

P545 Lab 1

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1 Introduction

In this lab you will be designing a driver component that operates the cart autonomously through a course on the parking lot which looks like a square with rounded corners. To accomplish this task you will use the cart's compass and odometer to measure heading and distance, respectively

2 Sensors

2.1 Compass

The cart has a PNI V2XE compass module that measures heading and is being read by a component called compass. The heading value is returned in decimal degrees where 0=north, 90=east, 180=south, and 270=west. The variable is called **heading** in compass.s.

2.2 Odometer

The VCS module measures revolutions of the cart's motor to measure distance travelled. The distance is reported as a running total of the meters travelled since the cart was powered on. The variable is called **distance** in vcs.s.

2.3 GPS

The cart has a Garmin GPS18 5Hz GPS. It measures absolute position along with speed and heading. For this assignment, you will be using the position measurement to quantify the performance of your driver. The variables that you will need are called **lat** and **lon** in gps.s.

3 Actuators

3.1 Throttle

For this lab, we will be setting the throttle at a fixed value to drive the course. This is analogous to holding your foot on the accelerator at a fixed angle (con-

stant torque). The cart's speed will fluctuate as the load on the motor changes. The value has been set at 50% in the code sample, but this might need to be adjusted at the testing site if the cart speed is not adequate. The variable `percent_throttle` is in `jdriever.s`.

3.2 Steering

You will be using the steering actuator to control the heading of the cart. Steering is specified as the inverse of turn radius in meters. For example, if you want to turn an arc that is 20m in radius, you would write 0.050 to `turn_radius_inverse`. The turn radius is negative for left turns and positive for right turns. Writing 0 would indicate an effectively infinite turn radius or straight driving. The variable `turn_radius_inverse` is in `jdriever.s`

4 Assignment Overview

Design a driver process that drives a square course which has round corners. The sides should be aligned with the 0, 90, 180, and 270 degree headings. The length of the sides should be 10m. The turn radius of the corners should be 3m. Design your program such that you can easily change the length of the sides and the corners along with the direction of travel around the square.

5 What to turn in

Write a concise summary of the testing that was performed and the results. Using collected gps data, include a plot of the path that the cart took as it traversed the course for at least two laps on the same graph with a plot of the ideal course.

Post this code to your svn lab directory for assignment 1. Drop me (bhimebau@cs.indiana.edu) an email when this is complete. This should be complete by 9/26/08.