", shown in the red box in the figure at left

The Grand Challenge is currently scheduled during the August 6th lecture period. The RRL staff have graciously made the space available during the July 30th lecture period for students of ENPM809T to use as a test run(s) through the course. Thus **we will convene in the RRL and not the lecture room on July 30th and August 6th**.

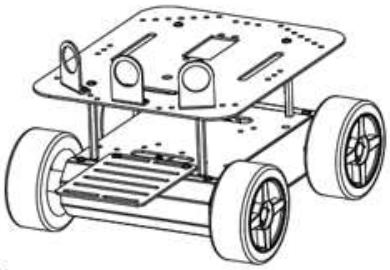
Question #3 (nothing to submit)

When sending email communications from your robot to Dr. Mitchell, please send the emails to the course Gmail account only: ENPM809TS19@gmail.com

Question #4 (20 points)

As discussed in this week's lecture, it is time to start pulling everything together in preparation for the Grand Challenge. Throughout the course, we have developed the following functionalities into our robots:

- Perception
1. RPi camera (***picamera***, ***raspistill***, ***raspivid***)
2. Ultrasonic range sensor (***range01.py***, ***drive01.py***)
- Locomotion
1. H-bridge (***motorcontrol01.py***)
2. Servo gripper (***servocontrol01.py***)
- Localization
1. Motor encoders (***encodercontrol01.py***, ***map01.py***)
2. Email communication (***email01.py***)
- Planning & Navigation



This week we began to combine these functionalities into an initial level of autonomy for our robots, which we continue to develop in this assignment. To complete this portion of the assignment:

1. Revisit the lecture notes and review Chapter 6 of the textbook.

2. Complete the ***trackblock01.py*** In-Class Exercise from the lecture notes, demonstrating your robot can autonomously rotate and track an object – in this case your colored block. Record a minimum 30 second video clip of yourself describing the setup and demonstrating your robot successfully tracks the block as you move the block to random locations. A brief example is available on the course YouTube page (note: there is **no** requirement to show the video and camera stills side-by-side):

   https://www.youtube.com/watch?v=8PdrtvqkbN8

   Upload the video to your YouTube account and include a link to the video in the .pdf uploaded to Gradescope.

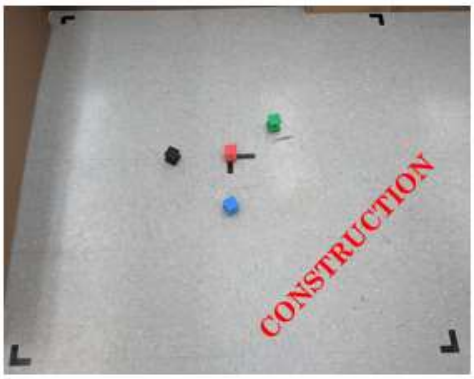
3. Complete the second In-Class Exercise from the lecture notes, demonstrating your robot can autonomously retrieve an object (i.e. your colored block) in a cluttered environment then send an email to ENPM809TS19@gmail.com once retrieved. You may use any items from your lab/house as clutter for this exercise. Record a minimum 30 second video clip of yourself describing the setup and demonstrating your robot successfully retrieves the block from a random location. A brief example is available on the course YouTube page (note again: there is **no** requirement to show the video and camera stills side-by-side):

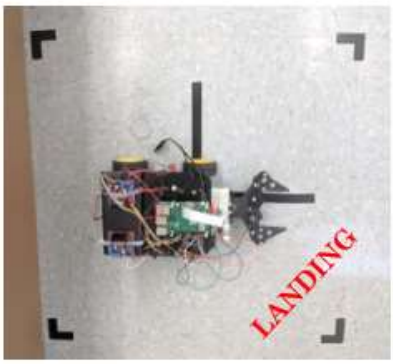
https://www.youtube.com/watch?v=AU_NEolDT7A

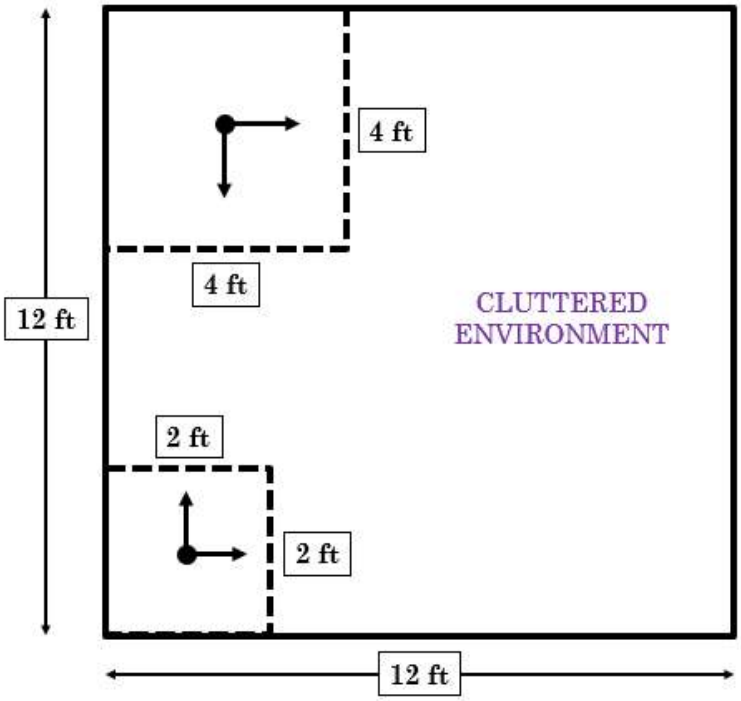
Upload the video to your YouTube account and include a link to the video in the .pdf uploaded to Gradescope.

Question #5 (nothing to submit…but ***highly*** encouraged to complete)

The Grand Challenge course was discussed in lecture this week and is illustrated in the figure below. Each robot will be placed in the center of the Landing Zone to begin a run through the course. In preparation for Tuesday's practice runs, create a "Transport to Construction Zone" script that tracks and updates the trajectory between your robot and the center of the Construction Zone. After your robot identifies and navigates to a block, this script would plan and navigate the path between your robot and the center of the Construction Zone such that the block can be delivered.







Although there is nothing to formally submit for this question, it is ***highly*** recommend to complete in advance of Tuesday's practice runs through the Grand Challenge course.