

Objective

Develop a small & portable GNSS data logger to determine the accuracy of the GPS data points.

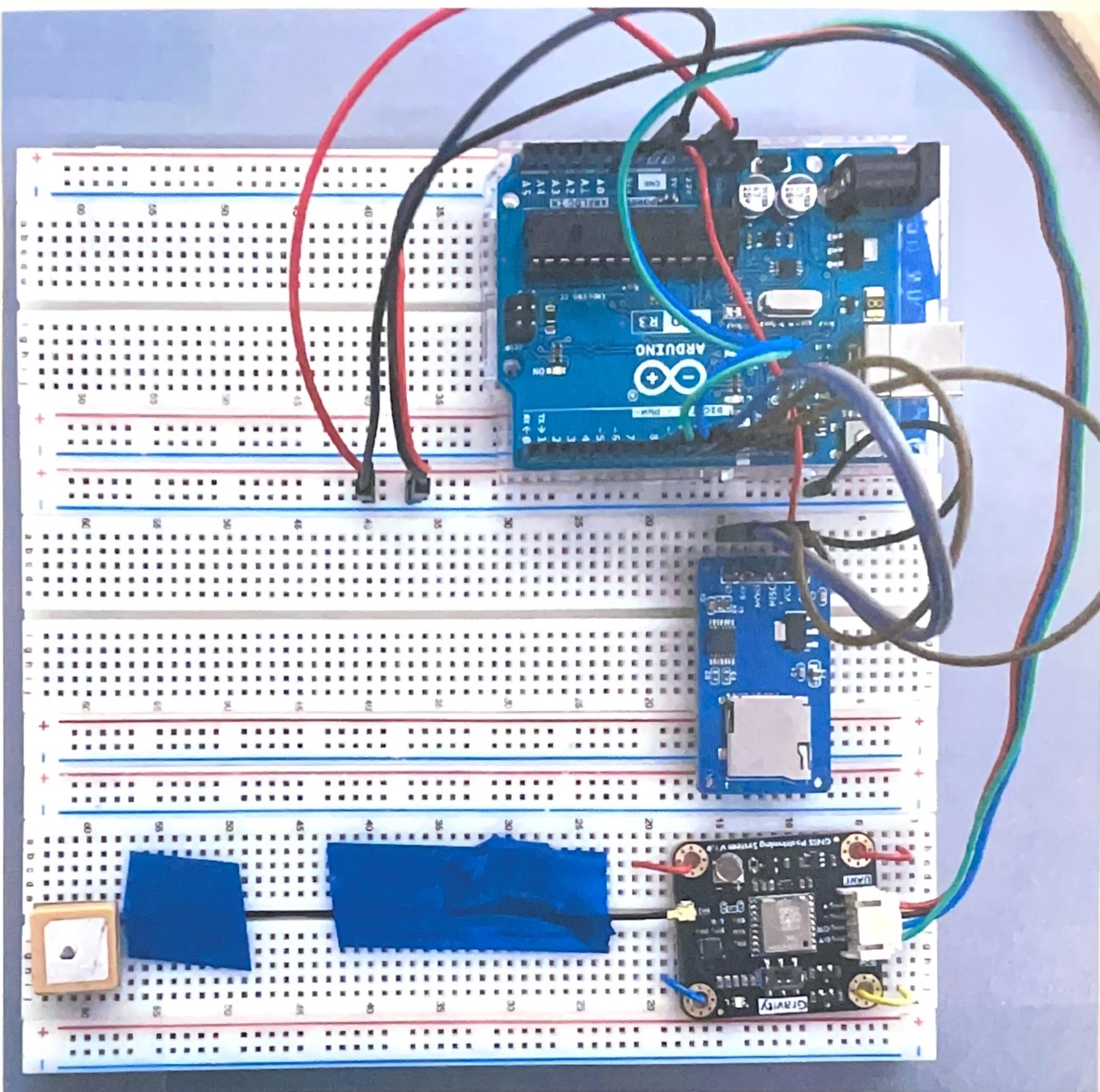
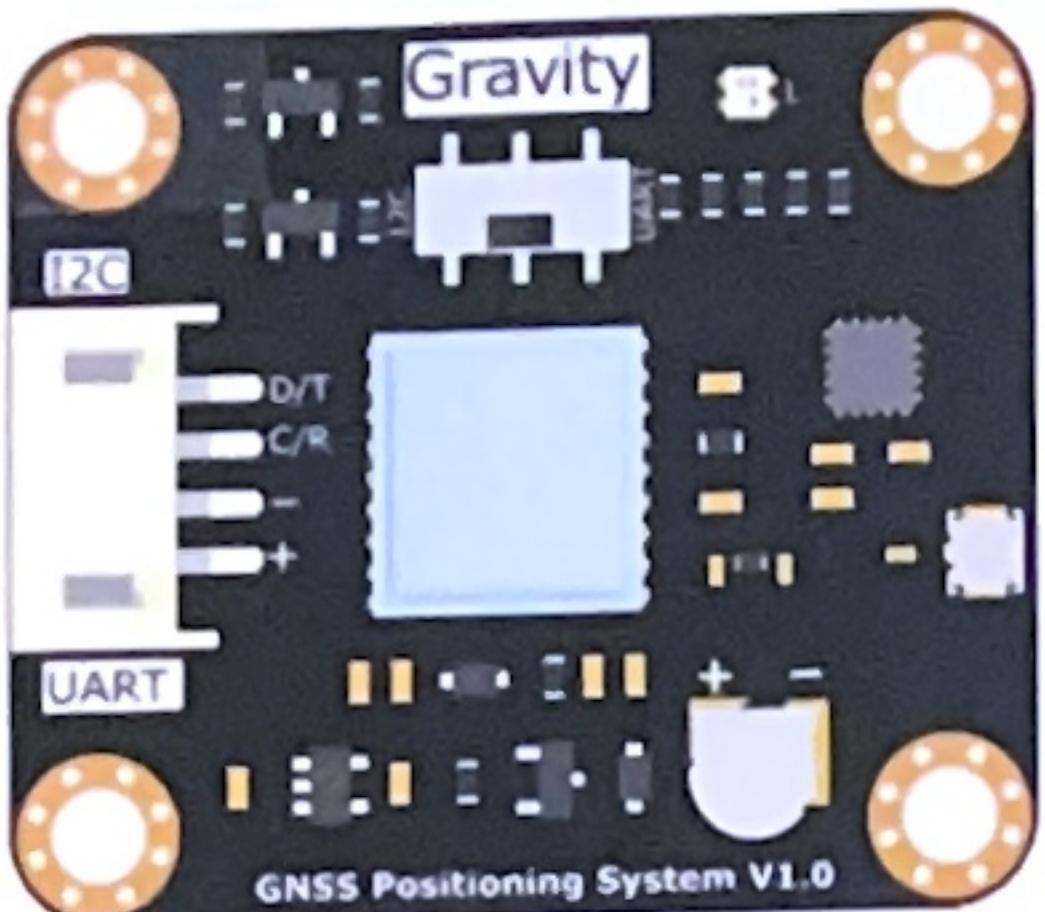


Figure 1 - Example Circuit

Here, we have an arduino uno connected to a gnss module using UART, and an SD card module using SPI.

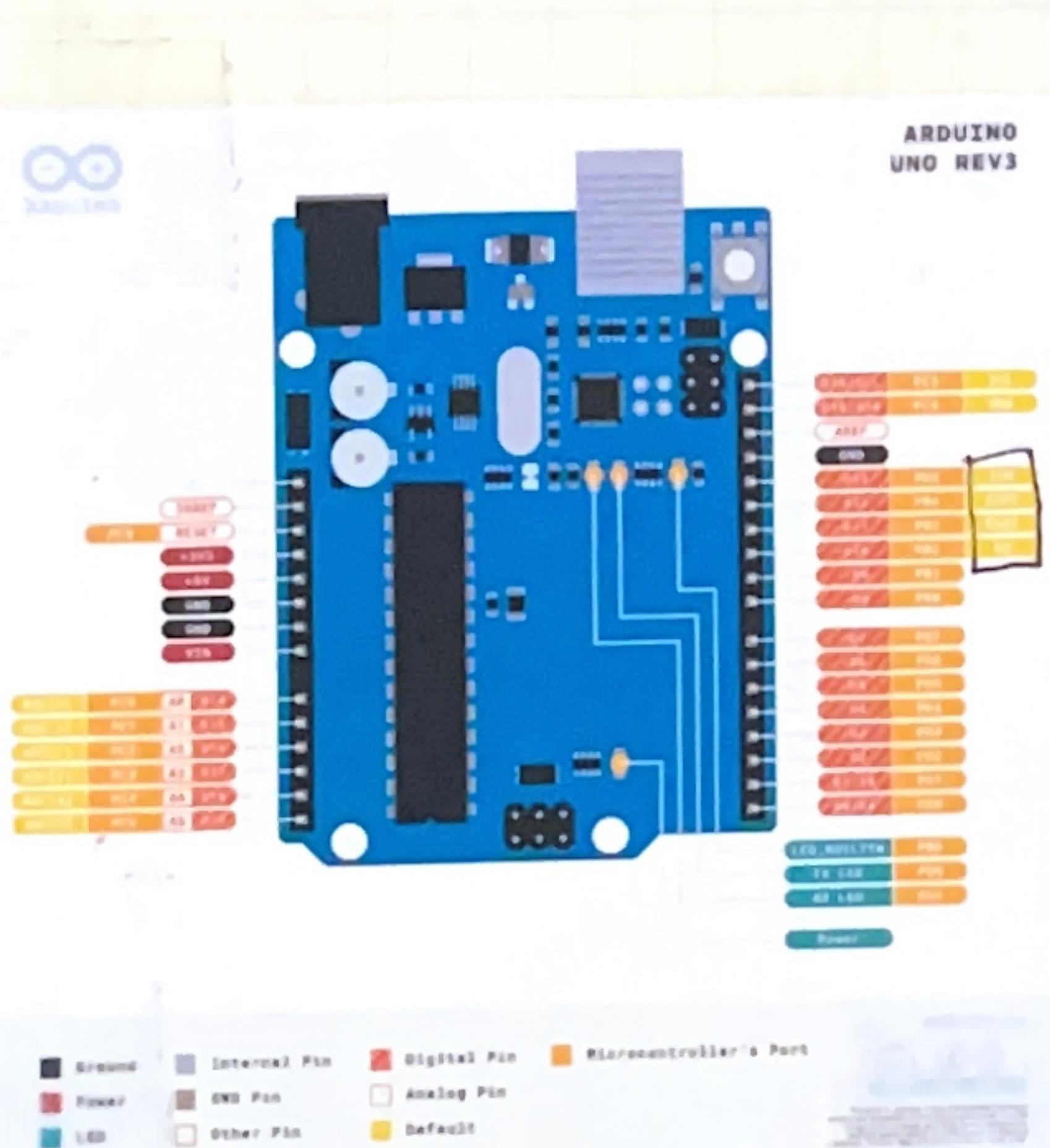
Wiring

Board Overview



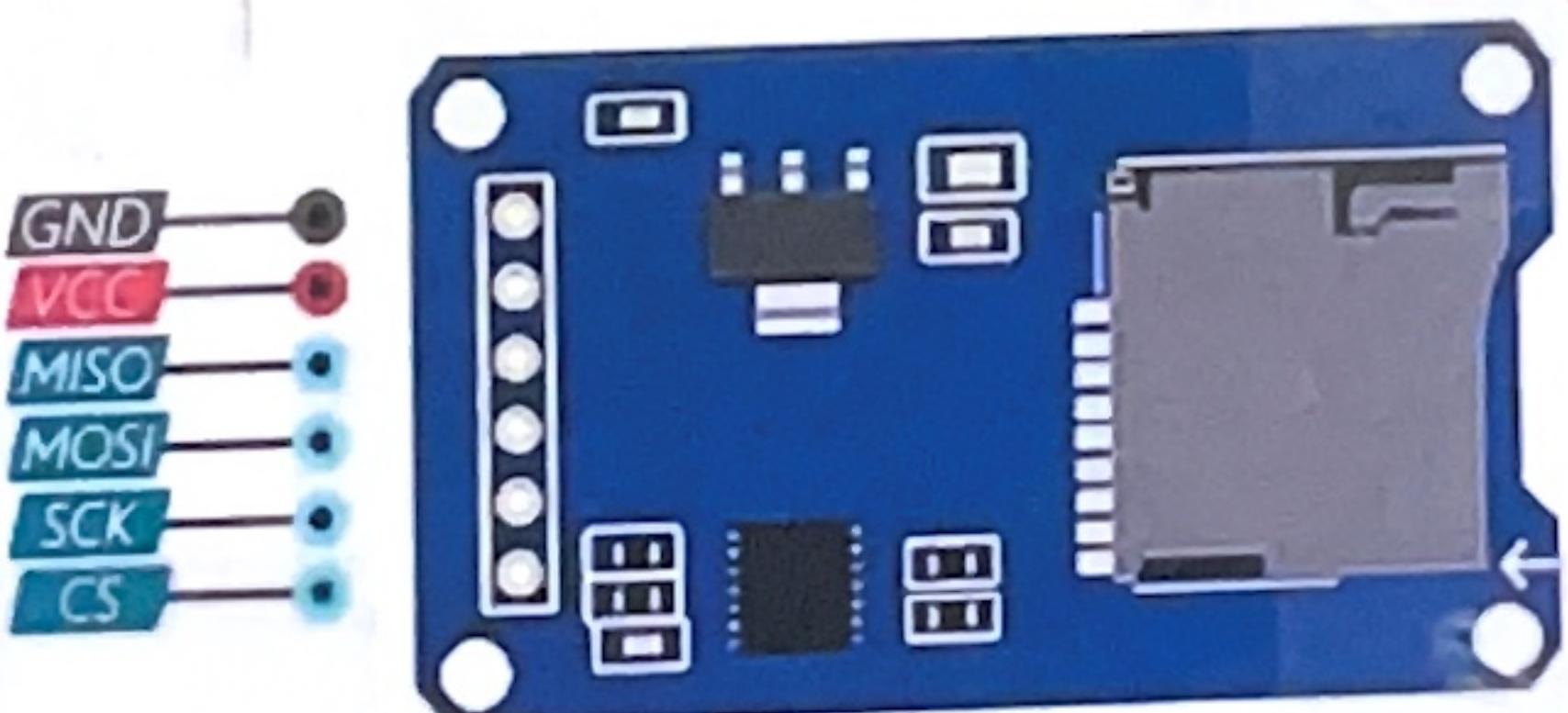
Num	Label	Description
1	D/T	I2C data line SDA/UART Data Transmitting- TX
2	C/R	I2C clock line SCL/UART Data Receiving- RX
3	-	GND
4	+	VCC

GNSS Pin	Arduino Pin
1 (Tx)	8 (Rx)
2 (Rx)	9 (Tx)



SPI pins on arduino

PIN Name	Arduino pin
MISO	10
MOSI	11
SCK	12
CS/SS	13



Plotting Data

Copy and paste data into excel.

Click the first column and press ctrl+a.

This should select all the data.

Click on "Data" → "Text to columns"

Select the "Delimited" bubble.

Click Next.

Check the comma box.

Click Finish.

Make sure each column is properly labeled.

Go to "my maps" on google and import your excel file.

Data



Figure 2 - Sitting on a bench

These points were collected in the same location, on the edge of a bench. Notice how spread out they are.



Figure 3 - in the middle of a field

Notice how these points aren't spread out as bad as the bench was. .

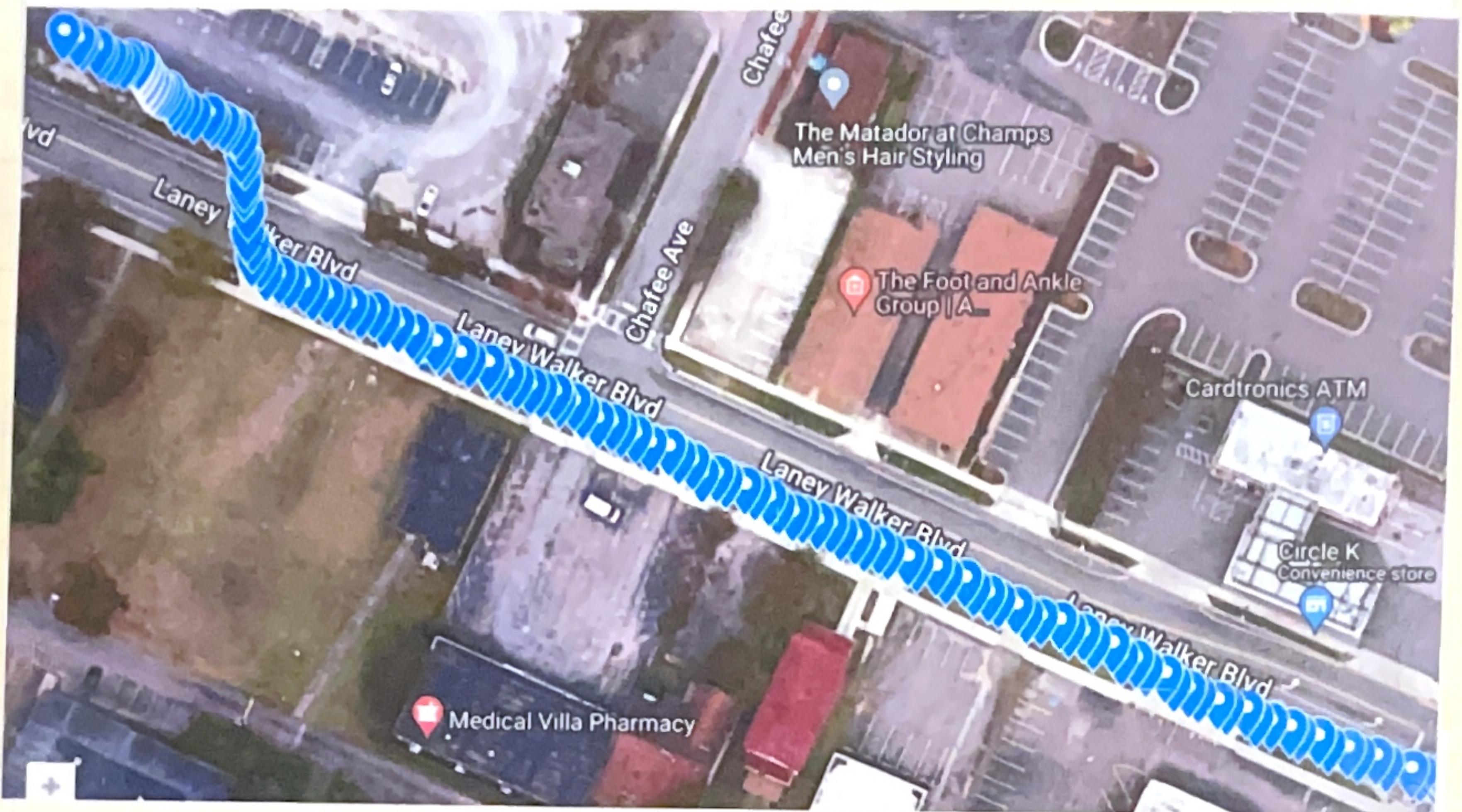


Figure 4 - on a brisk walk

These points were collected while walking on a sidewalk.



Figure 5 - another brisk walk

We experimented with a few brisk walks to try to see if they would mess up as bad as the first in Figure 2. None of the brisk walks messed up very far.



Figure 6 - A slow "robot paced" walk

After experiencing difficulties tracking the path of a robot on a side walk, we followed the same path seen in Figure 5. However, we moved very slowly. Notice how it doesn't even complete a loop.

Conclusions

After several trials similar to the ones above, we concluded that the GNSS module is best suited for a walking pace or faster. Even a leisurely stroll is slow enough to introduce inaccuracies in the GNSS module. It has consistently been unable to track slow moving objects.

Code

```

1 #include <SPI.h>
2 #include <SD.h>
3 #include <SoftwareSerial.h>
4 #include "DFRobot_GNSS.h"
5
6 SoftwareSerial mySerial(8, 9);
7 DFRobot_GNSS_UART gnss(&mySerial, 9600);
8
9 sLonLat_t currentLat;
10 sLonLat_t currentLon;
11
12 // These variables will hold our
13 // current Lat and current Lon.
14 float cLat;
15 float cLon;
16
17 // These variables will give us the
18 // direction of our cLat and cLon
19 char cLatDir;
20 char cLonDir;
21
22 uint8_t satsUsed;
23
24 uint16_t num = 1;
25
26 const int chipSelect = 10;
27

28 void setup()
29 {
30     Serial.begin(115200);
31     pinMode(chipSelect, OUTPUT);
32
33     // see if the card is present and can be initialized:
34     if (!SD.begin(chipSelect))
35     {
36         Serial.println("Card failed, or not present");
37         while (1);
38     }
39     Serial.println("card initialized.");
40
41     // Put a separator in the SD card
42     File outputfile = SD.open("data.txt", FILE_WRITE);
43     outputfile.println("=====");
44     outputfile.close();
45
46     while(!gnss.begin())
47     {
48         Serial.println("Check the gnss mode and wiring...");
49         while(1);
50     }
51     gnss.enablePower();
52     gnss.setGnss(eGPS);
53     gnss.setRgbOn();
54     Serial.println("GPS Connected!");
55 }
```

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Data Logger

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```
57 void loop()
58 {
59     // Update our Lat and Lon variables
60     currentLat = gnss.getLat();
61     currentLon = gnss.getLon();
62     satsUsed = gnss.getNumSatUsed();

63
64     if (satsUsed > 0)
65     {
66         // Turn the lat/long data into decimal degrees
67         cLat = currentLat.latitudeDegree;
68         cLon = currentLon.longitudeDegree;

69
70         // Get the cardinal direction associated with our decimal degrees.
71         // These directions are flipped in the library ???
72         cLatDir = currentLon.lonDirection;
73         cLonDir = currentLat.latDirection;

74
75         // Correct the latitude and longitude based on their cardinal directions
76         if (cLatDir == 'S')
77         {
78             cLat = -cLat;
79         }
80         if (cLonDir == 'W')
81         {
82             cLon = -cLon;
83         }
84

84
85         // Open the data file in append mode
86         File outputfile = SD.open("data.txt", FILE_WRITE);

87
88         if (outputfile)
89         {
90             outputfile.print(cLat, 6);
91             outputfile.print(", ");
92             outputfile.print(cLon, 6);
93             outputfile.print(", ");
94             outputfile.print(num);
95             outputfile.print(", test");
96             outputfile.println(", 111");
97         }
98         outputfile.close();
99         num++;
100    }
101    else
102    {
103        Serial.println("No sats yet...");
104    }
105 }
```