

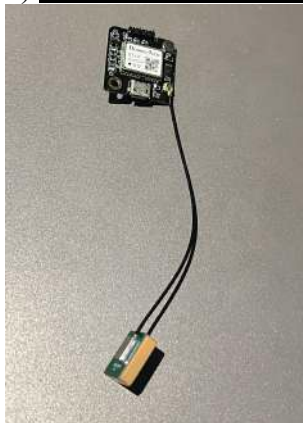
1. STATEMENT OF OBJECTIVE

Using an OLED sensor and the Serial Monitor of the Arduino Sketch IDE, the main purpose of our project is to show acceleration & magnetometer readings using the LM303 AGR on our Serial Monitor and show both GPS values for date, time, month, latitude and longitude via the OLED screen display.

2. OVERVIEW OF KEY SUBSYSTEMS

We have 4 main components for our project:

1) NEO-6M GPS MODULE SENSOR + ANTENNA



Comes with 4 PINS:

- TX = Connected to the TX of the Arduino MEGA 2560
- RX = Connected to the RX of the Arduino MEGA 2560
- GND = Connected to the GND of the Arduino MEGA 2560
- VCC = Connected to the 5V of the Arduino MEGA 2560

Useful for identifying location using commands such as

- `gps.location.lat()` - fetching the latitude of a place
- `gps.location.lng()` - fetching the longitude of a place

Useful for identifying time of a place using commands such as

- `gps.time.hour()`; - fetching hour
- `gps.time.minute()`; - fetching minute
- `gps.time.second()`; - fetching second

Useful for identifying date of a place using commands such as

- `gps.date.day()`; - fetching day
- `gps.date.month()`; - fetching month
- `gps.date.year()`; - fetching year

All these data is parsed through the TinyGPSPlus Library which is useful in parsing NMEA sentences into usable GPS data such as latitudes, longitudes, and time.

2) SSD1306 OLED 128*64 display AGR



Comes with 5 PINS used only 4:

- GND = Connected to the GND of the Arduino MEGA 2560 and NEO-6M GPS
- SCL = Connected to SCL21 of the Arduino MEGA 2560
- SDA = Connected to the SDA20 of the Arduino MEGA 2560
- VCC = Connected to the 5V of the Arduino MEGA 2560

Useful for displaying content using commands such as

- `display.print(gps.location.lat(), 6);`
- - For displaying the latitude of a place in 6 significant figures
- `display.print (gps.location.lng(), 6);`
- - For displaying the longitude of a place in 6 significant figures

Instantiated using the code:

```
Adafruit_SSD1306 display(horizontalPixels,verticalPixels,&Wire,reset);
```

Where:

horizontalPixels is a constant that defines the screen width in pixels

verticalPixels is a constant that defines the screen height in pixels

reset pin = set to -1 because device didn't come with a reset pin

This code declares all the parameters according to the device used. Further explanations commented on the attached Arduino Code.

3) LM303AGR



Comes with 5 PINS used only 4:

- GND = Connected to the GND of the Arduino MEGA 2560 and NEO-6M GPS
- SCL = Connected to SCL21 of the Arduino MEGA 2560
- SDA = Connected to the SDA20 of the Arduino MEGA 2560
- 3V = Connected to the 3.3V of the Arduino MEGA 2560

Instantiated using the code:

```
Adafruit_LSM303_Accel_Unified accel = Adafruit_LSM303_Accel_Unified(12345);
```

Where 12345 is just a unique Serial ID number to identify it, i.e., could have used any other number and still work.

Useful for fetching readings from its in-built accelerometer & magnetometer using commands such as:

```
sensors_event_t a, m;  
accel.getEvent(&a);
```

The following commands print the readings to the Serial Monitor after being fetched by the LM303AGR:

```
Serial.print("Accelerometer ");  
Serial.print("X: "); Serial.print(a.acceleration.x, 1); Serial.print(" m/s^2, ");  
Serial.print("Y: "); Serial.print(a.acceleration.y, 1); Serial.print(" m/s^2, ");  
Serial.print("Z: "); Serial.print(a.acceleration.z, 1); Serial.println(" m/s^2");
```

4) **ARDUINO MEGA2560 BOARD**



Used for interfacing all of the other components and obtaining power through the USB cable connected from it to the laptop:

Connections made to this board include:

SDA 20 = Connected to the SDA ports of LM303AGR and OLED display

SCL 21 = Connected to the SCL ports of LM303AGR and OLED display

RX1 19 = Connected to RX port of NEO-6M GPS module

TX1 18 = Connected to TX port of NEO-6M GPS module

3.3V = Connected to 3V of LM303AGR

5V = Connected to VCC of NEO-6M GPS module and SSD1306

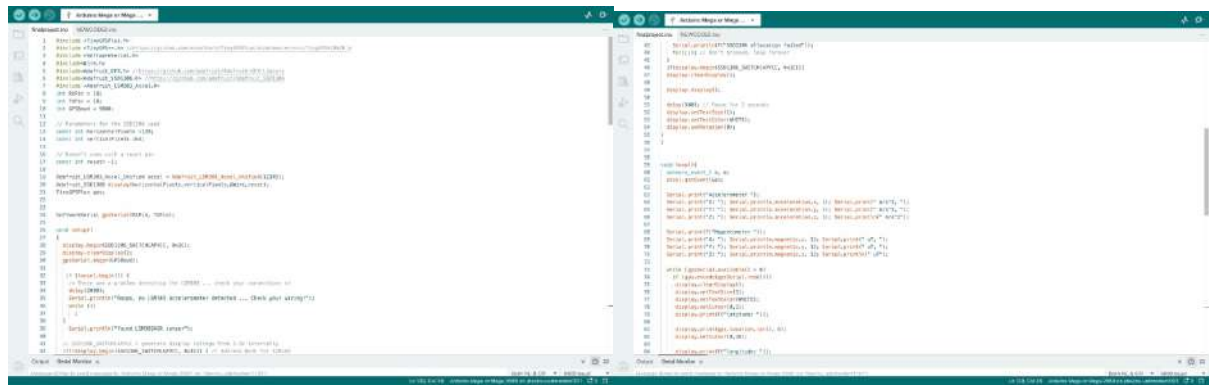
GND = Connected to GND of all other components

3. EXPLANATION OF ARDUINO CODES

CITATIONS:

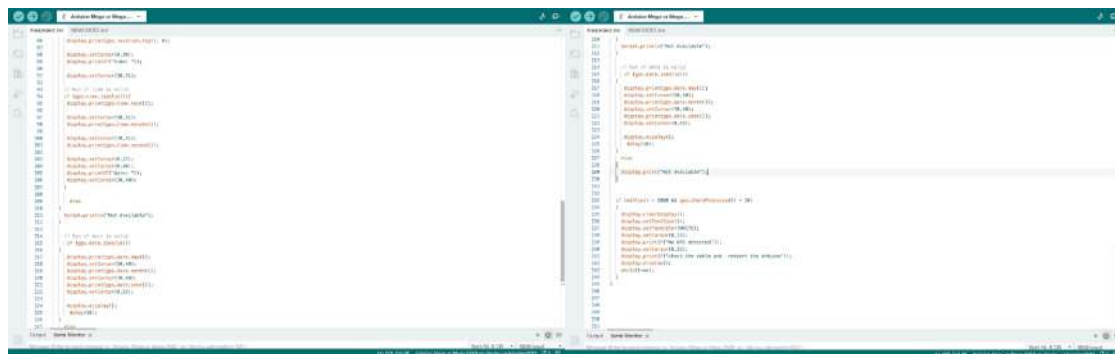
JimS111, 15 Feb. <https://forum.arduino.cc/t/lsm303agr-and-oled-fluctuating-compass/1089524/10>

Ghoziizg, July 13, 2022. <https://www.hackster.io/ghoziizg/display-gps-neo-6m-data-to-oled-eb071b>



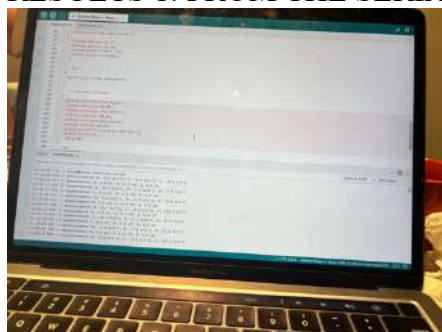
First 2 Images above outline codes that define constants, declares public methods for all the components, and initially setups the schematics for the entire process using the pre-determined GPS baud rate of the device, 9600Hz. Also set the RX pins and the TX pins to 19 & 18 respectively based off the placement of the wires in the AT2560

It also starts reading GPS data along from the line 73, and setups the display window for the outputs in the subsequent lines.

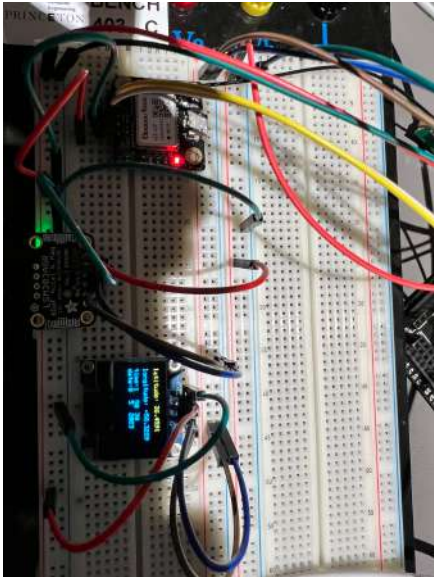


Last 2 Images above outline that first checks whether the GPS data is valid before printing the data to OLED displays. This is important to avoid printing wrong data to the output. Lines 133 – onwards also help in avoiding a similar issue by ensuring that if the GPS data is not shown within the first 5 seconds, then the error, “No GPS detected” should be displayed.

RESULTS 1: FROM THE SERIAL MONITOR



RESULTS 2: FROM THE OLED DISPLAY



CIRCUIT:

