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CPS 607 Lab 4 – Object Following

The goal of the lab was for the robot to navigate a world surrounded by lines with high contrast and follow any moving object. The Dark lines will represent my boundary where the robot cannot go. In addition, there will be objects to avoid at least as tall as the ultrasonic sensor. My approach to this lab builds off the previous lab which ensured that the robot stayed within its environment where black lines acted as boundaries. In summary, my previous approach was to always move forward until a sensor was activated. Depending on which sensor was activated, the car would turn in the opposite direction and continue moving forward.

Adapting the approach from Lab 3, I have an event timer that trigger every 100ms. During this time, the robot will scan either 60 or 120 degrees and measure its corresponding distance. Simultaneously, I am checking all three line-sensors and determining if I have crossed or about to cross a boundary line. If the sensors come into contact, the robot will reverse, turn left or right to avoid the boundary. In the case when the robot is following the moving object and it passes beyond a boundary line, the robot will take evasive action and stop tracking the object.

Once all three line-sensors are checked and deemed safe for the robot to traverse, I then check my conditions for tracking the object. If my left and right distances (checked at 60 and 120 degrees) are both greater than 70, there is no object close by so the robot will stop. If the distances are greater or equal to 20, the robot is too far and should move forward towards the object. If the distances are < 10, the robot will back up because its too close.

To solve the problem of following an object moving left or right, I will compare the left and right distances and determine which is greater. If right > left, then turn left. Likewise, if left > right, then turn right. Using this logic, we can try to make both distances roughly equal meaning that the robot is facing forward directly at the object.

One alternate solution I want to try is not using left and right distance comparison but one measurement. For instance, if robot is stationary, it will turn right on place. When the ultrasonic sensor moves from left to right and reads a distance, I know the edge of the object is to my right. That way, after the next iteration I should turn right towards the object. If I scan from right to left and detect an object, I know that the object is on my left, so the robot should turn left.

Note: currently (2020-11-22) experiencing some technical issue with robot. The demo video is not available at the moment. Will try to get it resolved before demo on Thursday. Before the difficulties, I got it working so the robot should work as intended. Currently in discussion with professor on how to proceed.