ENPM 809T – Autonomous Robotics: Spring 2020

Master of Engineering Program in Robotics

Due Date Friday, April 24th, 2020

Submission Information

- This assignment explores closed-loop motor encoder control of a robot's trajectory for the purposes of localizing the robot within its environment
- Submit response to Question #1 via email by 11:59 pm
- Submit response to Question #2 via Gradescope by 11:59 pm
- Question #1 requires only 1 submission per team
- Question #2 may be completed as a group, however **each student must upload the submission to Gradescope**

Question #1 (submit email)

In the spirit of the Grand Challenge, where a robot has been launched and delivered onto the surface of Mars, during the Week 12 lecture we will discuss Internet-of-Things applications for the purposes of receiving information from our robots. In preparation for the Week 12 lecture, create a new Gmail account:

https://support.google.com/mail/answer/56256?hl=en

This dummy account will be used for the sole purpose of receiving the messages and data autonomously transmitted from your robot during the Grand Challenge. As such, ***do not create a username or password that is used by your other accounts*** as this information could be viewed by the public.

Once the dummy account is created, email Dr. Mitchell at mitchels@umd.edu from the account. Please ***also carbon copy*** skotasai@umd.edu. Be sure to include the names of all team members in the message so Dr. Mitchell can track account ownership.

Question #2 (20 points)

The primary focus of this week's lecture was the tracking and interpretation of our robot's motor encoders to provide an estimate of the robot's location in a global reference frame.

To complete this portion of the assignment:

1. Revisit the lecture notes and ensure the encoder feedback from the ***encodercontrol01.py*** – ***04.py*** scripts behaves as expected. It is important to work through each step to ensure proper closed-loop motor control.
2. Complete the final In-Class Exercise from the lecture notes (see below). Record a minimum 30 second video clip of yourself describing the setup and demonstrating your robot successfully

traverses a **straight** line across a user-defined distance. Note: ***this video should be recorded with your cell phone, iPad, etc***. A brief example is available on the course YouTube page:

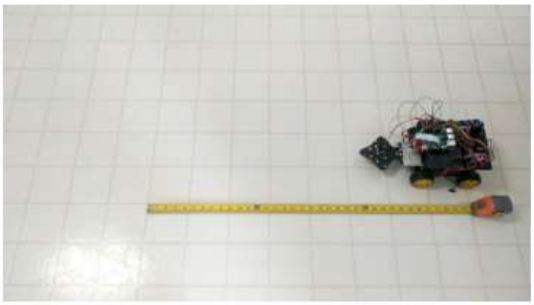
https://www.youtube.com/watch?v=an3v2KewWww

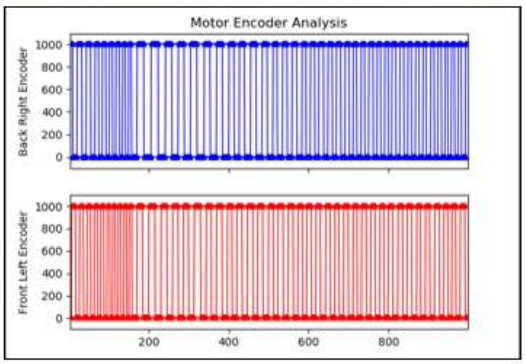
Upload the video to your YouTube account and include a link to the video in the .pdf uploaded to Gradescope. Also include in the .pdf a screenshot(s) of your Matplotlib plot(s) of the encoder states, along with 2-3 sentences describing the encoder data. Note: ***students must use subplots***! Be sure to indicate which platform your team is using (Baron or Pirate) in your submission.

In-Class Exercise

- Create new Python script ***encodercontrol05.py***
- Script must:
  1. Drive robot in straight line for a user-defined distance
  2. Record encoder data from both encoders
- Open & subplot all data in Matplotlib

$$\left(\frac{1\ wheel\ rev}{2\pi(0.0325) meter}\right)(x\ meters) = \#\ wheel\ rev$$





3. Update your Python script(s) as required to track encoder counts for the reverse( ), pivotleft( ), and pivotright( ) functions. In similar fashion to item #2 above, record a minimum 30 second video clip of yourself describing the setup and demonstrating your robot successfully traverses (a) a **straight** line when driving in reverse, and (b) the proper angles when pivoting left and right, for a user-defined distance/angle in each case. Upload the video to your YouTube account and include a link to the video in the .pdf uploaded to Gradescope.