COMP105P Tasks, Week 4-5

Tasks

After last week you should have a working wall follower. This week's task builds upon your wall follower adding the ability to detect obstacles and determine the robot's position. The task is to start from a known location and follow a curving wall until the wall suddenly turns 90 degrees. At this point, stop with the front of the robot 10cm from the wall and report the robot's position and direction, relative to the starting point.

- Task 3.0. Follow a curving wall on the left hand side. The starting position will be approximately 25cm from the wall. After a few meters the wall will turn 90 degrees right. Detect this turn, and stop facing the end wall with the front of the robot 10cm from the end wall.
- Task 3.1. Print out the position and direction of the robot relative to its starting point. For example, if relative to the robot's starting point and direction, the robot has moved 225cm in a direction of 10 degrees, print that out.

Hints and code

To help you along we have a couple of suggestions.

- You can detect the end wall using either ultrasound or infrared sensors. Both should work, but for the final positioning 10cm from the wall, ultrasound is probably more accurate. It's slower to read when you're driving though. Don't forget that the sensors are mounted a little way back from the front of the robot.
- To determine the robot's position, you'll need to constantly call `get_motor_encoders()` in your main loop, and use the readings to determine the robot's path. You can't just call them before you start driving and after you stop, and determine anything useful.
- It's probably easiest to maintain the robot's running position as x and y offsets from the starting point, plus direction. For this task you don't need to store the path as a series of x and y offsets, but you will for the midterm task. If you want to get ahead on that, consider storing the positions as you drive.
- You'll need to remember the maths of arcs and sectors. As a reminder, if you'd a sector of a circle with angle θ radians and radius r, the length of the arc is $r\theta$. As measured by the motor encoders, your robot will drive as a series of very short arcs, interspersed by very short straight lines.
- You'll make life much easier for yourself if you convert the encoder readings into centimeters (or millimeters) before doing any of the maths. Trying to work in encoder ticks will just be confusing.