ENPM 809T – Autonomous Robotics: Spring 2024

Master of Engineering Program in Robotics

Due Date Friday, April 19th, 2024

Submission Information

- This assignment begins to pull the functionalities built into our robots together in preparation for the Grand Challenge
- Submit response to Question #1 via Gradescope by 11:59 pm

Question #0.1 (nothing to submit)

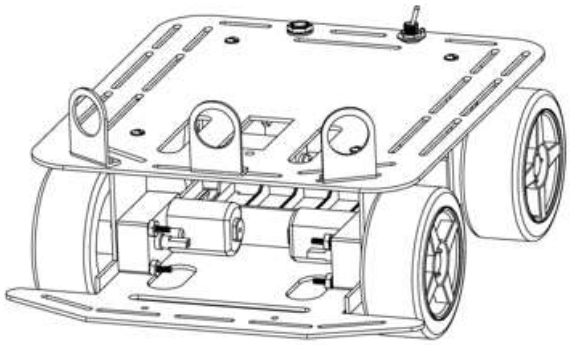
Reminder that the project video constitutes the largest portion of your project grade for ENPM809T this semester. Be sure to ***continue recording 30-60 second clips*** to document the build and testing of your vehicle this semester!

Question #1 (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 semester, we have developed the following functionalities into our robots:

Robot Functionality

- Perception
1. RPi camera (***picamera***, ***raspistill***, ***raspivid***)
2. HSV masking
3. Arrow detection & orientation
4. QR Code detection & decoding (***qrcode01.py***)
5. Facial detection (***face01.py***)
6. 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. IMU (***imu01.py***)
3. 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 a colored block (or equivalent, given our virtual classroom environment). 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. a colored block or equivalent) in a cluttered environment then send an email to ENPM809TS19@gmail.com once retrieved. Be sure to cc the course TA on the email as well. 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.