Post-Lab 1 Report

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TA:
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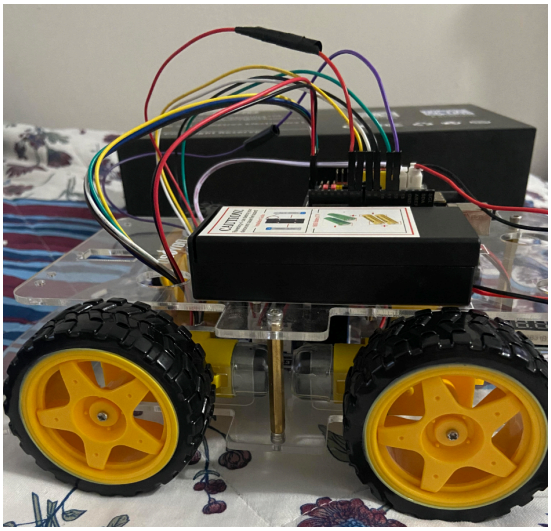
Lab Date: 09/02/2022
Due Date: 09/11/2022

Problem Statement



As a team we were given an OSOYOO V.2.1 Arduino-based robot car: our goal was to understand the robot as a team while building a connection between the teammates. Then given certain constraints and instructions, we had to make the robot perform certain actions and draw certain shapes/letter. Along with working as a team, we had to understand the ability of hardware troubleshooting and problem-solving. We also had to work through software debugging and troubleshooting. Our problem was understanding the various components of a functioning robotic car and how the software and hardware interact with each other.

Construction/Implementation

Before we started our construction we opened the box and decided to take each individual piece and inspect it for any flaws/issues. Once completed we started to see if we knew what each piece was and what it would be used for, while going through we came across a parts list which helped us a lot.

The construction of the robot however was quite straightforward, we had a video and text based tutorial [1] . We used a combination of both, when points in the video were unclear or hard for us to see we decided to refer to the text and vice versa. As a team we started off by working on halves of the robot per person(left and right). Once completed the motor installation we noticed that it is quicker to have one person work on the upper body of the robot and the other on the lower. We quickly adopted this mentality and we were able to optimize our robot construction process. Once completed the upper and lower body we installed the wires by checking our pins with the diagrams provided in the video.

Once completed we installed the Arduino compiler and dowloaded the zip file provided to us by the lab sheet we got the first part of the lab done. We then altered the code to(insert images/code stuff later) fulfill the other requirements for our robot. We took two roles with one person doing the software work and the other fine tuning the hardware(i.e. wheel camber angle)

Analysis & Testing

While we were testing the robot initially we found no issues until 2 problems, one major and one minor: we had a broken wire in our 6 to 1 male to female connector and our motors on the left side weren't perfectly straight.
Now to fix this issue we first made sure all our screws were tightened and made sure our motors were in the right direction and made sure they had minimal to no camber
How do we fix the wiring issues? Firstly I removed the rubber coating from the broken wire and found our extra wire. I then spliced the two wires and wrapped it electrical tape.
To fix this within our hardware I switched one line of code

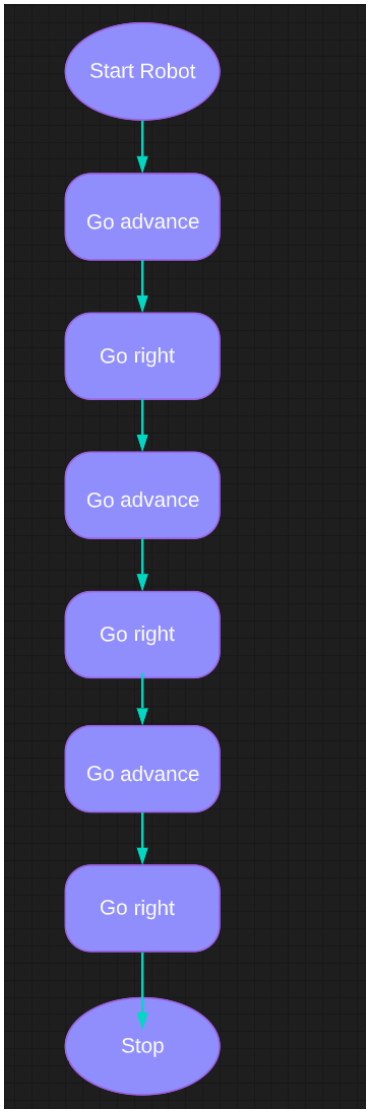
```
#define speedPinR 9    //  RIGHT PWM pin connect MODEL-X ENA
#define RightMotorDirPin1  12    //Right Motor direction pin 1 to MODEL-X IN1
#define RightMotorDirPin2  13    //Right Motor direction pin 2 to MODEL-X IN2 // had to change due to a damaged pin
#define speedPinL 6    // Left PWM pin connect 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
```

since our pin was stuck in our Arduino board.

Then we were to make changes to our software(ref code):

1. Make slight left turn, slight right turn, 90-degree left turn and 90-degree right turn.
2. Draw letters "T", "H" and "W".
3. Draw a rectangle, stairs, and star.

Once we were able to do this; creating the other sets of code was deemed very simple
Order of flowcharts(Letter W,T,H — Stairs, Star, and Rectangle)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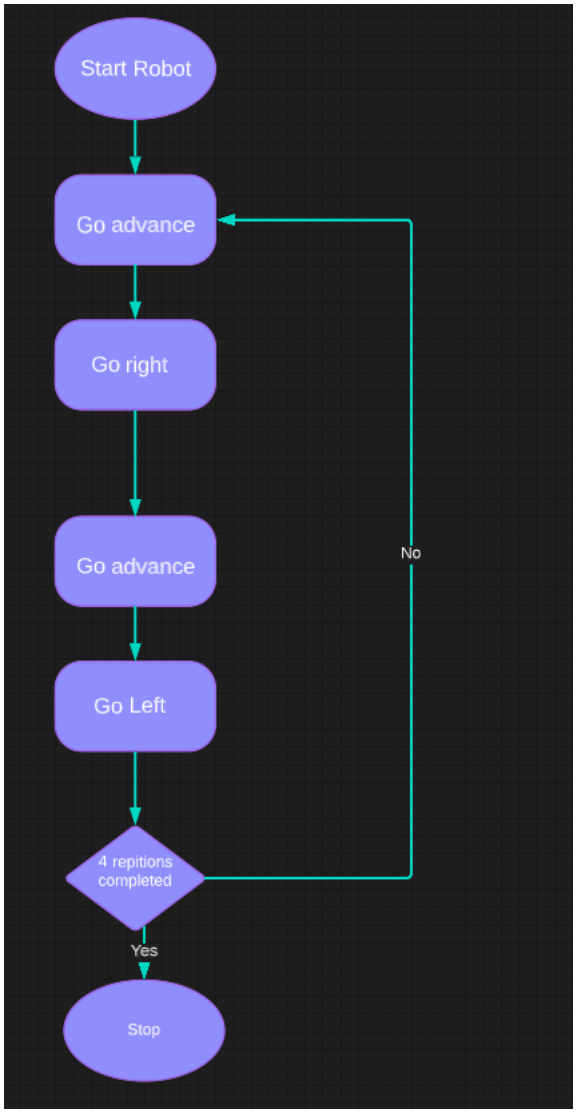
Go advance
Go right
Go advance
Go right
Stop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No
Yes
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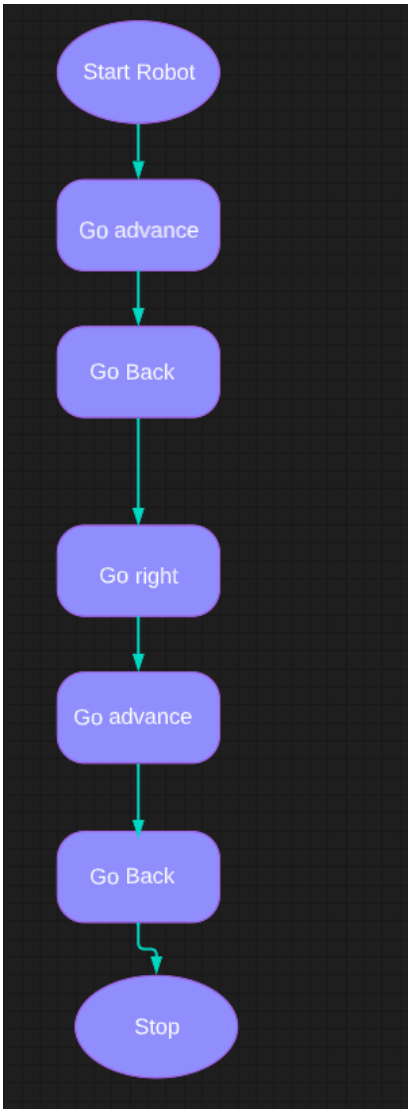
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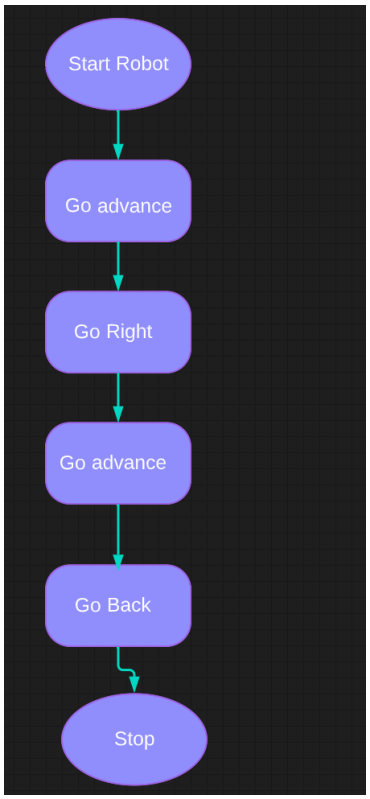
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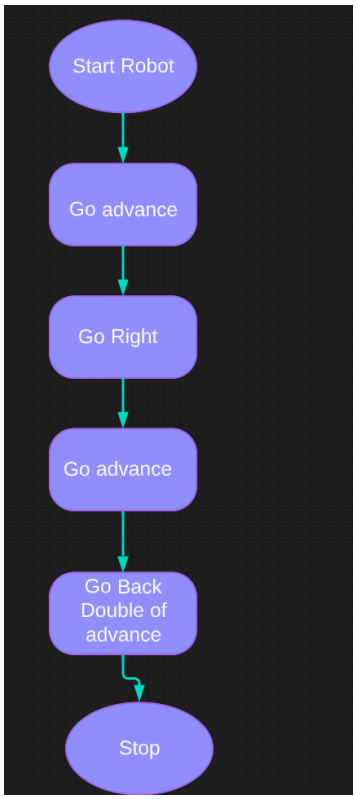
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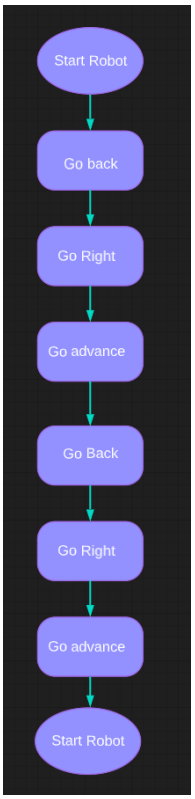
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Go Back
Go Right
Go advance
Start Robot

Short Answer Questions

1. What is a microprocessor & What is a microcontroller?
A microprocessor is the heart of a computer system, with the microcontroller being the heart of the embedded system.

2. What is the difference between the previous two components?
The microcontroller puts the all the load of the peripherals onto the CPU, with the micro processor being a more powerful CPU on a single chip that connects to the peripherals

3. Is an Arduino a microprocessor or microcontroller?
An Arduino is a single board microcontroller

Final Evaluation

Even a beginner with no prior programming knowledge or experience could learn a-lot from the OSOYOO robotic car. It s simple and enjoyable way for beginners to learn the basic interactions between hardware and software. The base Arduino code is simple to understand and edit, which helped the team to complete the project in the given time. After some effort and research(and a few hiccups) the car was able to perform every task assigned to us. We did have some issues with the motors and how the pins were connects but after overcoming this as a team we completed the given tasks. As engineers we should be ready to take on the challenges and short comings of the materials we are given to work around it. Along with the changes in hardware and R&D as computer engineers, we should be able to overcome any shortcomings with better software and our own intuition.

References

"Graphical Programming Kit for Learn Coding with Arduino IDE24 –IR Line FollowRobot Car." *Graphical Programming Kit for Learn Coding with Arduino IDE24 –IR Line Follow Robot Car " Osoyoo.com*, https://osoyoo.com/2019/07/31/arduino-graphical-programming-kit-lesson28-ir-line-follow-robot-car/.

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiE-PfV4j6AhU5AjQIHVoIAhoQFnoECAsQAQ&url=https%3A%2F%2Fwww.guru99.com%2F difference-between-microprocessor-andmicrocontroller.html&usg=AOvVaw0v_u6RJJyinJueAinxnNv

[1]https://www.youtube.com/watch?v=ZUqMQFxG8Ho&feature=emb_title

Attachments

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