CSE 460 Mobile Robotics - Lab 8

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***Abstract*— Lab 8 report for CSE 460 Mobile Robotic with Professor David Saldaña. The videos for this lab can be found here: https://drive.google.com/drive/folders/1GUjHlg4-obK1n-PsiHISGMb_uF2ZLZNH?usp=share_link. The python scripts for this lab can be found here: https://github.com/amandabaran/robotics/tree/main/lab8.**

I. Position Control

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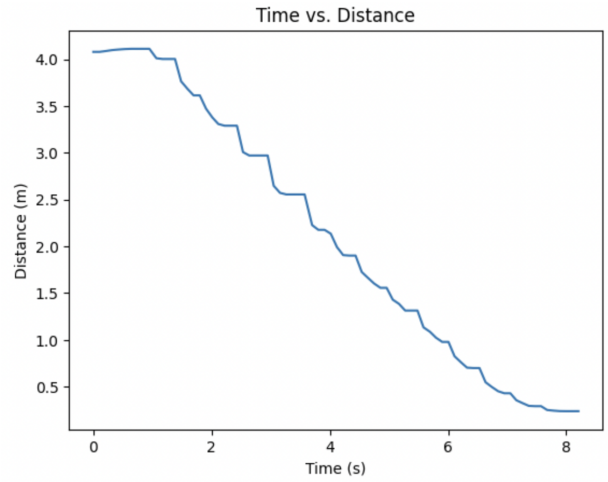
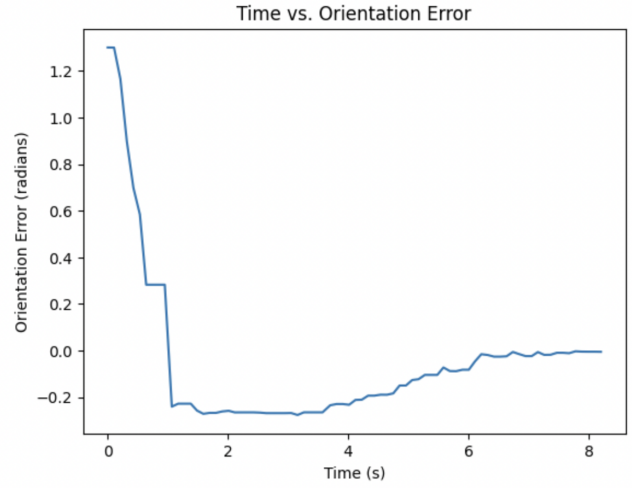
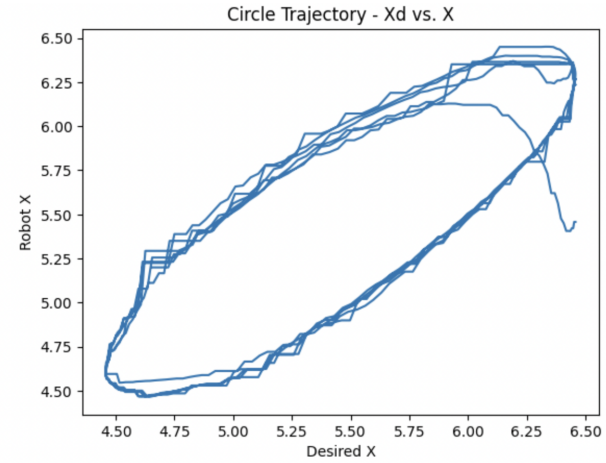
The code that imlpements a position control solution allowing the robot to reach any (x,y) coordinate on the plane can be found here: https://github.com/amandabaran/robotics/blob/main/lab8/part2.py The experiment that produces the results below began with the robot starting at position (5, -2), and the desired end position was (6, 2). The first plot shows time vs distance to the goal, and the second plot shows time vs orientation error.







II. Trajectory Tracking

A. Circle Trajectory

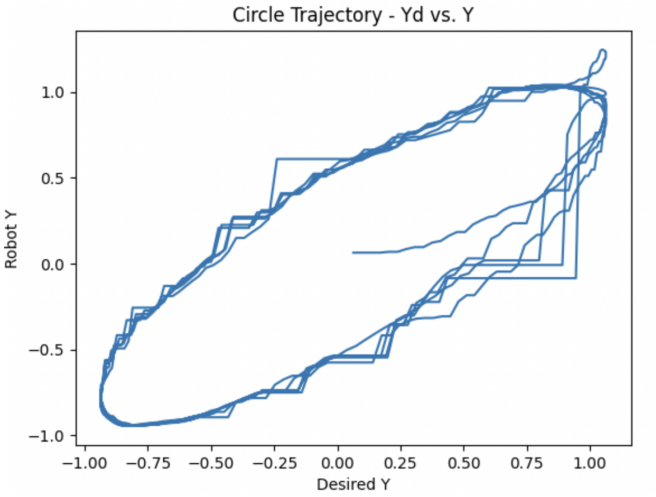
The code that implements a circle trajectory with radius of 1 can be found here: https://github.com/amandabaran/robotics/blob/main/lab8/circle.py The video of the robot using this code to go in a circle can be watched here: https://drive.google.com/file/d/1ZV0Je4REnC4sWyVnWs16FmdseqAMysvN/view?usp=share_link.

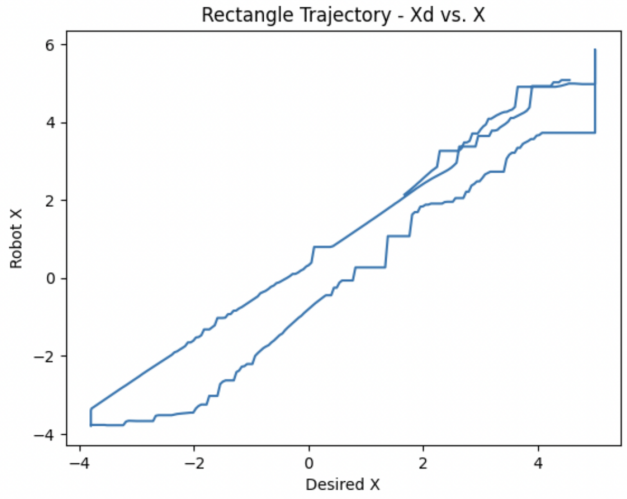
B. Rectangle Trajectory

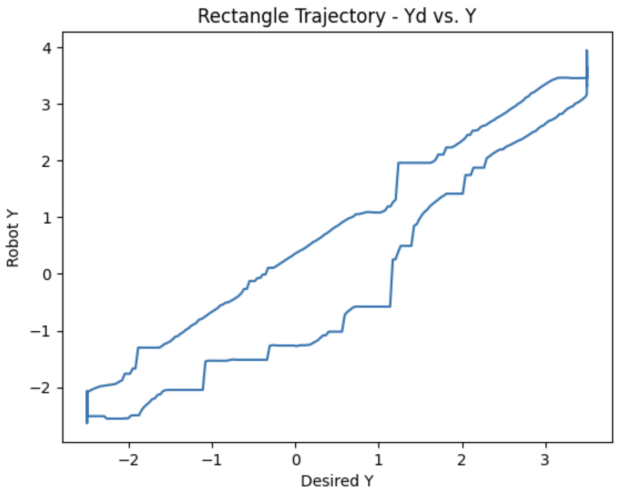
The code that implements a rectangular trajectory around the racetrack in the lab can be found here: https://github.com/amandabaran/robotics/blob/main/lab8/rectangle.py. The video of the robot using this code to go around the track can be watched here: https://drive.google.com/file/d/1znu-JBOXRvitV6eoTjVJbLiRj3pUFP-a/view?usp=share_link.

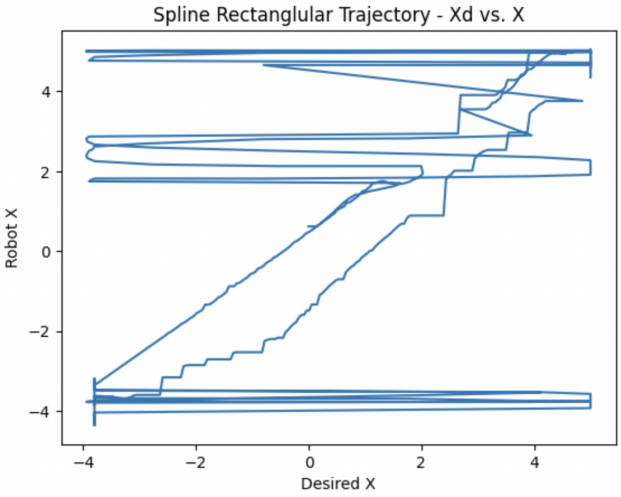
C. Rectangular Spline Trajectory

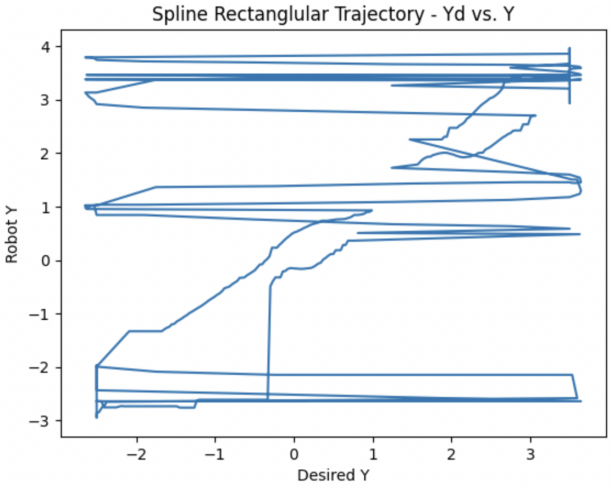
The code that implements a rectangular trajectory around the racetrack in the lab can be found here: https://github.com/amandabaran/robotics/blob/main/lab8/spline.py. The video of the robot using this code to go around the track can be watched here: https://drive.google.com/file/d/1m8M09cwxaFc4TOJuDB5aKWSGpgEWXB_z/view?usp=share_link.











III. Questions

A. 1. Advantages of using the Optitrack System

The greatest advantage is that you are always able to learn your precise location with only a few millimeters of error. With a simple calculation of linear and angular velocities, the robot can be move to any point on the plane. It can also distinguish amongst different objects by the pattern of light that is reflected by the markers on the object, which allows you to learn the position of other objects in the plane.

B. 2. Rectangle Trajectory without Optitrack?

The robot would need to use a different source of information to learn its position in order to autonomously drive around the track. One way the robot could have done this would be by using an infrared light sensor to detect the black line between the two yellow lines in the center of the track. Following this line using the information from the sensor would take the robot around the track. Sending the robot straight for a measured amount of time and then turn left when the robot is estimated at each corner of the track would be a very inaccurate method as the robot would not be adjusting with feedback.