

ENEL 387 Group Project

**Final Report of
Autonomous Robot**

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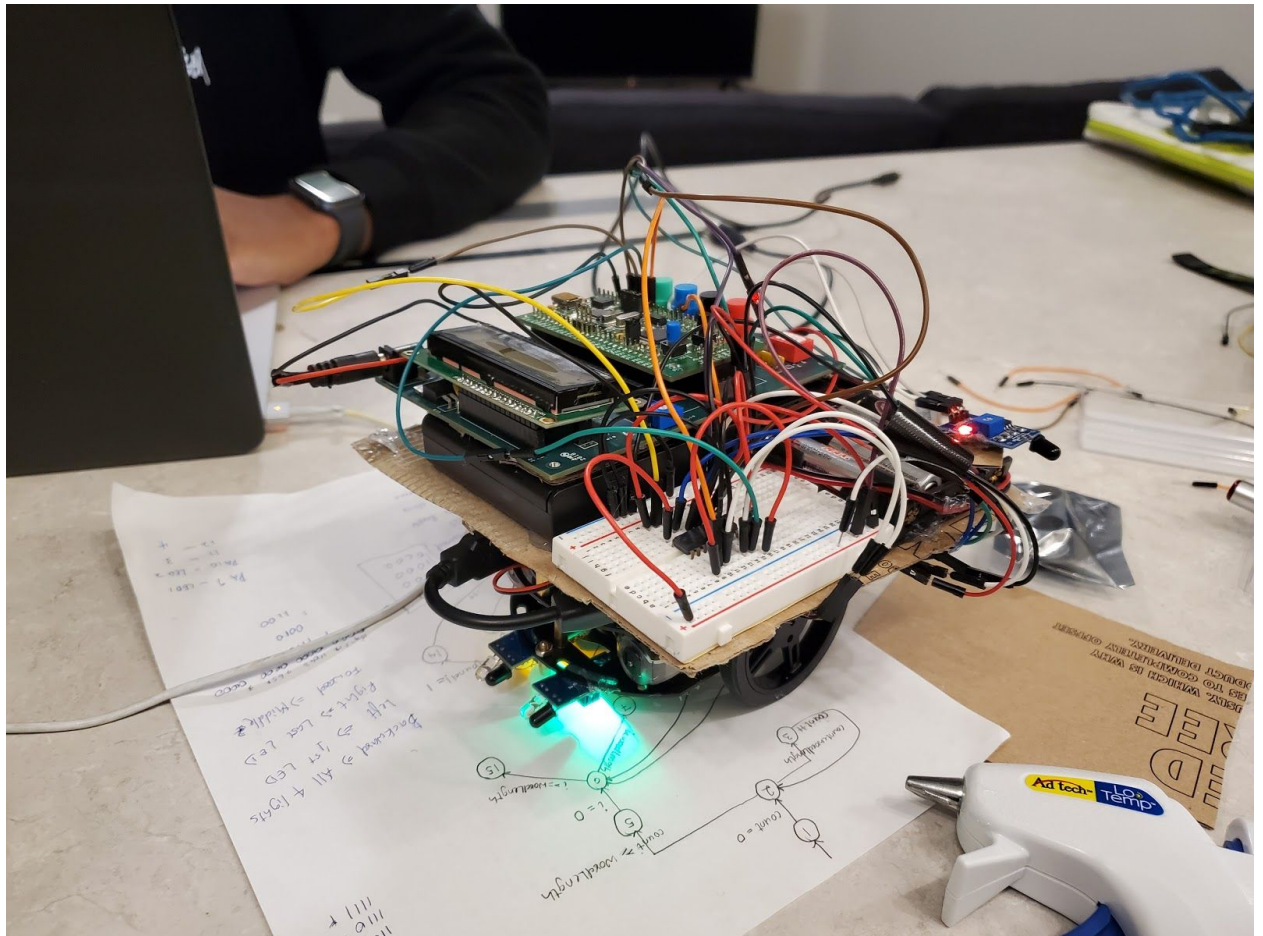
Building the Robot:

We have started from building out the robot itself, the two wheels, attacks with the two IR sensors under the robot.

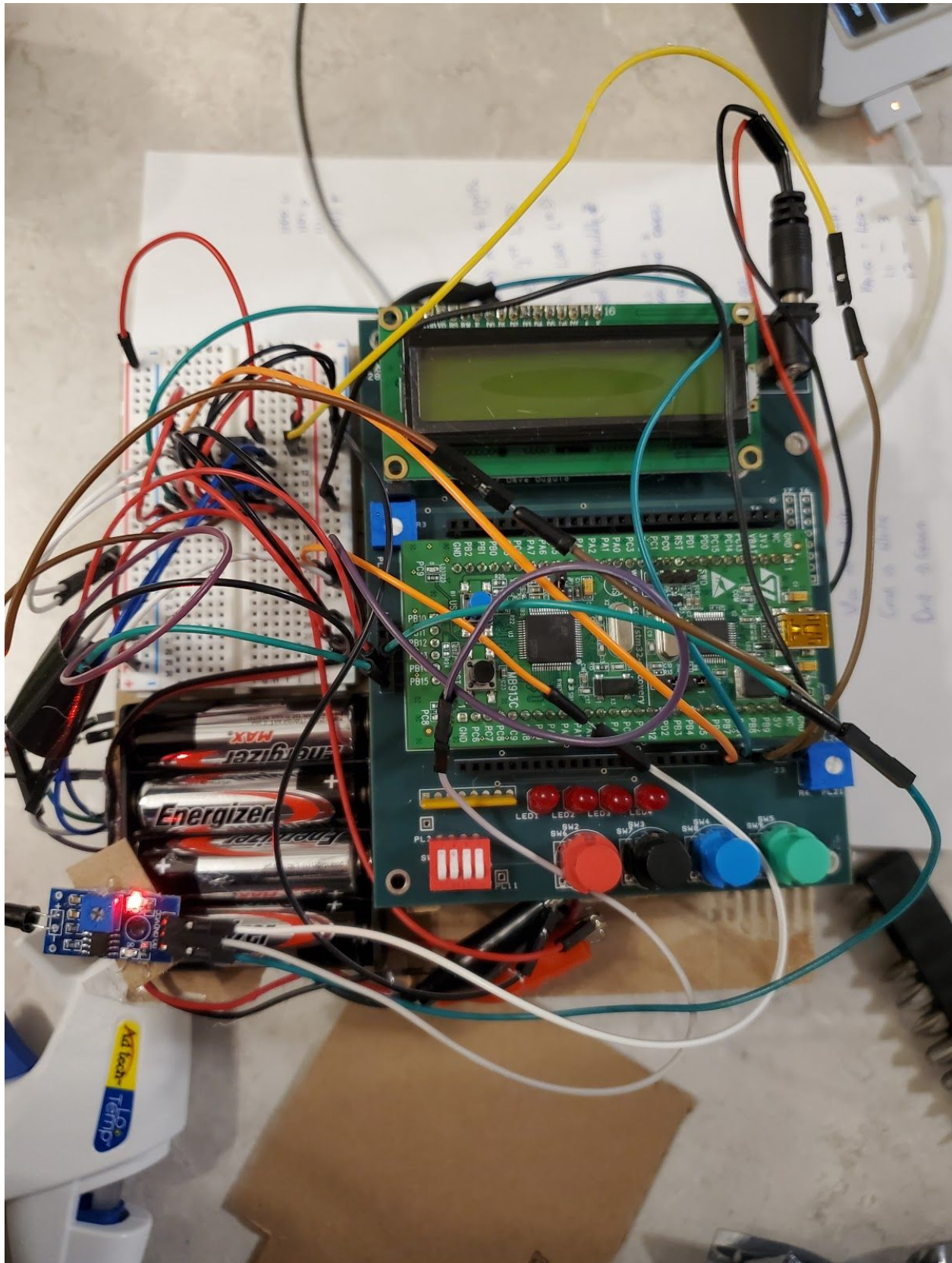
Next, with the 4 X AA batteries that are sourced for the need of ~5V, our STM32100 microcontroller with the 10 X AA batteries under, one Flame sensor at the left side, and the breadboard stick on the top of the robot.

Then, we can now make the connection circuit of the motor drivers to our STM32100 board, the two IR sensors and the one Flame sensor along with 4 X AA batteries and 10 X AA batteries.

Picture of the Robot:



Picture of the Connection:



Programing:

In clocks.h & clocks.c)

The function of

```
void clockInit(void);
```

will enable the needed clocks for our STM32100 microcontroller.

In PWM.h & PWM.c)

The function of

```
void PWM_clocks(void);
```

which is the initialization of PWM.

The function of

```
void Timer4_PWM(void);
```

is the timer initialization for PWM.

Then we have the functions of

```
void move_forward(void);
```

```
void move_backward(void);
```

```
void move_right(void);
```

```
void move_left(void);
```

```
void stop(void);
```

which can make the wheels move with different kinds of direction or to stop moving.

Lastly, the function of

```
void lineFollowing(void);
```

that will be executed to make the robot move in a different direction as to go along with the line.

The application of motor drivers will control the right and left motors of the wheels. As the button is pressed down, the system will have to finish running up the PWM code program, then by the use of these two drivers the robot will start up to navigate its course.

In GPIO.h & GPIO.c

In IR_Sensor.h & IR_Sensor.c

we have the function of

```
uint16_t IR_Left_Sensor(void);
```

when the left IR sensor senses the line, the robot will move right as to go back and follow the line in the direction where it is supposed to go.

also, the function of

```
uint16_t IR_Right_Sensor(void);
```

when the right IR sensor senses the line, the robot will move left so to go back and follow the line in the direction where it is supposed to go.

Next, function of

```
uint16_t Flame_Sensor(void);
```

that will make the robot stop for a while, when the Flame sensor feels the heat of the candle.

With these sensors built in front and rear, the robot will navigate its course even in the dark. These two infrared sensors will also assist the robot to avoid the obstacles by using the light wavelengths.

In addition, with the built in flame sensor, the robot can sense the temperature of surrounding as to avoid the collision.

In LCDlab.h & LCDlab.c

we have the functions of

```
void CMD2LCD(uint8_t);
```

```
void DAT2LCD(uint8_t);
```

```
void LCD_IO_INIT();
```

```
void LCD_INIT();
```

```
void StartLCD();
```



```
void delay(uint32_t);
```

which are the initialization of LCD.

The functions of

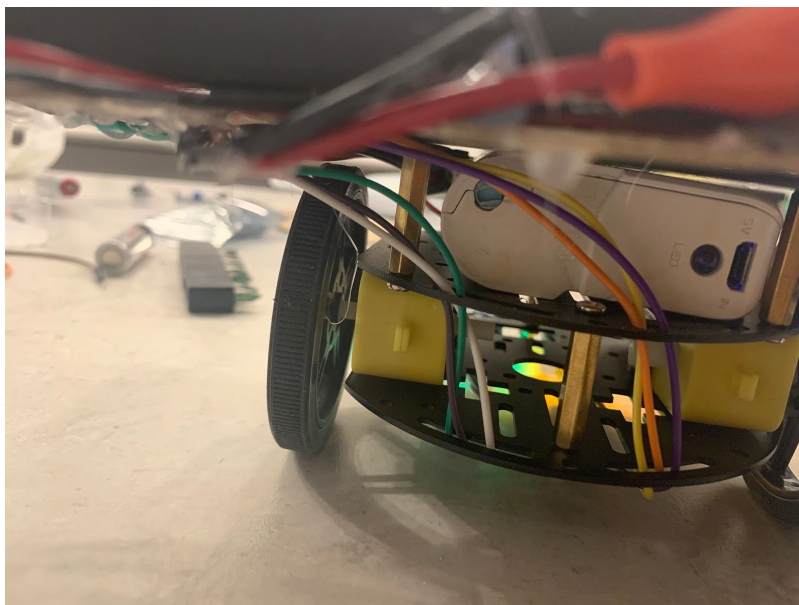
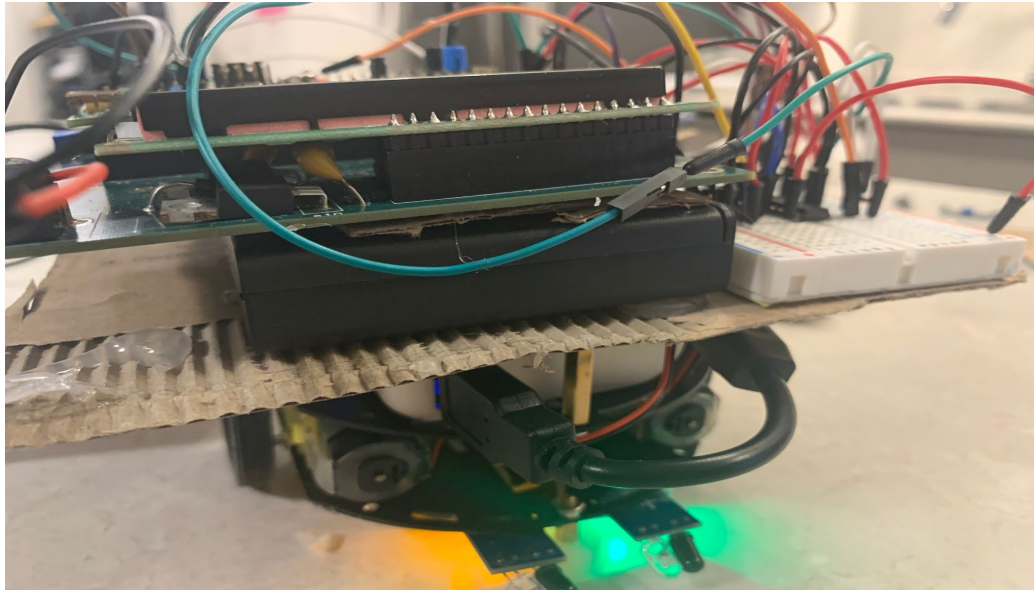
```
void LeftSensorTriggered();  
void RightSensorTriggered();  
void BothSensorTriggered();  
void FlameSensorTrig();
```

which will display the message on the LCD that is happening with the robot.

Design Process

Our robot was fairly easy to build. We have a power bank in a compartment of our robot that supplies 5V to our driver(VCC1) and also our sensors. Then we have a 6V source that goes to the other power pin of our driver(VCC2). Under our microcontroller we have a 12V power source that gives power to our 384 board.





Deviations

We did not entirely deviate from our main plan. There were a few changes made as our robot was built. We moved away from ultrasonic sensors because we did not see any use of it in our project. We also made use of 2 IR sensors - both placed in front (we had one front and one rear in our functional specifications document). Finally, we changed our temperature sensor to a IR flame sensor instead.

Link to our video: <https://youtu.be/Myg30LHXbMU>