NOTE: You will demo this lab to me at the robot competitions!

I. Learner Objectives:

At the conclusion of this lab, participants should be able to:

- Follow a path using the PmodLS1 module to sense the path
- Control a robotic car
- Interface with the peripheral HB5 modules

II. Prerequisites:

Before reading this lab, participants should be able to:

- Summarize the unit related to Timers
- Explain the unit related to External Interrupts
- Outline the lab related to ports

III. Keywords:

QRB1134 phototransistors, PWM

IV. Pre-lab:

None.

V. Lab:

For this assignment you have a lot of freedom as to how you may complete the task of path following. However, you must implement your solution using assembly. You may want to follow the Digilent recommended configuration found here. **The robot only needs to be able to follow paths (laid out by electrical tape)**. Note that the electrical tape should be placed on a smooth white surface. The robot should be able to follow solid straight line or curved paths as "fast" as possible. Also, as an added bonus, the robot should be able to follow some "mystery" path that I decide to layout with electrical tape. You should consider paths that have some "break" or "gap" in them or paths that happen to intersect each other (i.e. like a figure eight).

The key to this lab is to understand that each of the fours sensors, that you will be using to follow the path, has an infrared emitting diode and a NPN silicon phototransistor. The infrared signal will reflect off a white surface. If the phototransistor collects the signal it means that a white surface has been detected, otherwise a non-reflective surface has been detected (i.e. the electrical tape). You have two options for implementing a response to the data detected by the sensors. You may use a polling technique, that consistently checks the status of each sensor port, or you may use an interrupt technique.

Ultimately, a logic '1' on a pin indicates that the sensor senses a white surface; a logic '0' indicates that the sensor does not sense anything, i.e. must be a non-reflective surface.

On **Wednesday, December 5**, we will have class competitions to see which robots can accomplish path following the "fastest" and of course we will enjoy some pizza as we perform these competitions! We will also compete in figure skating!

Required hardware: you will be using the PmodLS1 module to perform the line sensing! You may find out more information about the PmodLS1 here. Also, note that QRB1134 phototransistors are being used. Find out more information about these sensors here.