Pre-Lab 2 Report

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ECE 100-L04
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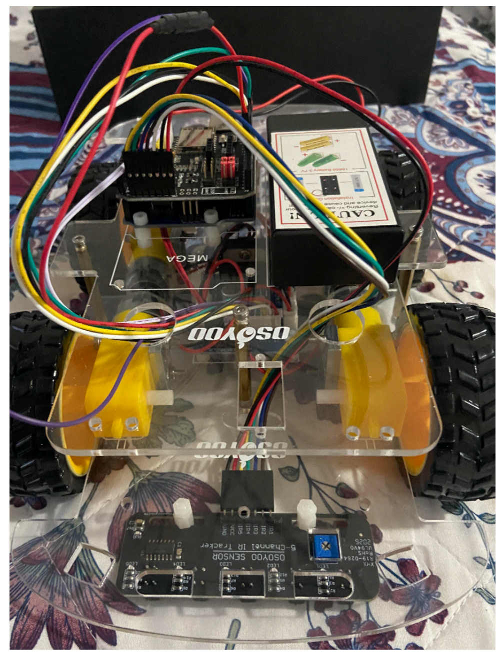
Due Date: 09/16/2022

Problem Statement

As a team how do we build upon our fundamentals from our last lab, to complete a line follower path created by our class(ECE - L04) TA. Along with understanding the line sensing objective we can optionally install the IR receiver to make the robot stop based on controller input. Once we complete the build the problem is how do we build the most optimal line follower robot ?



Construction/Implementation

Given our chassis from our previous lab(OSOYOO V.2.1 Arduino-based robot car) we were tasked to create a line follower by added a IR receiver. Before we start we had to understand how the line sensing module works and functions in regards to the line follower. The sensor contains a IR sensor that can be used for line following and edge following[1]. Given lab instructions provided to us by our lab TA and professor we implemented a plan to work on the robot:

Step 1. Find our various parts and organize them before installing them
Step 2. Unscrew the top body of the chassis to make pin and wire installation easier
Step 3. Screw in M3 Plastic screws, nuts, and pillars
Step 4. Install line follower sensor
Step 5. Upload base code to test how the sensor works
Step 6. Understand what each light means on the sensor(green and red) and note it down
Step 7. Edit the base to find optimum solution for constraints given

We did however come across some issues during our construction: one semi major issue that came across was the distance between the IR color sensors and the ground may pose an issue in accurate line detection. We knew this may be a potential issue as one of the teammates had worked on something similar in high school. To finally finish off our construction we consulted with our lab ta on the calibration of our IR sensor before finally moving on to the analysis and testing.

Analysis & Testing

Once we reached our analysis and testing point we decided to try two different sets of coding prompts. Created by both teammates. Both had their shortcomings and their gains in each regards. With our first set of code the teammates came across the issue of finding a way to make the robot operate on the white line instead of the black line provided in the base code. We then realized how the 5 sensors displayed red and green and then tested it using this principal:

```
  if(sensorval=="11011"){
    go_Advance();
    set_Motorspeed(180, 180);
  }

  if (sensorval=="11111"){
    go_Back();   //The car front touch stop line, need stop
    set_Motorspeed(150,150);
  }
}
```

Step 1. Slide a piece of paper under one sensor

Step 2. Check green vs. red light showing

Step 3. Check code in regards to how wheels spin

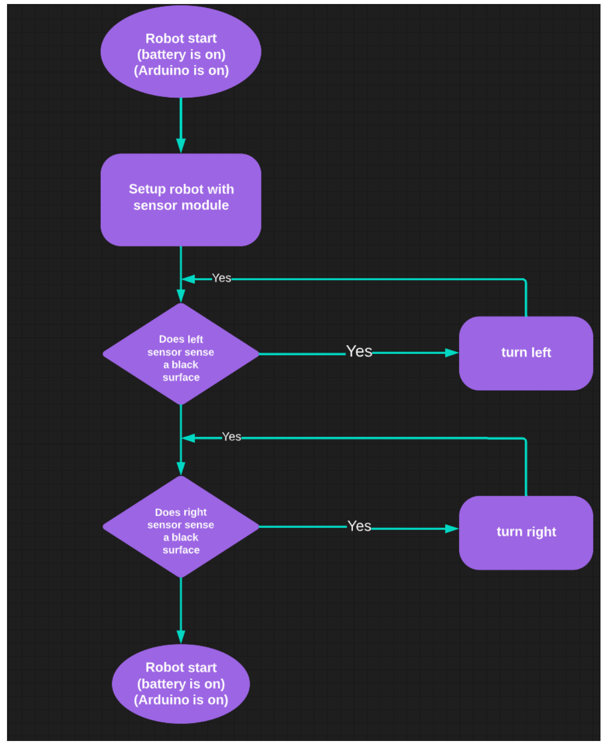
Step 4. Understand how the code is implemented within the hardware

We then implemented it within the program; since we now tested our sensors we understood what changes needed to be made in our programs and how they may impact our robot. While testing we did come across some more issues. Firstly we had an issue with our left hand side motor, it seemed to have had broken due to over use or issues with the materials . So once again we had to make change with the robot. As team we then tested various subsets of test cases and variable cases to find the optimum solution, we also decided to test our test cases and variables in our flowcharts before we completed our testing

```
#define FAST_SPEED 255
#define MID_SPEED 230
#define SLOW_SPEED 150     //back speed
#define speedPinR 9    //  RIGHT PWM pin connect MODEL-X ENA
#define RightMotorDirPin1  12    //Right Motor direction pin 1 to MODEL-X IN1
#define RightMotorDirPin2  11    //Right Motor direction pin 2 to MODEL-X IN2
#define speedPinL 6    // Left PWM pin connect MODEL-X ENB
#define LeftMotorDirPin1  7    //Left Motor direction pin 1 to MODEL-X IN3
#define LeftMotorDirPin2  8   //Left Motor direction pin 1 to MODEL-X IN4
```

Final Evaluation

Once the team had created and tested our variables we were effectively able to use the robot as a proper line follower. We also decided to test simple changes within our code to get the final output desired. The lab's result took some time for us to achieve but as a team we learned how the intersection between hardware and software can impact the outcome of a certain problem. In our case the lab work we did helped us learn about the test cases we implement, and how simple changes within your software and hardware or in unison. The reference point of the flowchart used by the team was very helpful, however one thing that multiple teams had come up was that if we used multiple colors of tape to test our codes and different/surprise tracks to prevent usage of brute force coding practice(s). This would also further push all the teams to create a more versatile piece of code and tweaks to their robot that would help the team and the class to improve their understanding of software and hardware. For our future competition the team plans on taking our robot home and creating our own sample tracks to test on. This idea was presented during our discussion of the mentality of avoiding brute force(by using the delay feature at times). One other really intresting point mentioned by the team during work was certain parts on our robot breaking or malfunctioning while we worked; it was very challenging and intriguing learning how to fix these parts and how they impact the robot while the issues occur.



References

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Rdomunky, and Instructables. "Soldering Multiple Wires for a Distribution Joint." *Instructables*, Instructables, 5 Oct. 2017, https://www.instructables.com/Soldering-multiple-wires-for-a-distribution-joint/.

Attachments

Lab1 - https://drive.google.com/file/d/1xWJrzy4H8H0xspDF9Soo0SDoppDl39Oj/view?usp=sharing

Lab 2 - https://drive.google.com/file/d/1TKfF6f2XGZ1p1ZBmupoAfbKK1Qt7a94d/view?usp=sharing