ECGR4161/5196, Spring 2009: Lab 7

A vehicle with sensing and computer control – Version 1.0

Learning Objectives

This lab will have students assemble a system – vehicle vehicle, power, and computer control – and demonstrate a working autonomous vehicle. In particular, the vehicle will follow an object.

General Information

The general steps for this lab are:

1. Use your vehicle from the last lab.
2. Add two sensors (i.e. PING or SFR05) to identify the distance to an obstacle.
3. Write the software.
4. Test your software on the bench.
5. Test your software with the vehicle on the ground.
6. Demonstrate to Dr. Conrad and turn in a lab report.

Laboratory Assignments

You may use the PCs in Woodward 203 or your own PC to do this lab experiment. The machines in Woodward 203 already have the software tools loaded. Specifically, your code should try to follow an object and maintain a distance of 6 feet from the object.

Since this is a difficult problem, there are several levels of success of demonstration. You only need to make one demonstration (the possible points are not cumulative). Choose one demonstration!

1. While the vehicle is at rest, press switch 1. The vehicle will rotate in place in order to ensure an object (Dr. C) is always in front of the vehicle. In this demonstration, the object (Dr. C) will always be 6 feet from the vehicle and he will walk around the vehicle in clockwise and counter–clockwise directions. A successful demonstration will be if the vehicle turns in place and is always within 30 degrees of where Dr. C is standing.
2. From a starting rest, press switch 2. The vehicle will accelerate to a 20% rate. An object, Dr. C, will walk in front of the vehicle and he will NOT try to maintain a 6 foot distance from the vehicle. He will NOT swerve to the left and right but will walk in a straight line at varying speeds. A successful demonstration will be if the vehicle matches Dr. C's speed for 30 seconds.
3. From a starting rest, press switch 3. The vehicle will accelerate to a 20% rate. An object, Dr. C, will walk in front of the vehicle and he will try to maintain a 6 foot distance from the vehicle. He will then swerve to the left and right while maintaining the same speed as the vehicle. A successful demonstration will be if the vehicle turns correctly to follow Dr. C when he swerves for 30 seconds.
4. From a starting rest, press switch 3. The vehicle will accelerate to a 20% rate. An object, Dr. C, will walk in front of the vehicle and he will NOT try to maintain a 6 foot distance from the vehicle. He will then swerve to the left and right at varying speeds. A successful

demonstration will be if the vehicle matches Dr. C's speed and turns correctly to follow Dr. C when he swerves for 30 seconds.

Other Requirements

Req. 1 – The code generated is written in C for the QSK62P.
Req. 2 – The code is well commented and easy to follow
Req. 3 – Your lab report should include the final build output from the builder.
Req. 4 – The vehicle should ignore objects over 15 feet away from it.

Lab Report

Include in the checkout part of your lab report the lines:

1. SW1 functionality (50 points) _____/_____
2. SW2 functionality (75 points) _____/_____
3. SW3 functionality (90 points) _____/_____
4. Full functionality (110 points) _____/_____

Include in your lab report observations and procedure like the following:

The general learning objectives of this lab were . . .

The general steps needed to complete this lab were . . .

Some detailed steps to complete this lab were . . . .
1. Step one
2. Step two
3. . . . .
Code generated or modified to complete this lab...
No need to include all the files for the lab. Just include the modified code.

Some important observations while completing/testing this lab were . . .
Here include the memory report given at the end of the compile process.

In this lab we learned . . . .

Attach the final build output at the end