Department of Electrical Engineering and Computer Science

Howard University

Washington, DC 20059

EECE 404 Senior Design II

Spring 2022

Spring 2022 Project: Team Deliveriod

By

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Summary:

For this project, we wanted to create an autonomous delivery system that could deliver documents in an office environment. We wanted our robot to have a server that is able to connect to the WiFi and accept requests from a user who connects to it. This way there is not too much technical knowledge to use the robot, just simply establish an internet connection and issue a command.

Problem Statement:

Getting up from your desk to transfer documents has developed the need to create a robot that will autonomously transfer said documents so that you will not get disturbed from your work.

Design Requirement:

Some of the requirements we needed were 2D Map which consisted of simulation area mapping and measurement. We also needed arduino code and a meshing map with motor code to have the robot functioning. We also used an Arduino MKR1000 for embedded development of the device functions. We also had to assemble a 3D Model of our ideal frame and also we needed the parts for the frame assembly of the robot.

Solution Design:

For our solution design we came up with two designs that we had a choice between to implement. The first being a small truck frame that would only be able to transport lightweight items and move at a quicker speed. The second, was a larger truck frame that would do the same as the smaller option, but be able to carry a lot more items, along with being able to carry heavier items as well which would replace the faster speeds of the smaller frame. We chose the larger option because while we need the robot to be able to transport in a timely manner, we did not need the robot to move any faster than how we had on the larger frame. So the trade off was not that significant.

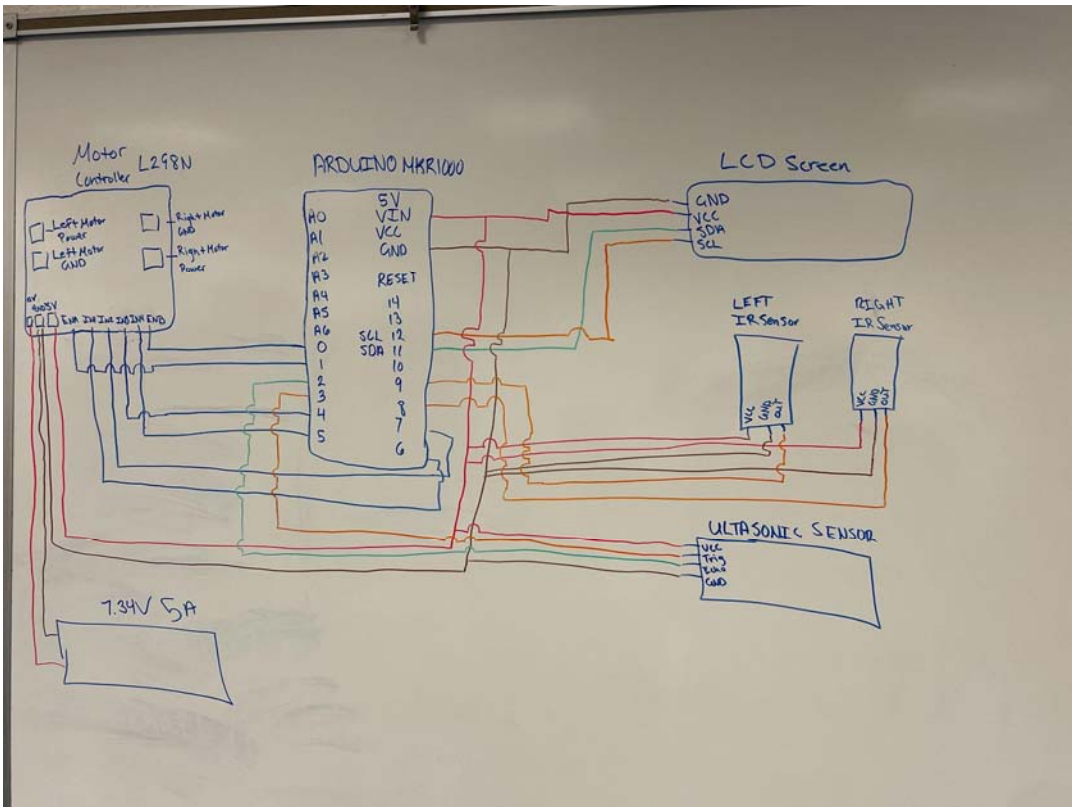
Project Implementation Plan:

EECE404 Senior Design II
Weekly Project Implementation Plan

Team Name	Deliveroid
Final Solution Product	Delivery Robot

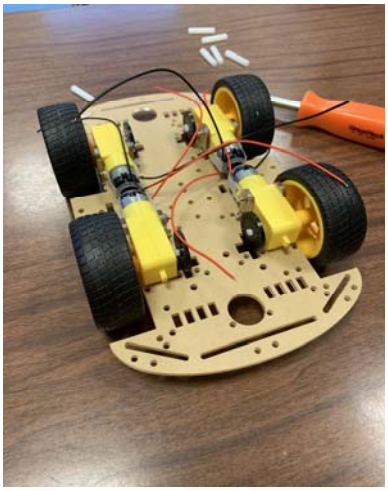
		Dates		
Sprint #	**Increments**	**From[MM/DD/YY]**	**to [MM/DD/YY]**	**Weekly development tasks**
1	Robot Foundation	Feb. 8	Feb. 15	Getting parts together/Researching
				Start build on robot frame
2	Motor Control	Feb. 22	Mar. 1	Finishing Robot assembly
		Mar. 1	Mar. 8	Work on motor alignment
3	Sensors/Softwar e	Mar. 8	Mar. 15	Attaching sensors to robot frame
		Mar. 15	Mar. 22	Building software and testing
4	Connecting Software/Hardwa re	Mar. 22	Mar. 29	Testing network w/ microcontroller
		Mar. 29	Apr. 5	Testing robot functions to make sure robot carries out its instructions

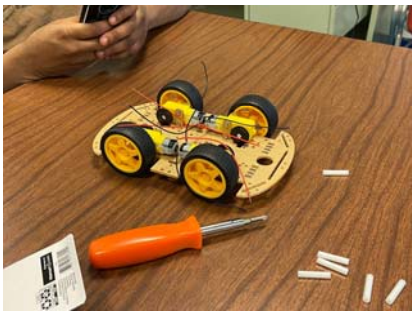
Project Implementation Process:



Sprint 1:

The goal was to gather all our parts and build the chassis for the robot. One of the major issues was connecting the parts together and making sure the motors were all spinning the same direction.





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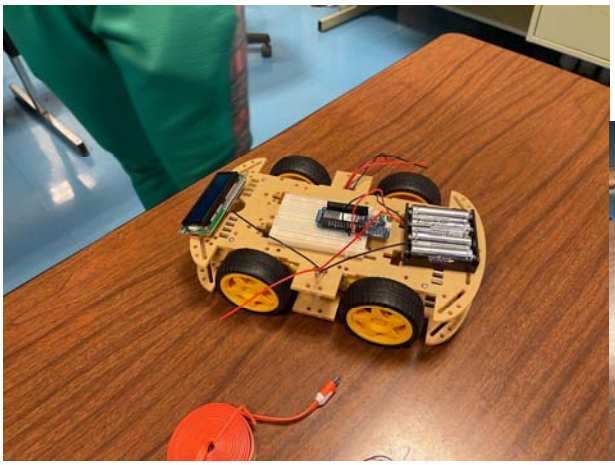
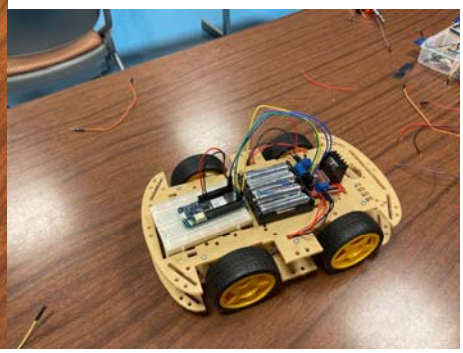
Sprint 2:

In this sprint we finished the assembly of the robot which includes 4 double a batteries, H bridge motor drive(red), MKR1000 ardunio(blue), which was all connected to a breadboard. One of the

major challenges of this sprint was wiring motors to the H bridge motor driver to communicate with the arduino serial port.

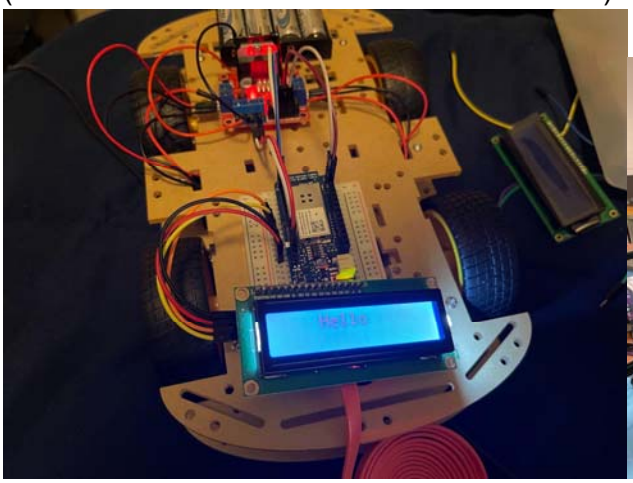




Sprint 3:

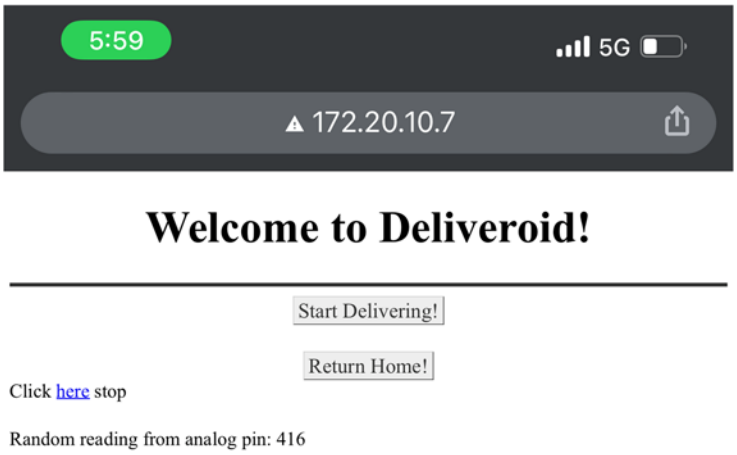
In this sprint we connected 2 IR sensors to the breadboard and we placed them in the front of the robot. We also created the code for the functions of the robot such as following the black tape and the speed of the motors. We also connected an LED screen to see various messages.

(PLACE LINK TO CODE HERE TO VIEW ???)



Sprint 4:

In this sprint we tested the network we created with the microcontroller. This allows us to test the robot functions to make sure it carries out given instructions. One of the major challenges of this was configuring our network to communicate with arduino motors wirelessly.



Conclusion:

This project was a good experience with working hands on in robotics and embedded systems. The robot we constructed was able to perform its operations of delivering products to the client and returning back to its place of origin was a success. If we had a little more time for

solution implementation, we would have, instead of having the robot rely on a piece of black tape for its guidance, the robot could be independent using some computer vision algorithm to be its guidance and obstacle avoidance. However, the end product was achieved in having the robot being autonomous, needing no human interaction other than when to start delivering and when to return home. There were a lot of good learning experiences when working on the robot that we were not familiar with before and have more questions that we can fill in on our own for the future.

References:

For a reference we want to make all of our code available for future engineering students to reference and engage with a long with a parts list and links on where to buy said parts. This is all to make people's lives easier in the future who want to work on the robot or create one on their own.

Hardware:
Chassis: Robot
Microcontroller Board: Arduino MKR1000
Motor Driver: L298n
Sensors:

- IR Prox
- Ultrasonic
- Load Cell

Software:
All code for the robot is located in the Deliveroid Github repository feel free to clone at any time and if there seems to be any issue with the code make all suggestions and requests to vmichael2018@gmail.com
Repo: https://github.com/vaughanthedon/deliveroid_software