CSC 615 – Follow in Line but Stop

This is an INDIVIDUAL assignment. You can (and should) work in groups to research how to do the assignment, but each person should code their own version and make their own submission.

This is a physical class, so I will want to see what you do in action. Documentation, including short video clips (can use your cell phone) are required as part of the submission. It can be by the Hardware Manager of recorded via the WebCam.

You will also need to submit hardware drawings. These should be neat (can be either electronic or hand drawn, then scanned) of how the hardware is connected to the Raspberry Pi. This includes which pin (physical and GPIO), positive and negative flow, resisters, etc. I, and the Hardware Manager, should be able to rebuild your setup from this diagram and then run your program and get the same results. Also see https://www.circuit-diagram.org/editor/# if you want to use that (they have a Raspberry Pi template.

Assignment Description

1. Read the following pages "Component Knowledge".

2. This assignment is about using the Line sensor and the IR Obstacle sensor. In many ways these two sensors are very similar, and we will be strictly be using digital outputs form these devices. That means it is either on or off (true or false).

3. You will connect the out pin of the IR Obstacle Sensor, and the DO pin of the Line Sensor to GPIO pins in the Pi. The VCC pins on each will connect to either 3.3V or 5V pins on the Pi, and the Gnd pins connect to ground.

4. You will read (i.e. input) from the two sensors, one should be able to tell you if you are over Black or over White (i.e. on the line or off the line) and the other sensor will state if there is an obstruction in front of the sensor. You must do this with threads, one for each sensor and a main loop that checks the values.

5. You must have console output with a message to indicate if there is an Obstacle (IR sensor) and if it is still on the line (Line Sensor). Record the output for the submission.

6. Submit your homework in your GitHub and on Canvas per the submission details below

Component Knowledge

Line Sensor with TCRT5000 Reflective Optical Sensor

IR Infrared Obstacle Avoidance Sensor

Specification: Tracking Sensor module is designed with reflected Infrared sensor, indicator light. Built in a potentiometer for sensitivity control Product model : TCRT5000; working Voltage : DC 3. 3-5V Output channel : 0/1; detect distance : 1-25mm; focal distance : 2. 5mm Chipset : LM393; **Module interface specification (3-wire)** 1 VCC 3.3V-5V external 2 GND External GND 3 DO small board digital output interface switch connected to the microcontroller IO port 4.AO: Invalid	**Specification:** The output port OUT sensor module can be directly connected to the microcontroller IO port , you can directly drive a 5V relay ; the module detects the distance 2 ~ 30cm, detection angle 35 °, the distance can detect potential is adjusted Can be used for 3-5V DC power supply modules When the power is turned on, the red power indicator light Using the comparator LM393 **Interface :** 1. VCC: External 3.3V-5V voltage (can be directly connected to 5v MCU and 3.3v MCU) 2. GND: GND External 3. OUT: Small board digital output interfaces (0 and 1)

Both boards will produce a digital HIGH or LOW when the IR signal is or is not received back at the IR Detector.

Submission Details

You need to submit the following files in your github repository:

1. All .c and .h source code files.

2. A makefile file to build your program (the file MUST be called **`makefile`**). The executable output files MUST be called **`followLine`**.

3. A PDF that is clear and readable with your hardware diagram (make sure to indicate polarity and pin numbers).

4. A PDF showing the console output that has the Indicator if the sensor is on the line and if there is an obstacle. Also, a short writeup with the issues and resolution and perceived accuracy and distance that the device is effective. (combine the hardware PDF with this PDF and submit as one document in your github and in Canvas)

5. A mp4 file showing your assignment in action along with the console display.

All parts of the submissions must have your name and student ID number. For Video's please have at least a 2 second clip at the beginning with your Student ID card clearly visible. (In absence of **your student ID card print out your Name and ID number on paper and film that**).

Please post questions to the slack channel.

Grading Criteria

Grading criteria will be based on the following:

Completion and success of the assignment	25%
Code well structured, original and well documented	50%
Hardware Diagram	15%
Video	10%

Instructions followed (this includes submission requirements) This is only a detractor from your grade, i.e. failure to follow the instructions will result in a reduction from the grade calculated from the criteria above.	-50%