Final Project Description

Learning Objectives:

- Use infrared transmitters and receivers to make a robot follow a line
- Use I^2C, SPI, or another communication protocol to communicate with an external device
- Present designed effectively

Parts Needed for Lab (all parts are provided in your team's Parts Kit):

4 – Infrared Transmitter
4 – Phototransister (IR receiver)
1 - Robot/Motor Kit
1 - Battery Pack
Other parts of your choice

Important Dates

Preliminary Design Report – November 13th

Part 1 Demonstration – November 20th

Critical Design Review Presentations begin – November 17th

Part 2 Demonstration – December 7th

Competition – December 7th or 8th

Final Project Procedures and Demonstrations

Part 1: Creating the Line-Following Robot

Description:

In this part, create a robot that follows a line of tape on the floor.

Requirements:

Using the robot created in Lab 3, follow the line on the lab floor until you reach the end. Then, your robot must turn around and return to the finish. You are not allowed to touch your robot or help it in any way from the beginning to the end. It must be completely autonomous. Infrared transmitter and receivers must be used as the key component for following the line. This must be done with the PIC in stand-alone mode. This is accomplished by powering the PIC through the provided power pack and the USB cable that comes with the PIC.

Pre-lab Requirements

1. A detailed circuit diagram that includes pin numbers to every device (assuming it has pin numbers)
    a. Consider carefully how you design your circuit using infrared transmitters and photodiodes. It is well-worth your time to research how these circuits are designed in practice. At this point, it is not important to choose values for resistors or capacitors. The *configuration* is what matters most.
2. A detailed explanation of how you will design the circuit using the infrared transmitters and photodiodes through testing. (A circuit diagram that you will use to test your design, what equipment you will use, what you expect to see, etc.)
    a. Your first diagram will merely be a *draft* circuit. You will likely want to design your circuit values by testing its functionality in the lab as you vary values.
3. A detailed description of your software. A finite-state machine is preferable.

Part 2: Integrating a sensor

Description:

In this part, integrate a sensor in the robot design. You have freedom to choose what kind of sensor subject to the following constraints:

1. No single part can cost more than $50.
2. Since you may need to buy several parts, the collection of parts must not cost more than $100.
3. Any parts that are not bought are not included in the price restriction.
4. The instructor's approval is provided about what you are using/buying.

Requirements:

An external sensor must be integrated with robot. It does not need to aid the robot in any way in accomplishing its line-following ability. Note that accomplishing this part will give you no credit if you have not finished Part 1. Also, before choosing which sensor to integrate, you must have a written agreement with the instructor about what requirements you intend to fulfill with a given sensor.

Pre-lab Requirements

1. A detailed circuit diagram that includes pin numbers to every device (assuming it has pin numbers).
2. A detailed explanation of how you will test the component once received.
3. A detailed description of your software. A finite-state machine is preferable.
4. A written agreement with the instructor about the sensor you intend to purchase or use has been signed by the instructor.

Part 3: The Race

Description:

In this part, you will work with two other teams in a competition. A team of three will compete against another team of three. The details will be released later.