



Jeanine Carhart

CEIS 114

FINAL PROJECT

AUGUST 27, 2022

INTRODUCTION

PROJECT SCOPE

- Project Plan for IoT Traffic Controller
- Create the Traffic Controller
- Create a Multiple Traffic Light Controller
- Create a Multiple Traffic Light Controller with a Cross Walk
- Creating a Multiple Traffic Light Controller with a Cross Walk and an Emergency Buzzer
- Group Discussion Feedback & Final Project – Option 2

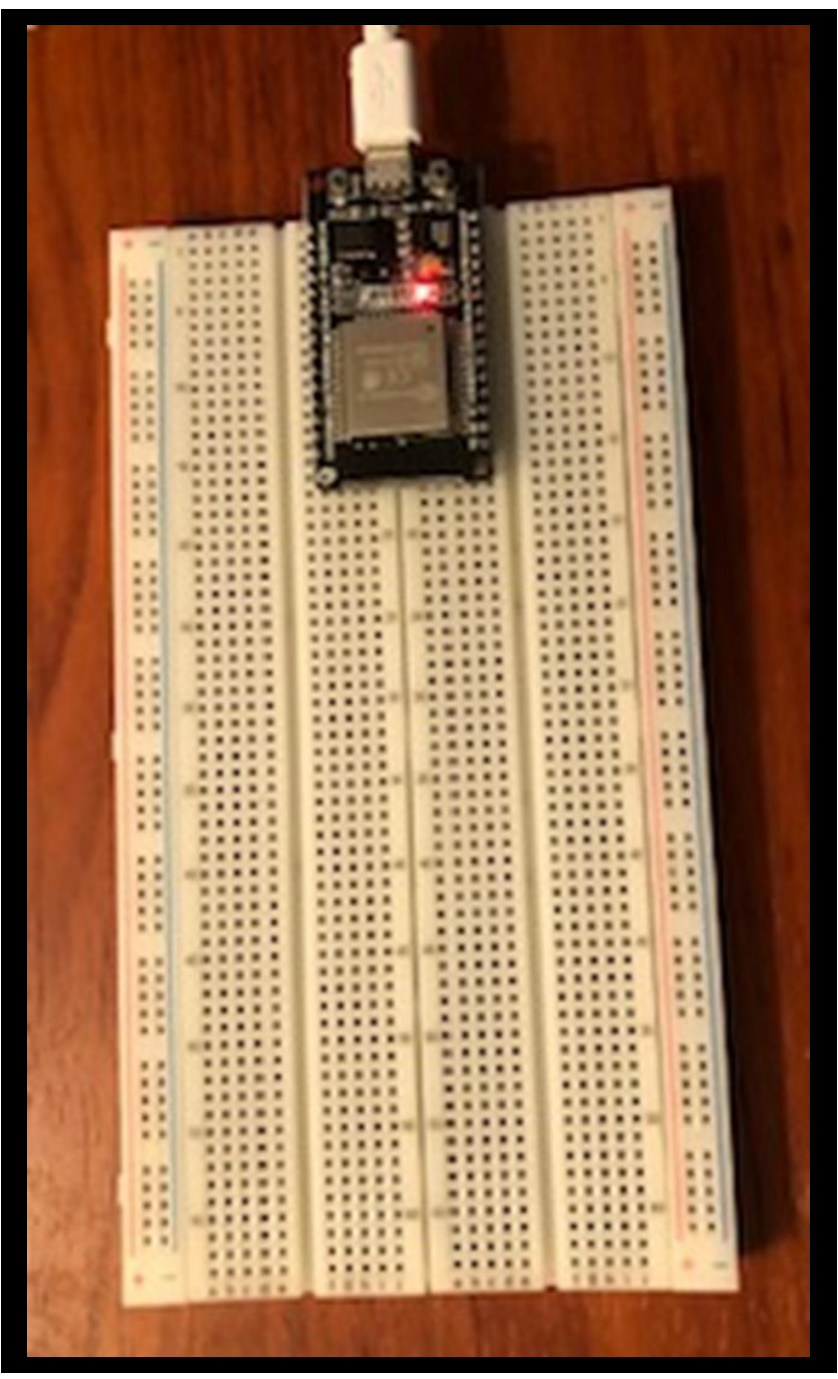
Module 2

Project Plan for IoT Traffic Controller

INVENTORY

- ✓ ESP 32 Board
- ✓ Colored LEDs: Red, Yellow, Green, and Blue
- ✓ 220 Ohm Resistors (optional)
- ✓ Wires
- ✓ Breadboard(s)
- ✓ LCD Unit with I2C Adapter
- ✓ Active Buzzer
- ✓ Mini Router
- ✓ Push Button(s)
- ✓ PIR Motion Sensor



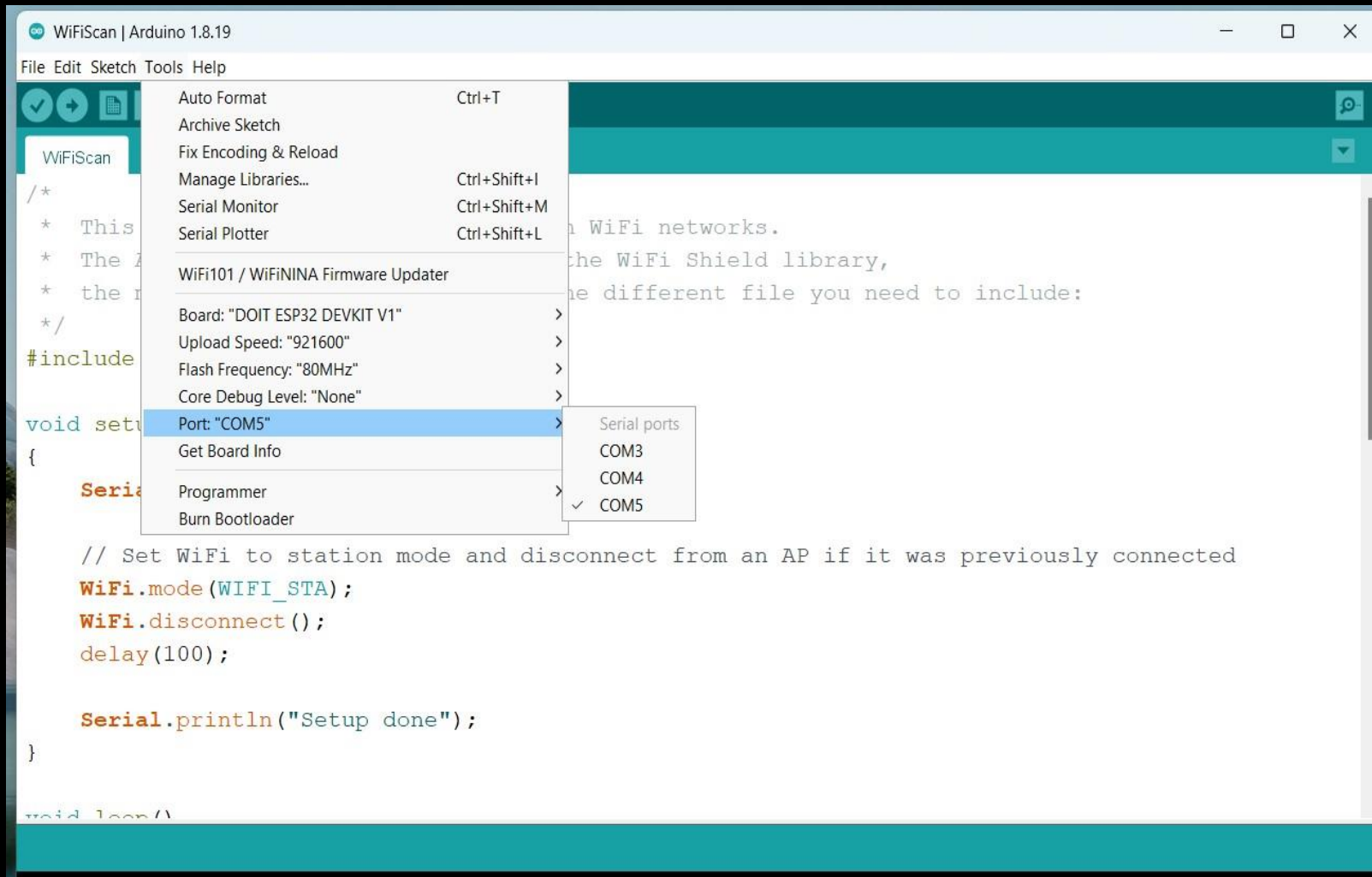


ESP 32

Microcontroller mounted and powered ON

Installation of Arduino IDE

Screenshot of Arduino IDE with Port selected from Tools menu



ESP 32 WiFi Scan

Screenshot of Serial Monitor in Arduino IDE showing the available networks

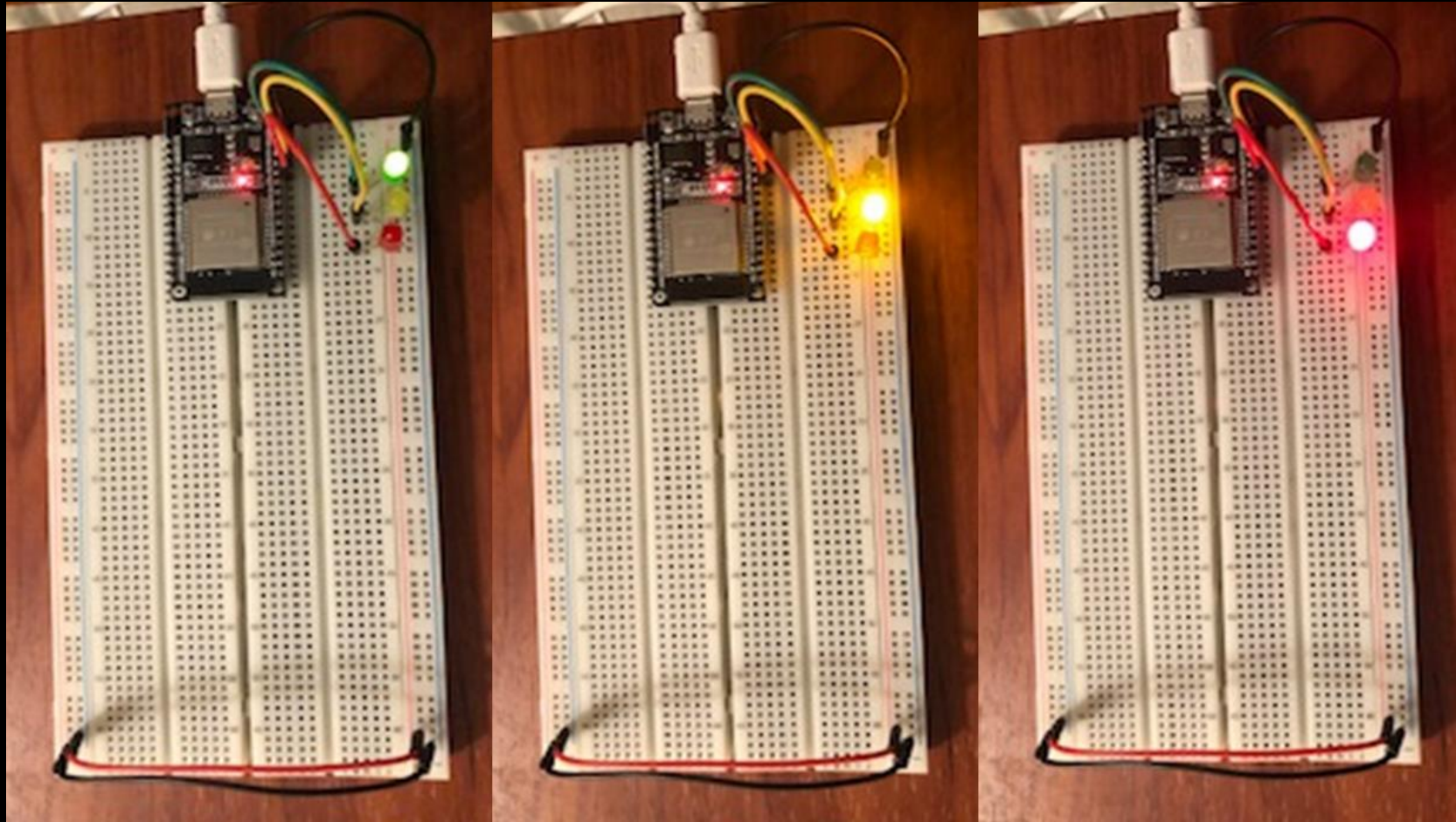
```
COM5
16:42:38.042 -> 6: MySpectrumWiFi2b-2G (-85)*
16:42:38.042 -> 7: SpectrumSetup-70 (-86)*
16:42:38.042 -> 8: SpectrumSetup-31 (-89)*
16:42:38.042 ->
16:42:43.060 -> scan start
16:42:47.960 -> scan done
16:42:47.960 -> 9 networks found
16:42:47.960 -> 1: NETGEAR71 (-53)*
16:42:47.960 -> 2: NETGEAR-Guest (-53)*
16:42:48.007 -> 3: DIRECT-c2-HP M283 LaserJet (-55)*
16:42:48.007 -> 4: surfs-up (-83)*
16:42:48.007 -> 5: MySpectrumWiFi2b-2G (-84)*
16:42:48.007 -> 6: NETGEAR63 (-84)*
16:42:48.007 -> 7: SpectrumSetup-70 (-86)*
16:42:48.054 -> 8: SpectrumSetup-31 (-88)*
16:42:48.054 -> 9: FatBallz (-92)*
16:42:48.054 ->
16:42:53.064 -> scan start
16:42:57.575 -> scan done
16:42:57.575 -> 8 networks found
16:42:57.575 -> 1: NETGEAR71 (-55)*
16:42:57.575 -> 2: NETGEAR-Guest (-56)*
16:42:57.575 -> 3: DIRECT-c2-HP M283 LaserJet (-59)*
16:42:57.575 -> 4: SpectrumSetup-70 (-84)*
16:42:57.621 -> 5: MySpectrumWiFi2b-2G (-84)*
16:42:57.621 -> 6: SpectrumSetup-31 (-86)*
16:42:57.621 -> 7: RUTHLESS (-87)*
16:42:57.621 -> 8: surfs-up (-88)*
16:42:57.667 ->
```


Module 3

Creating the Traffic Controller

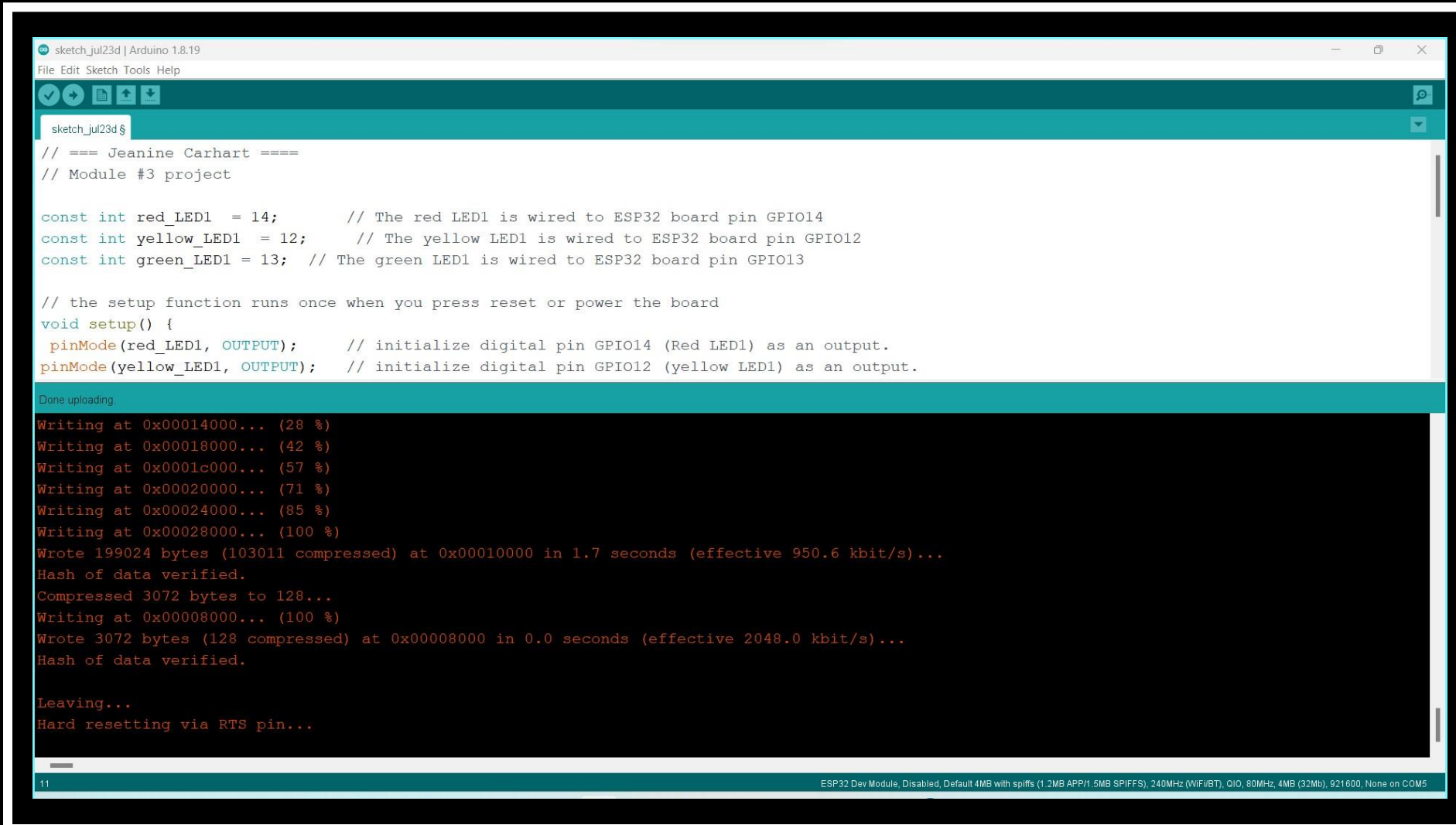
Circuit with working LEDs

- ESP 32 Board
- Colored LEDs: Red, Yellow and Green
- 220 Ohm Resistors (optional)
- Wires
- Breadboard



Screenshot of code in Arduino IDE

Screenshot of code in Arduino IDE showing my name in the comment



The screenshot shows the Arduino IDE interface. The top menu bar includes 'File', 'Edit', 'Sketch', 'Tools', and 'Help'. The main editor area contains the following code:

```
// ==== Jeanine Carhart ====  
// Module #3 project  
  
const int red_LED1 = 14;    // The red LED1 is wired to ESP32 board pin GPIO14  
const int yellow_LED1 = 12; // The yellow LED1 is wired to ESP32 board pin GPIO12  
const int green_LED1 = 13; // The green LED1 is wired to ESP32 board pin GPIO13  
  
// the setup function runs once when you press reset or power the board  
void setup() {  
  pinMode(red_LED1, OUTPUT); // initialize digital pin GPIO14 (Red LED1) as an output.  
  pinMode(yellow_LED1, OUTPUT); // initialize digital pin GPIO12 (yellow LED1) as an output.  
}
```

Below the code editor, the 'Serial Monitor' window is open, displaying the upload progress:

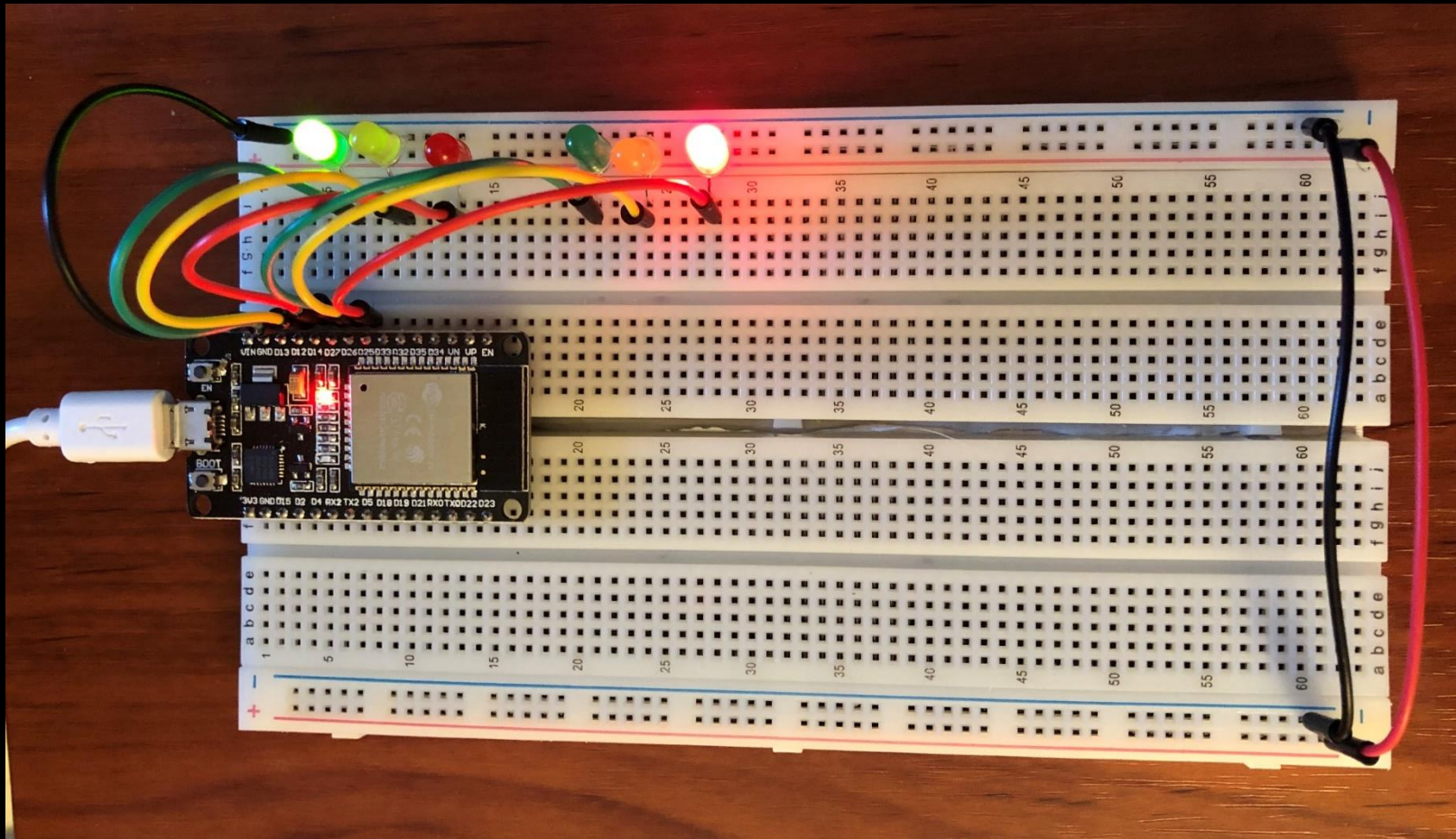
```
Done uploading.  
Writing at 0x00014000... (28 %)  
Writing at 0x00018000... (42 %)  
Writing at 0x0001c000... (57 %)  
Writing at 0x00020000... (71 %)  
Writing at 0x00024000... (85 %)  
Writing at 0x00028000... (100 %)  
Wrote 199024 bytes (103011 compressed) at 0x00010000 in 1.7 seconds (effective 950.6 kbit/s)...  
Hash of data verified.  
Compressed 3072 bytes to 128..  
Writing at 0x00008000... (100 %)  
Wrote 3072 bytes (128 compressed) at 0x00008000 in 0.0 seconds (effective 2048.0 kbit/s)...  
Hash of data verified.  
  
Leaving...  
Hard resetting via RTS pin...
```

The status bar at the bottom indicates the board type: 'ESP32 Dev Module, Disabled, Default 4MB with spiiffs (1.2MB APP/1.5MB SPIFFS), 240MHz (WiFi/BT), QIO, 80MHz, 4MB (32Mb), 921600, None on COM5'.

Module 4

Creating a Multiple Traffic Light
Controller

Circuit with working LEDs



- ESP 32 Board
- Colored LEDs: Red, Yellow and Green (two sets)
- 220 Ohm Resistors (optional)
- Wires
- Breadboard

Screenshot of code in Arduino IDE

Screenshot of code in Arduino IDE showing my name in the comment



```
sketch_jul28a | Arduino 1.8.19
File Edit Sketch Tools Help

sketch_jul28a
// ==== Jeanine Carhart ====
// Module #4 project

// Define some labels
const int red_LED1 = 14; // The red LED1 is wired to ESP32 board pin GPIO14
const int yellow_LED1 = 12; // The yellow LED1 is wired to ESP32 board pin GPIO12
const int green_LED1 = 13; // The green LED1 is wired to ESP32 board pin GPIO13
const int red_LED2 = 25; // The red LED2 is wired to Mega board pin GPIO25
const int yellow_LED2 = 26; // The yellow LED2 is wired to Mega board pin GPIO 26
const int green_LED2 = 27; // The green LED2 is wired to Mega board pin GPIO 27

// the setup function runs once when you press reset or power the board
void setup() {
  pinMode(red_LED1, OUTPUT); // initialize digital pin GPIO14 (Red LED1) as an output.
  pinMode(yellow_LED1, OUTPUT); // initialize digital pin GPIO12 (yellow LED1) as an output.
  pinMode(green_LED1, OUTPUT); // initialize digital pin GPIO13 (green LED1) as an output.
  pinMode(red_LED2, OUTPUT); // initialize digital pin GPIO25 (Red LED2) as an output.
  pinMode(yellow_LED2, OUTPUT); // initialize digital pin GPIO26 (yellow LED2) as an output.
}

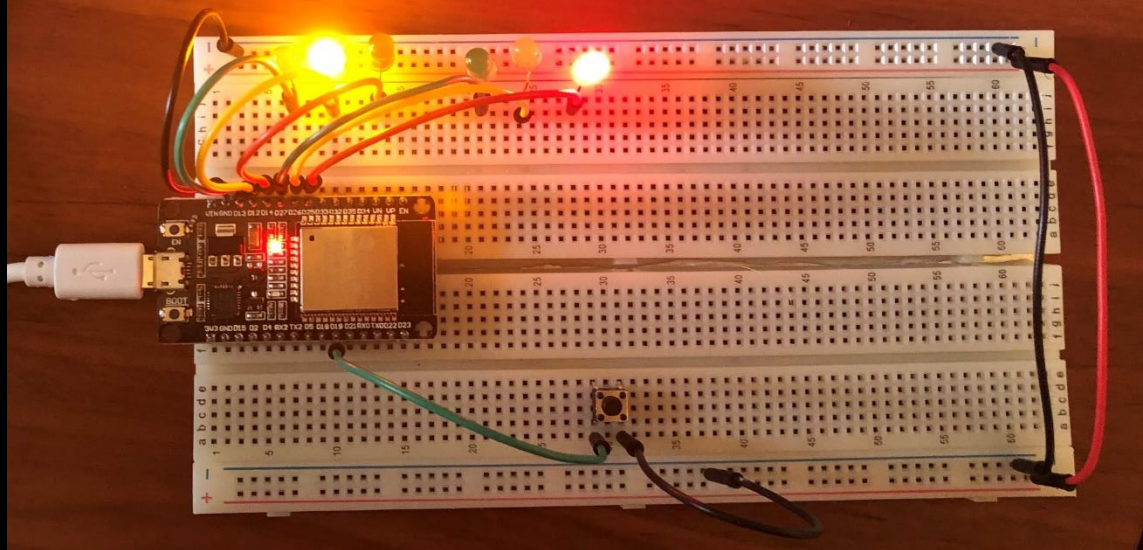
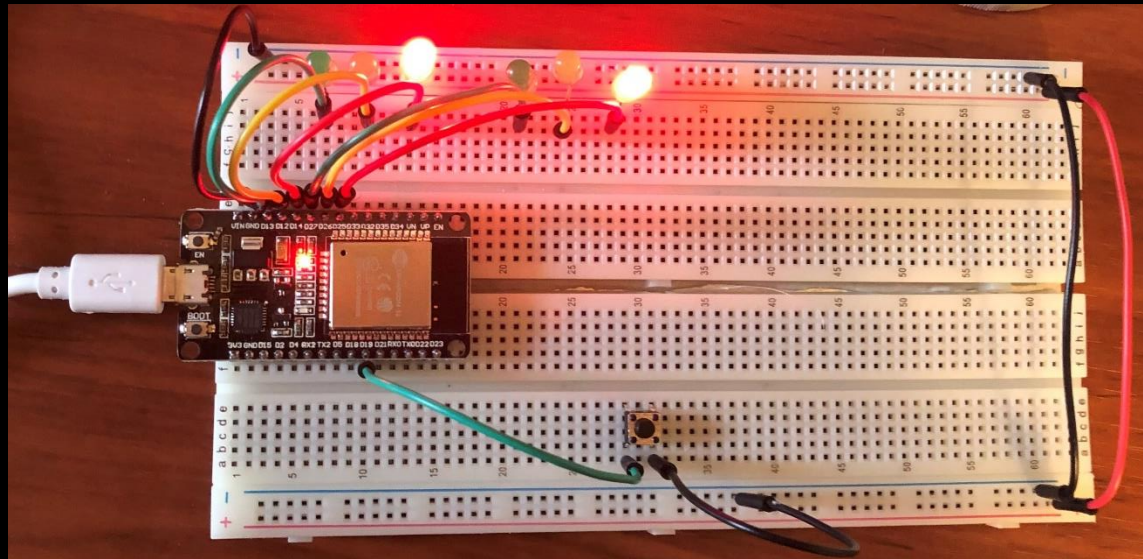
Writing at 0x00008000... (100 %)
Wrote 3072 bytes (128 compressed) at 0x00008000 in 0.0 seconds (effective 847.4 kbit/s)...
Hash of data verified.

73 ESP32 Dev Module, Enabled, Default 4MB with spiiffs (1.2MB APP/1.5MB SPIFFS), 240MHz (WiFi/BT), QIO, 80MHz, 4MB (32Mb), 115200, Error on COM5
```

Module 5

Creating a Multiple Traffic Light
Controller with a Cross Walk

Circuit with working LEDs



- ESP 32 Board
- Colored LEDs: Red, Yellow and Green (two sets)
- 220 Ohm Resistors (optional)
- Push Button
- Wires
- Breadboard

Screenshot of Code in Arduino IDE

Screenshot of code in Arduino IDE showing my name in the comment

```
sketch_aug05b | Arduino 1.8.19
File Edit Sketch Tools Help
sketch_aug05b
// === Jeanine Carhart ====
// Module #5 project
const int red_LED1 = 14; // The red LED1 is wired to ESP32 board pin GPIO14
const int yellow_LED1 =12; // The yellow LED1 is wired to ESP32 board pin GPIO12
const int green_LED1 = 13; // The green LED1 is wired to ESP32 board pin GPIO13
const int red_LED2 = 25; // The red LED2 is wired to Mega board pin GPIO25
const int yellow_LED2 = 26; // The yellow LED2 is wired to Mega board pin GPIO 26
const int green_LED2 = 27; // The green LED2 is wired to Mega board pin GPIO 27

int Xw_value;
const int Xw_button = 19; //Cross Walk button

// the setup function runs once when you press reset or power the board
void setup() {

  pinMode(Xw_button, INPUT_PULLUP); // 0=prescribed, 1 = unpressed button
  Serial.begin(115200);
  pinMode(red_LED1, OUTPUT); // initialize digital pin 14 (Red LED1) as an output.

Leaving...
Hard resetting via RTS pin...

103 ESP32 Dev Module, Enabled, Default 4MB with spiffs (1.2MB APP/1.5MB SPIFFS), 80MHz (WiFi/BT), QIO, 80MHz, 4MB (32Mb), 115200, Info on COM5
```

```
COM5
12:00:41.383 -> Count = 5 == Walk ==
12:00:42.412 -> Count = 4 == Walk ==
12:00:43.395 -> Count = 3 == Walk ==
12:00:44.375 -> Count = 2 == Walk ==
12:00:45.404 -> Count = 1 == Walk ==
12:00:46.383 -> == Do Not Walk ==
12:00:56.381 -> == Do Not Walk ==
12:01:06.394 -> == Do Not Walk ==
12:01:16.399 -> == Do Not Walk ==
12:01:26.394 -> Count = 10 == Walk ==
12:01:27.380 -> Count = 9 == Walk ==
12:01:28.407 -> Count = 8 == Walk ==
12:01:29.388 -> Count = 7 == Walk ==
12:01:30.413 -> Count = 6 == Walk ==
12:01:31.395 -> Count = 5 == Walk ==
12:01:32.422 -> Count = 4 == Walk ==
12:01:33.401 -> Count = 3 == Walk ==
12:01:34.384 -> Count = 2 == Walk ==
12:01:35.408 -> Count = 1 == Walk ==
12:01:36.386 -> == Do Not Walk ==
12:01:46.384 -> == Do Not Walk ==
12:01:56.381 -> == Do Not Walk ==
12:02:06.394 -> == Do Not Walk ==
12:02:16.388 -> Count = 10 == Walk ==
12:02:17.411 -> Count = 9 == Walk ==
12:02:18.395 -> Count = 8 == Walk ==
```

Autoscroll Show timestamp

No line ending | 115200 baud | Clear output

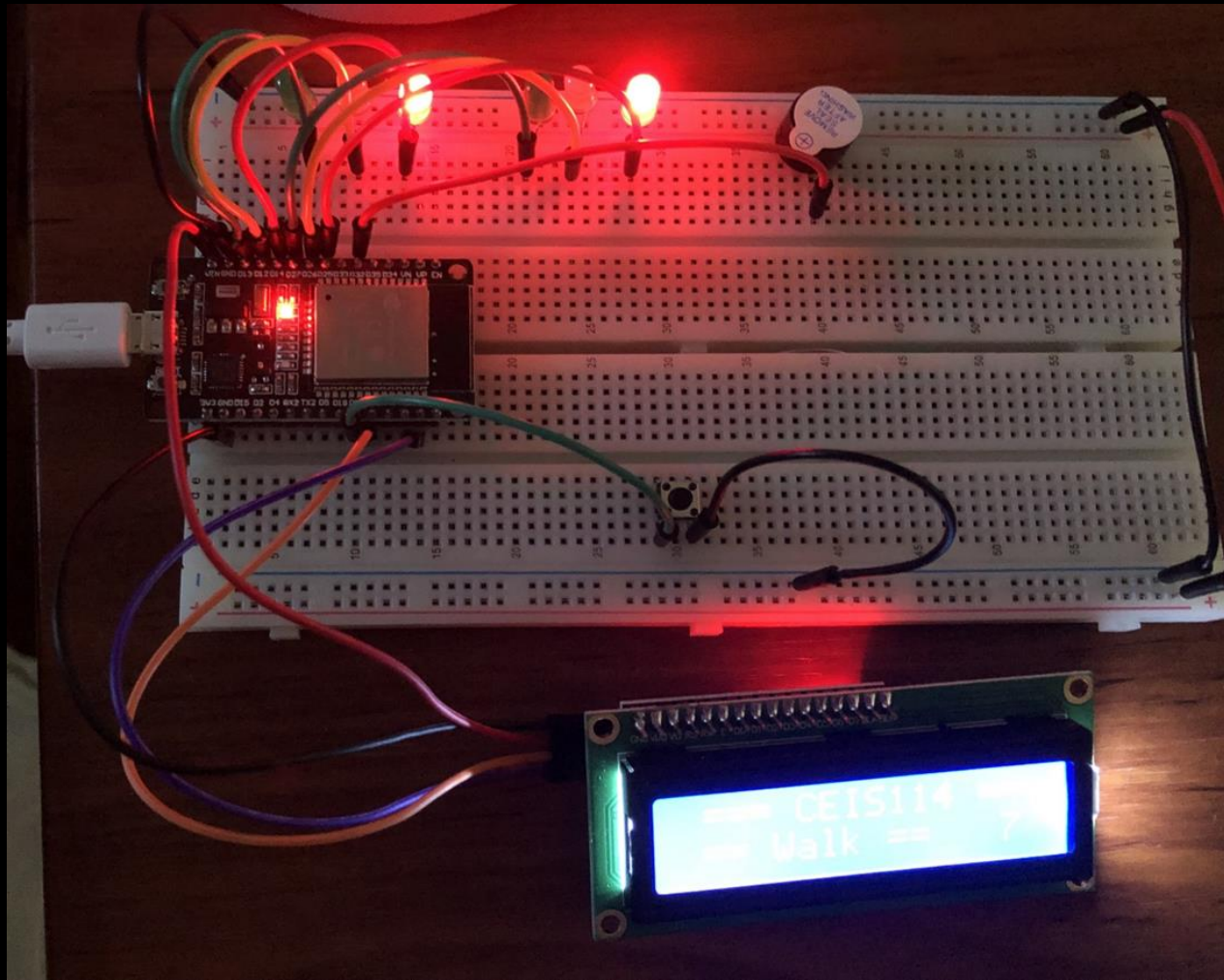
Screenshot of Serial Monitor in Arduino IDE

Screenshot of output in Serial Monitor

Module 6

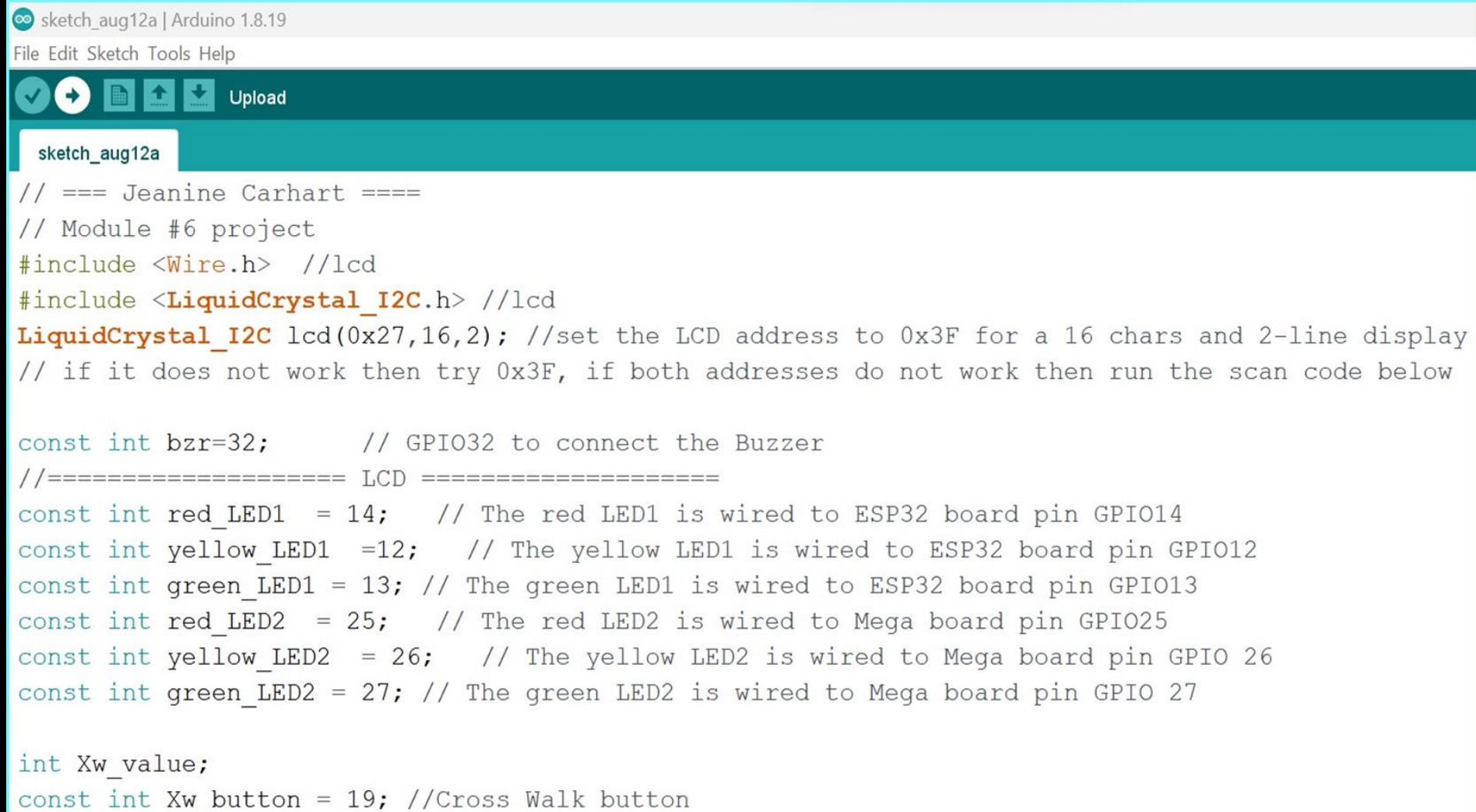
Creating a Multiple Traffic Light
Controller with a Cross Walk and an
Emergency Buzzer

Circuit with working LEDs and LCD display



- ❖ ESP 32 Board
- ❖ Colored LEDs: Red, Yellow and Green (two sets)
- ❖ 220 Ohm Resistors (optional)
- ❖ Push Button
- ❖ LCD Unit with Message Display
- ❖ Wires
- ❖ Breadboard

Screenshot of code in Arduino IDE

The image shows a screenshot of the Arduino IDE interface. At the top, the window title is 'sketch_aug12a | Arduino 1.8.19'. Below the title bar is a menu bar with 'File', 'Edit', 'Sketch', 'Tools', and 'Help'. A toolbar contains icons for a checkmark, a right arrow, a grid, an up arrow, a down arrow, and an 'Upload' button. The main workspace shows a tab for 'sketch_aug12a' containing the following code:

```
// === Jeanine Carhart ===  
// Module #6 project  
#include <Wire.h> //lcd  
#include <LiquidCrystal_I2C.h> //lcd  
LiquidCrystal_I2C lcd(0x27,16,2); //set the LCD address to 0x3F for a 16 chars and 2-line display  
// if it does not work then try 0x3F, if both addresses do not work then run the scan code below  
  
const int bzc=32; // GPIO32 to connect the Buzzer  
//===== LCD =====  
const int red_LED1 = 14; // The red LED1 is wired to ESP32 board pin GPIO14  
const int yellow_LED1 =12; // The yellow LED1 is wired to ESP32 board pin GPIO12  
const int green_LED1 = 13; // The green LED1 is wired to ESP32 board pin GPIO13  
const int red_LED2 = 25; // The red LED2 is wired to Mega board pin GPIO25  
const int yellow_LED2 = 26; // The yellow LED2 is wired to Mega board pin GPIO 26  
const int green_LED2 = 27; // The green LED2 is wired to Mega board pin GPIO 27  
  
int Xw_value;  
const int Xw_button = 19; //Cross Walk button
```

Screenshot
of code in
Arduino IDE
showing my
name in the
comment

Circuit with working LEDs and LCD display

Screenshot of output in Serial Monitor

```
COM5
16:19:03.095 -> Count = 6 == Walk ==
16:19:04.174 -> Count = 5 == Walk ==
16:19:05.297 -> Count = 4 == Walk ==
16:19:06.374 -> Count = 3 == Walk ==
16:19:07.453 -> Count = 2 == Walk ==
16:19:08.533 -> Count = 1 == Walk ==
16:19:09.610 -> Count = 0 == Walk ==
16:19:10.736 -> == Do Not Walk ==
16:19:20.803 -> == Do Not Walk ==
16:19:30.822 -> == Do Not Walk ==
16:19:40.866 -> == Do Not Walk ==
16:19:50.884 -> Count = 10 == Walk ==
16:19:51.962 -> Count = 9 == Walk ==
16:19:53.041 -> Count = 8 == Walk ==
16:19:54.123 -> Count = 7 == Walk ==
16:19:55.201 -> Count = 6 == Walk ==
16:19:56.284 -> Count = 5 == Walk ==
16:19:57.367 -> Count = 4 == Walk ==
16:19:58.446 -> Count = 3 == Walk ==
16:19:59.525 -> Count = 2 == Walk ==
16:20:00.600 -> Count = 1 == Walk ==
16:20:01.677 -> Count = 0 == Walk ==
16:20:02.851 -> == Do Not Walk ==
16:20:12.879 -> == Do Not Walk ==
```

Autoscroll Show timestamp

No line ending

Module 7 & 8

Group Discussion Feedback

&

Final Project – Option 2

Group Discussion

Screenshots of Group Feedback on Project 6

 [Jeanine Carhart \(She/Her\)](#)

Friday

Hi Caleb,

Very nice executable plan. You have outlined practical steps to reach your goal and a clear path to get there. Your attention to details is apparent as you followed instructions carefully; for example, your photos are well lighted and your name is clearly displayed on the picture of the code, also, the output from the code is visible on the serial monitor. If you follow your plan as you've outlined it, your final project will be exceptional.

Edited by [Jeanine Carhart](#) on Aug 20 at 9:11am

[Reply](#)  (1 like)

 [Caleb Gary](#)

Aug 15, 2022

Hi Jeanine,

I have reviewed your plans to prepare your Final Project Deliverable and I have some feedback for you! I think your plan is very likely to succeed. You understand that you will need to redo your portfolio using WIX due to course requirements. I love that you recognize the need for quality assurance for your screenshots and photos in order to remain professional. I believe you could improve your plan by continuing to add items that need to be addressed. I am looking forward to your list when you finish, you got this!

[Reply](#)  (1 like)


 [Jeanine Carhart \(She/Her\)](#)

Wednesday

Thank you, Caleb. I believe you're right! I DO need to add more to my plan and I will work on that today. I appreciate your critique and value your feedback.

Thank you!

JC

[Reply](#)  (1 like)

 [Jeanine Carhart \(She/Her\)](#)

Saturday

Hi Theo,

Good job getting your project working! Your photos are clear and your attention to detail paid off, as your code and the serial monitor work and look great.

One area you might be able to make some improvement in is making sure your work can be identified easily. It would be a shame to have your efforts go to waste because your name couldn't be found on your project. You might want to add it to the very first slide and also in the Arduino code.

We both have dark photos for our actual projects but I've seen other student's projects where the photos are very clear. I think we might be able to fix that by taking our pictures in natural daylight instead of in the evening or in settings where we have to rely on house lights.

I think your plans to go back and change some things for your final project will turn out well and you'll succeed in getting that polished look you want.

My best to you!

[Reply](#) 

 [Theo Bingham](#)

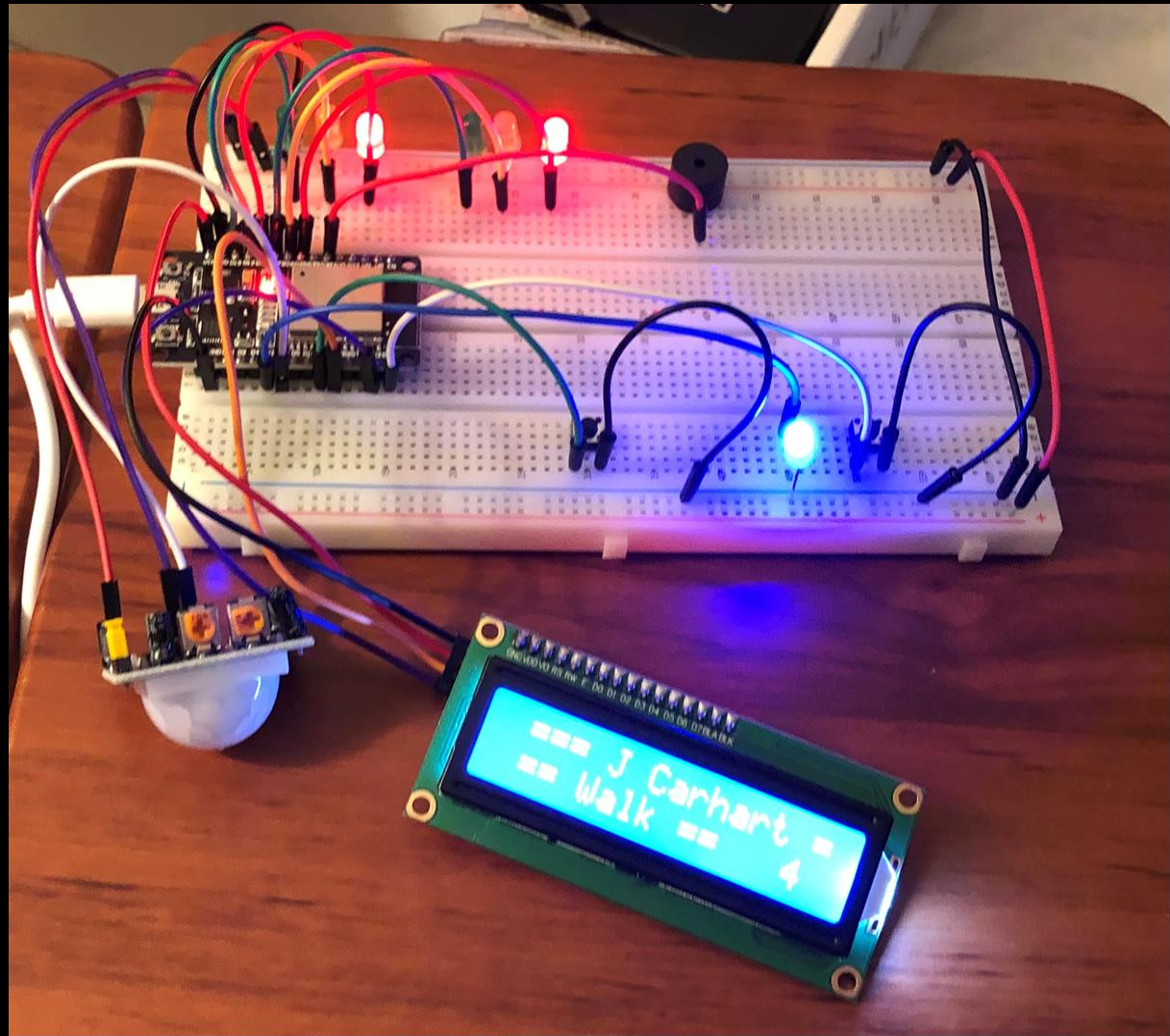
Sunday

Thanks Jeanine,

I appreciate the feedback. I agree with the pictures I actually had to retake them, believe it or not, because the first were even darker. I will definitely take into consideration about adding my name to the 1st page of the project. I was so focused on completing the project I didn't add my name to it. Again, thank you so much for your feedback.

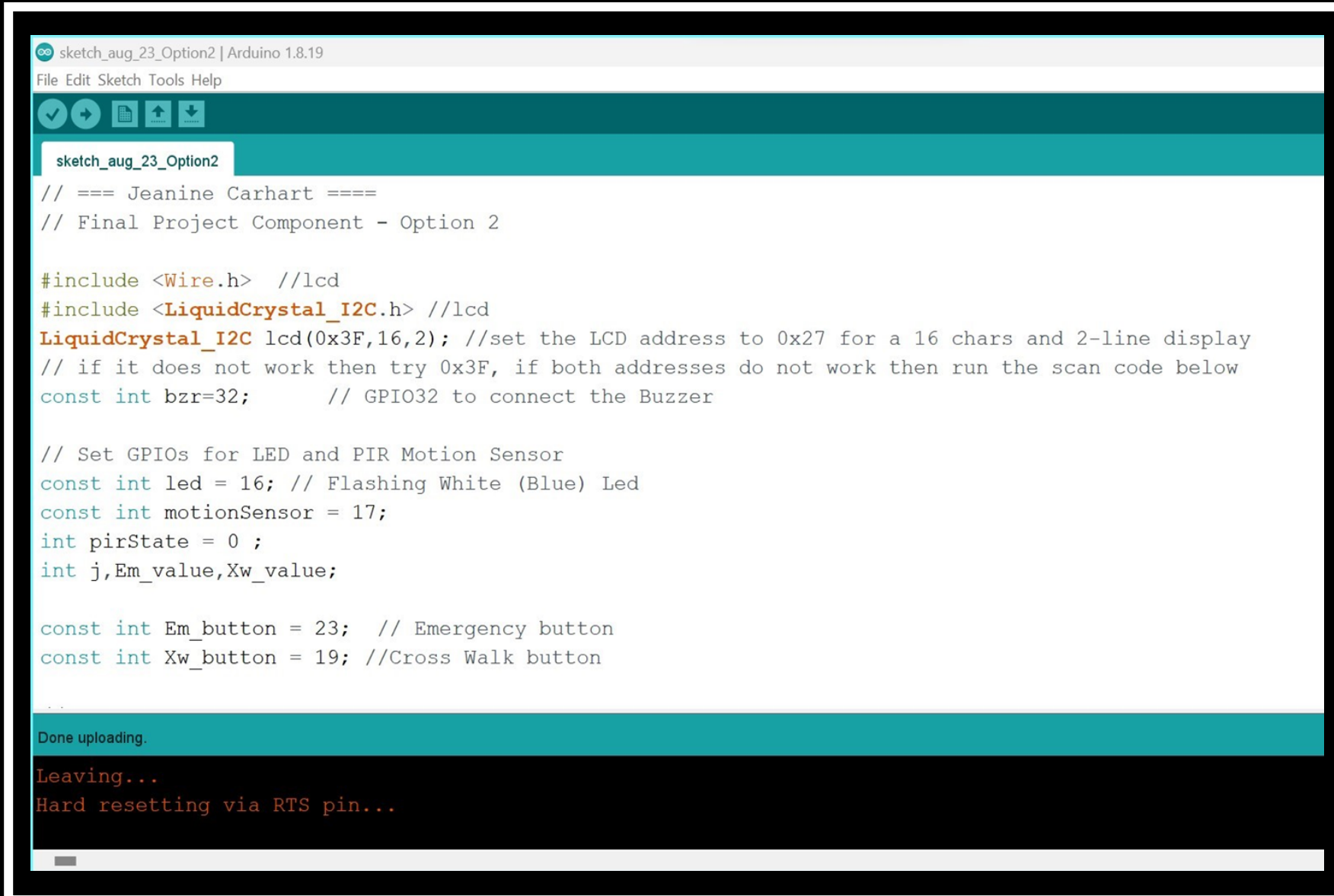
[Reply](#)  (1 like)

Circuit with working LEDs And LCD display



- ESP 32 Board
- Colored LEDs: Red, Yellow and Green (two sets)
- One Blue LED - Emergency Light
- 220 Ohm Resistors (optional)
- Push Buttons - 2
- LCD Unit
- Buzzer
- PIR Motion Sensor
- Router
- Wires
- Breadboard

Screenshot of code in Arduino IDE



```
sketch_aug_23_Option2 | Arduino 1.8.19
File Edit Sketch Tools Help

sketch_aug_23_Option2
// === Jeanine Carhart ====
// Final Project Component - Option 2

#include <Wire.h> //lcd
#include <LiquidCrystal_I2C.h> //lcd
LiquidCrystal_I2C lcd(0x3F,16,2); //set the LCD address to 0x27 for a 16 chars and 2-line display
// if it does not work then try 0x3F, if both addresses do not work then run the scan code below
const int bzc=32; // GPIO32 to connect the Buzzer

// Set GPIOs for LED and PIR Motion Sensor
const int led = 16; // Flashing White (Blue) Led
const int motionSensor = 17;
int pirState = 0 ;
int j,Em_value,Xw_value;

const int Em_button = 23; // Emergency button
const int Xw_button = 19; //Cross Walk button

...

Done uploading.
Leaving...
Hard resetting via RTS pin...
```

Screenshot of code in Arduino IDE showing your name in the comment

Screenshot of Serial Monitor in Arduino IDE

Screenshot of output in Serial Monitor

```
COM5
21:53:33.828 -> == Do Not Walk ==
21:53:34.859 -> == Do Not Walk ==
21:53:35.935 -> == Do Not Walk ==
21:53:36.962 -> == Do Not Walk ==
21:53:37.993 -> == Do Not Walk ==
21:53:39.024 -> == Do Not Walk ==
21:53:40.103 -> == Do Not Walk ==
21:53:41.133 -> == Do Not Walk ==
21:53:42.164 -> == Do Not Walk ==
21:53:43.191 -> == Do Not Walk ==
21:53:46.192 -> Count = 10 == Walk ==
21:53:47.783 -> Count = 9 == Walk ==
21:53:49.376 -> Count = 8 == Walk ==
21:53:50.973 -> Count = 7 == Walk ==
21:53:52.522 -> Count = 6 == Walk ==
21:53:54.118 -> Count = 5 == Walk ==
21:53:55.710 -> Count = 4 == Walk ==
21:53:57.254 -> Emergency button was pressed
21:54:07.317 -> == Do Not Walk ==
21:54:08.347 -> == Do Not Walk ==
21:54:09.425 -> == Do Not Walk ==
21:54:10.457 -> == Do Not Walk ==
21:54:11.492 -> == Do Not Walk ==
21:54:12.525 -> == Do Not Walk ==
21:54:13.558 -> == Do Not Walk ==
21:54:14.633 -> == Do Not Walk ==
 Autoscroll  Show timestamp
```

Challenges

Challenges

Couldn't connect breadboard to internet	Had to download drivers again
Buzzer wasn't working	Wire was plugged in wrong pin
Motion detector wasn't working	Need to warm detector slightly

Career Skills

Career Skills

✓ Problem solving

✓ Persistence

✓ Research

✓ Patience

✓ Attention to Detail

✓ Analytical Thinking

Conclusion

Conclusion

Learned how to create a device with two sets of traffic lights and how to control them for a crosswalk and an emergency light.

This project gave me a little taste of how our traffic lights are controlled in real life and how useful automation and the IoT is in our day-to-day life.