Lab 9: Robot Path Following

EE 234

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**Introduction**

In this lab we wanted to use sensors to control our robot to follow a black line made out of electrical tape using tools we have learned throughout the semester. The sensors were infrared emitting diodes with a NPN silicon phototransistor. Effectively they close the circuit and the board receives a digital 1 while it is on a reflective surface and a 0 when on a non-reflective surface. Based on what you get from your sensors you can control the robot.

However the sensor setup, and control design were up to us. There are two options that we considered: a poling technique or an interrupt technique. Polling was easier simpler to implement but not as reactive or dynamic as a interrupt method would have been.

**Software Design**



We reused ROBOMAL code from lab 7 for a basis so all we really needed to do was build a poling loop implementing the sensors. We used all four sensors and then built a logic table for the actions based on the 16 logical possibilities. Where the locations in the tabledescribe the location of the sensors on the front of the board.

The interior sensors are for micro adjustments whereas the outer sensors are responsible for macro movements

You can see from the flow chart that we prioritize from macroscopic movements to adjustments based on which sensors are ‘hit.’ A hit is defined as changing from 1 to 0.

The far left has the highest priority. This is simply a ‘natural’ priority in that it comes first in the code. The software design is extremely simple and robust allowing for a high rate of speed when traversing courses. It is not smart however it simply follows the black tape like a high speed rail.

To actually implement control after the sensors are polled the wheels need to be set to a speed and direction. ROBOMAL was recycled for the hard left and hard right turns as well as when simply going forward. The other turns were modified ROBOMAL commands where for the slight turns we did not reverse wheel direction but instead slowed one down and sped the other one up.

**Conclusion**

This lab used a semesters worth of skills and allowed us to creatively tackle a design task. Interrupts could have been implemented instead of polling by using change of notice interrupts.

There are many ways to improve the design and account for different and interesting problems such as line breaks. I would like to add interrupts as it would provide better control. I would also like to order a new motor so that both my wheel turn at the same speed. One does not respond well even to a full PWM.

The reality is I wish I had some other type of problem that had more specific design criteria. I like broad solutions but not non-specific problems and so this lab has really sparked some curiosity in more real world application of embedded systems.

Thanks for a great semester Andy!!!