

Soldier Health Monitoring and Position Tracking System

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I N T R O D U C T I O N

- In today's era, enemy warfare is an important factor in any nation's security.
- The national security mainly depends on **Army**, **Navy** and **Air-Force**. The important and vital role is played by the soldiers.
- So, to support this technological idea, in this project I have come up with a system which will track soldiers position as well as give their health status during a operation/mission.
- This system in particular will be useful for individuals, who involve in missions or in special operations.

O B J E C T I V E

- To track the location and monitor the health of the soldier in real time, who get lost and injured in the battlefield, and also to minimize the time of search and rescue operation efforts of army control unit.

A P P L I C A T I O N S

D E F E N C E F O R C E S

The project can be implemented in battlefield or high altitude areas where health and location of soldiers is the most basic information which should be known to the control room.

C I V I L I A N S

This project can also be utilized by individuals who work in remote areas or high altitudes wherein the most basic information should be known to someone dear to them or their guardian's.

PROGRESS SCHEDULE

SEPTEMBER 24, 2020

DESIGNING

Designing of the model based on the objective.

SEPTEMBER 28, 2020

SIMULATION

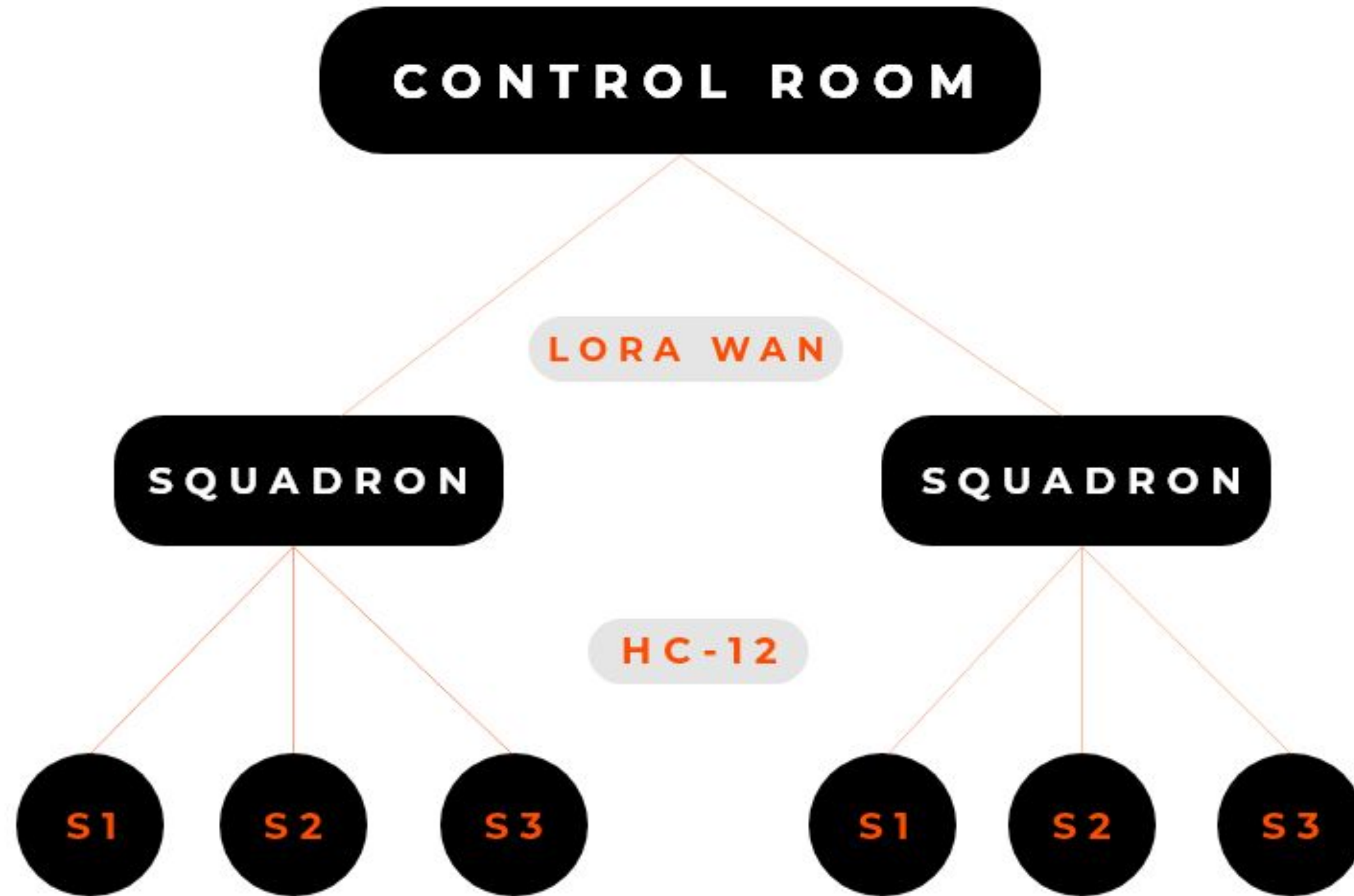
Simulation of project based on the first drafted design and simultaneously simulating every individual components ordered.

OCTOBER 03, 2020

HARDWARE IMPLEMENTATION

Implementing the first part/section of the project with hardware components acquired.

DESIGNING



S1,S2,S3 - Soldiers

Soldiers are the key player that play a role in the whole system – they are equipped with multiple sensors ..i.e. Temp sensor (LM-35), Pulse sensor (RC-A-4015), GPS sensor (Neo-6M), RF transmitter (HC-12) and an Arduino UNO.



Squadron Leader

Squadron leader is placed at level 2, so that information is received to him before it is received to the control room, as to take action a bit earlier if some mishap occurs. The squadron leader would also be equipped with sensors ..i.e. RF receiver (HC-12), Temp sensor (LM-35), LoRa WAN transmitter (SX-1278) and an Arduino UNO.



Control Room

This is level 3, where all the information received through the LoRa WAN (SX-1278) is stored in a place.

SIMULATION

Temp Sensor (LM-35)

LM-35 is a precision Integrated circuit Temperature sensor, whose output voltage varies, based on the temperature around it. It is a small and cheap IC which can be used to measure temperature anywhere between -55°C to 150°C .



Pulse Sensor (RC-A-4015)

A pulse wave is the change in the volume of a blood vessel that occurs when the heart pumps blood, and a detector that monitors this volume change is called a pulse sensor. RC-A-4015 does the same work by using a led, which emits light and simultaneously receives the emitted light and accordingly processes the light to provide an analog value of the heartbeat.



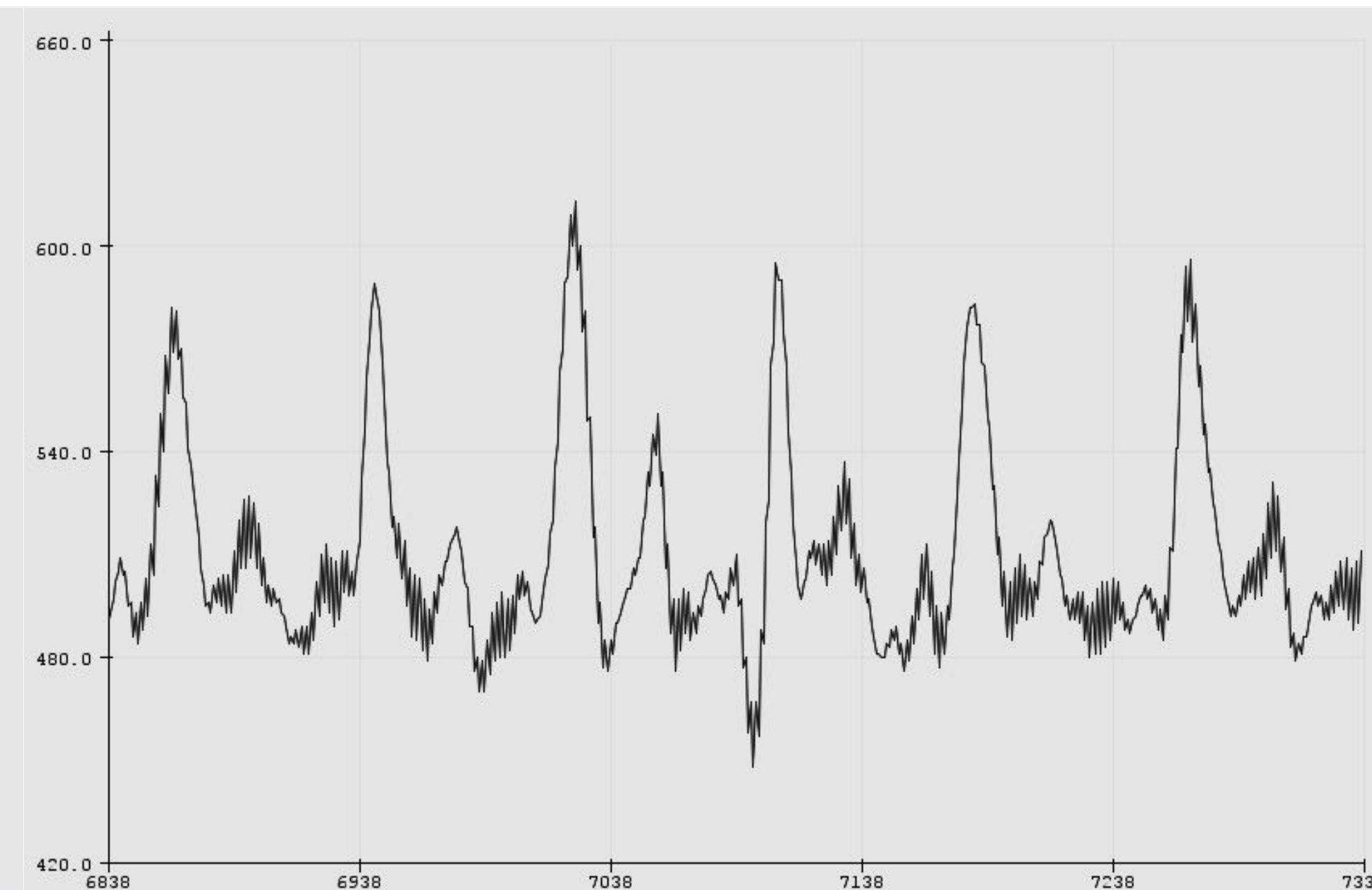
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26.1	78.9
28.6	83.4
25.1	77.1
21.9	71.4
24.8	76.6
21.7	71.0
25.0	77.0
21.9	71.4
24.5	76.1
21.4	70.5
18.7	65.6
21.1	69.9
18.5	65.3
19.9	67.8
17.4	63.3

LM-35

TEMPERATURE = 20.04C	68.07F
BPM: 77	
TEMPERATURE = 26.87C	80.37F
BPM: 69	
TEMPERATURE = 26.39C	79.50F
BPM: 63	
TEMPERATURE = 26.87C	80.37F
BPM: 61	
TEMPERATURE = 14.18C	57.52F
TEMPERATURE = 18.09C	64.55F
BPM: 53	
TEMPERATURE = 17.60C	63.68F
BPM: 49	
TEMPERATURE = 24.43C	75.98F
BPM: 50	
TEMPERATURE = 27.36C	81.25F
BPM: 51	
TEMPERATURE = 26.87C	80.37F
BPM: 52	
TEMPERATURE = 26.39C	79.50F
BPM: 56	

(LM-35) + (RC-A-4015)

```
♥ A HeartBeat Happened !  
BPM: 90  
♥ A HeartBeat Happened !  
BPM: 82  
♥ A HeartBeat Happened !  
BPM: 77  
♥ A HeartBeat Happened !  
BPM: 78  
♥ A HeartBeat Happened !  
BPM: 75  
♥ A HeartBeat Happened !  
BPM: 78  
♥ A HeartBeat Happened !  
BPM: 77  
♥ A HeartBeat Happened !  
BPM: 76  
♥ A HeartBeat Happened !  
BPM: 76  
♥ A HeartBeat Happened !  
BPM: 75  
♥ A HeartBeat Happened !  
BPM: 73  
♥ A HeartBeat Happened !  
BPM: 74  
♥ A HeartBeat Happened !  
BPM: 74  
♥ A HeartBeat Happened !  
BPM: 73  
♥ A HeartBeat Happened !  
BPM: 73
```



RC-A-4015

SIMULATION

GPS Sensor (Neo-6M)

GPS sensors are receivers with antennas that use a satellite-based navigation system with a network of 24 satellites in orbit around the earth to provide position, velocity, and timing information.



RF Sensor (HC-12)

The HC-12 is a half-duplex wireless serial communication module with 100 channels in the 433.4-473.0 MHz range that is capable of transmitting up to 1 km.



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Neo-6M (NMEA Data)

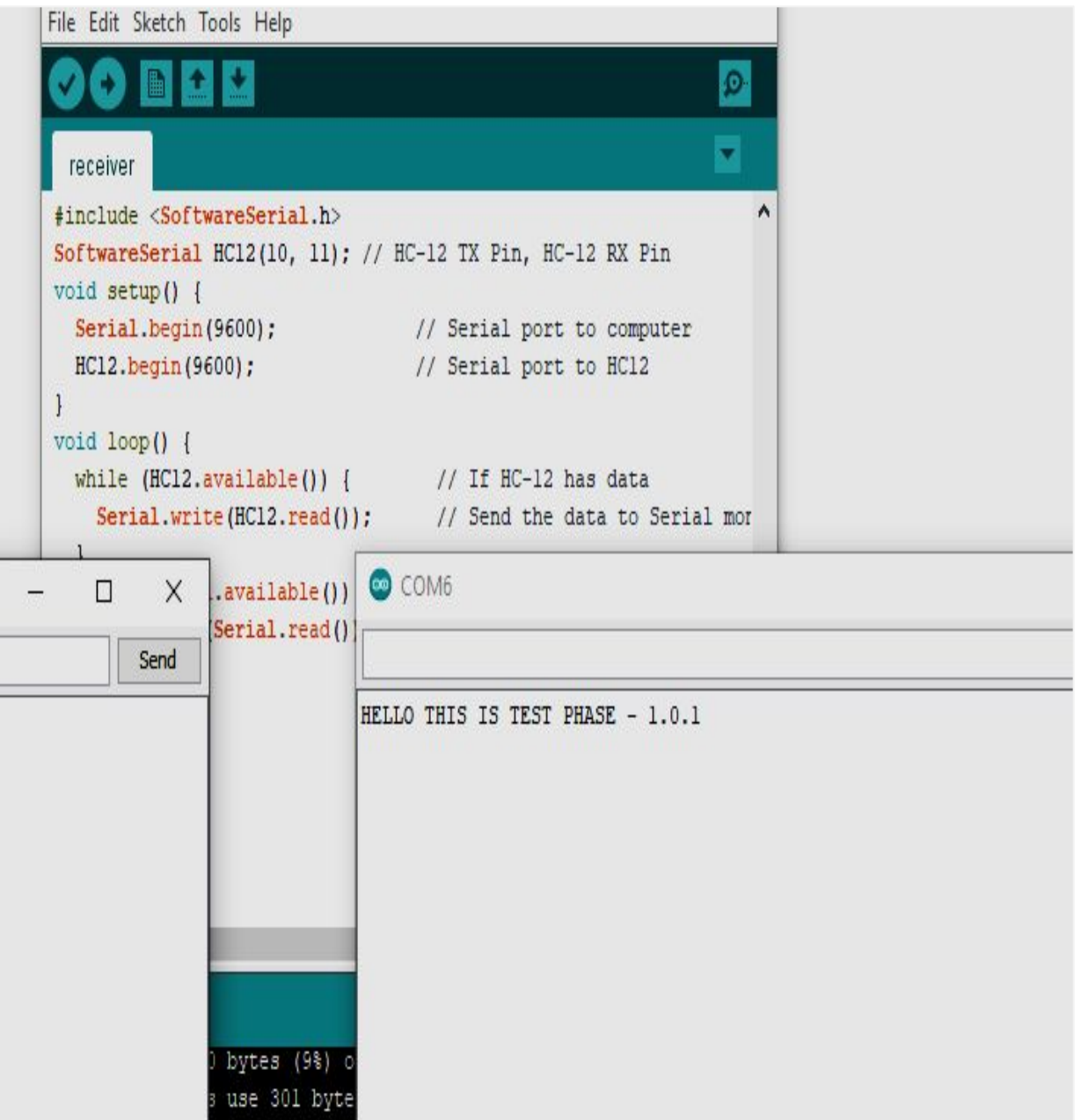
```
#include <SoftwareSerial.h>
SoftwareSerial HC12(10, 11); // HC-12 TX Pin, HC-12 RX Pin

void setup() {
    Serial.begin(9600);           // Serial port to computer
    HC12.begin(9600);             // Serial port to HC12
}

void loop() {
    while (HC12.available())      // If HC-12 has data
    {
        Serial.write(HC12.read()); // Send the data to Serial monitor
    }
    while (Serial.available())    // If Serial monitor has data
    {
        HC12.write(Serial.read()); // Send that data to HC-12
    }
}
```

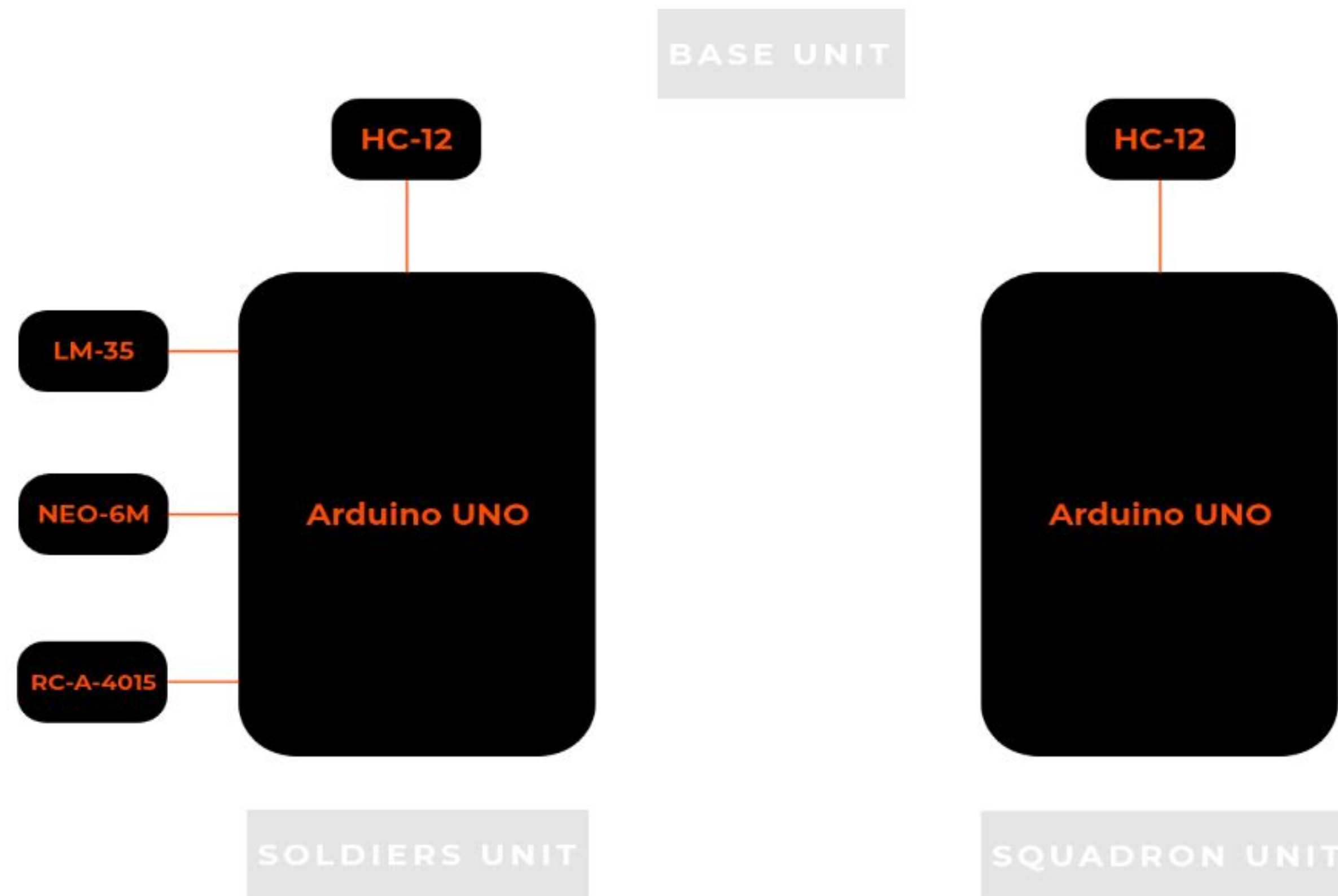
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Location:	18.596075, 73.900329	Date	9/30/2020
Location:	18.596075, 73.900329	Date	9/30/2020
Location:	18.596073, 73.900329	Date	9/30/2020
Location:	18.596073, 73.900329	Date	9/30/2020
Location:	18.596073, 73.900329	Date	9/30/2020
Location:	18.596073, 73.900329	Date	9/30/2020

Neo-6M(Lat,Lon and Date Data)



HC-12 (Transmitter and Receiver)

HARDWARE IMPLEMENTATION



Block diagram

Soldiers unit (Health and Position data) → Squadron unit

HARDWARE IMPLEMENTATION

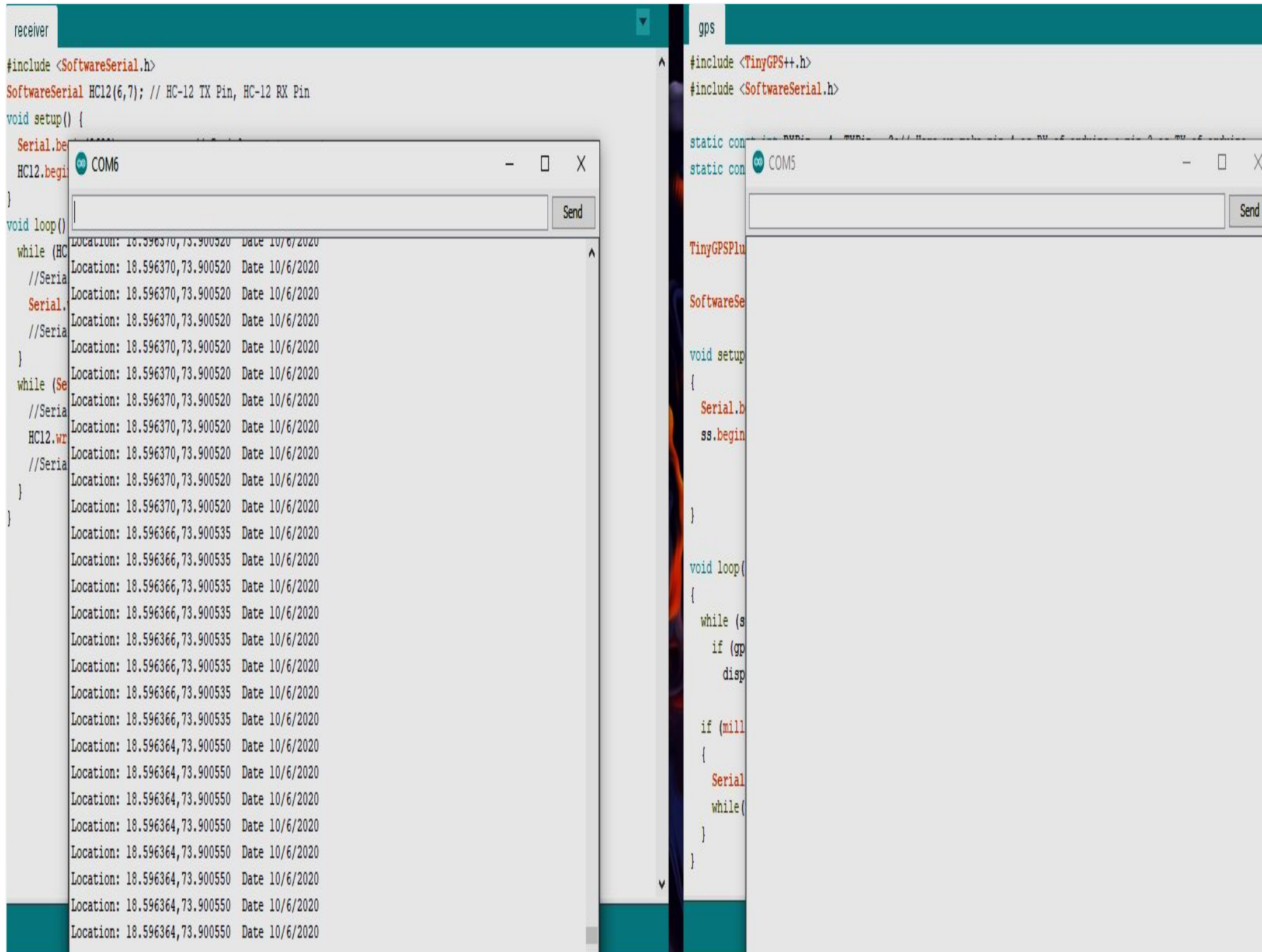
- Successfully implemented with the base level of the project ..i.e. sending the data collected from the soldiers S-Health system that comprises (Temp sensor, Pulse sensor, GPS sensor, HC-12 transmitter and Arduino UNO) to the squadron leader unit that has the HC-12 receiver.

The screenshot shows the Arduino IDE with a sketch named 'receiver'. The code includes `<SoftwareSerial.h>` and initializes a `SoftwareSerial` object `HC12` on pins 6 and 7. The `setup` function configures the serial port to 9600 baud for both the computer and the HC12 module. The `loop` function checks if data is available from the HC12 and prints it to the serial monitor. The serial monitor (COM5) displays a continuous stream of temperature readings in Celsius, such as 'Temp sensor: 19 °C', 'Temp sensor: 20 °C', etc. A second sketch, 'gps_test_integ', is also visible in the background.

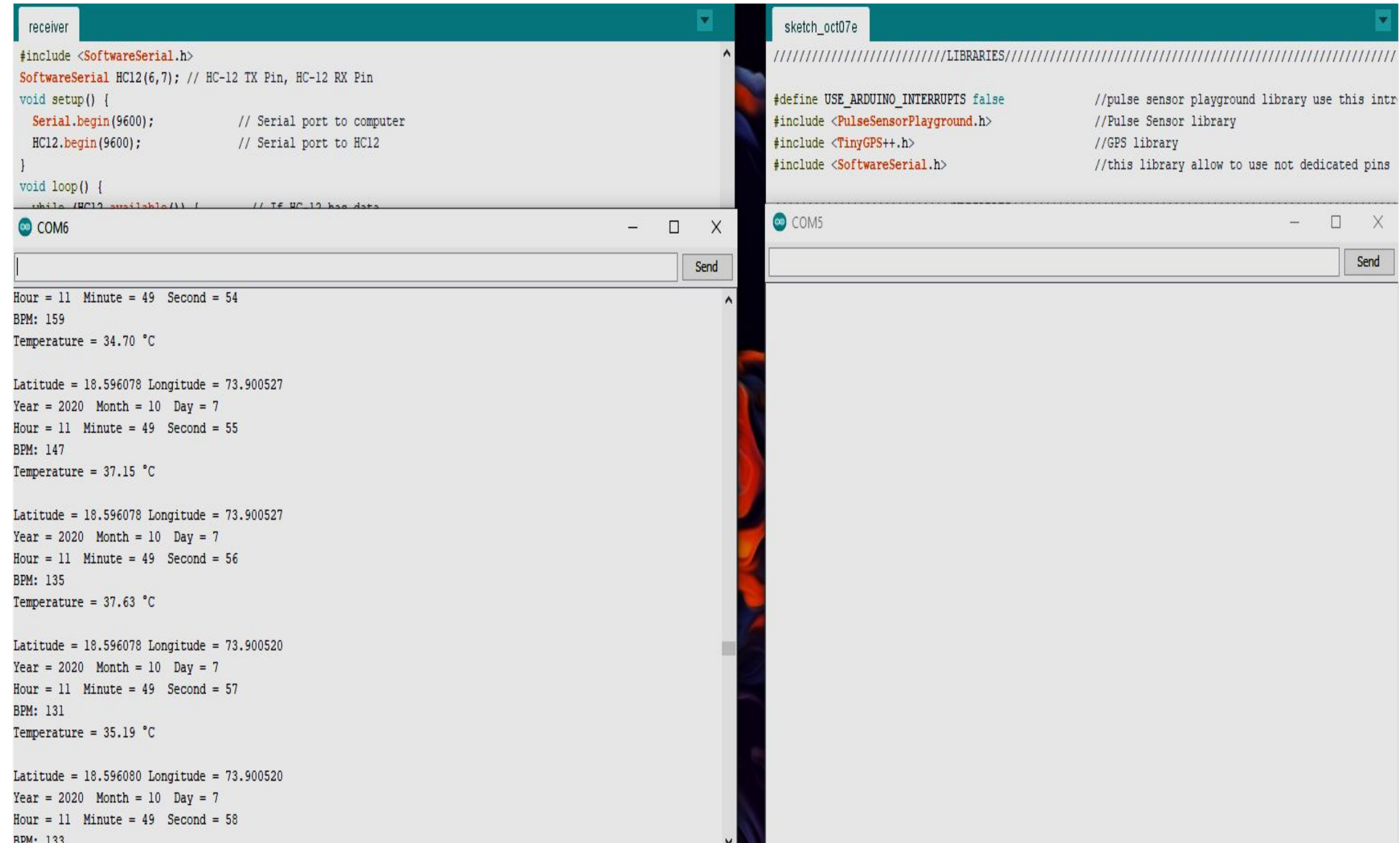
LM-35 and HC-12 Integrated

The screenshot shows the Arduino IDE with a sketch named 'pulse_and_hc-12_integrated'. The code includes `<SoftwareSerial.h>` and `<PulseSensorPlayground.h>`. It defines `USE_ARDUINO_INTERRUPTS` as `true` and includes the `PulseSensorPlayground` library. The `setup` function initializes the `SoftwareSerial` object `HC12` and the `PulseSensor` object. The `loop` function reads data from the HC12 and prints it to the serial monitor. The serial monitor (COM5) displays a continuous stream of heart rate (BPM) readings, such as 'BPM: 72', 'BPM: 72', 'BPM: 48', etc. A second sketch, 'gps_test_integ', is also visible in the background.

RC-A-4015 and HC-12 Integrated

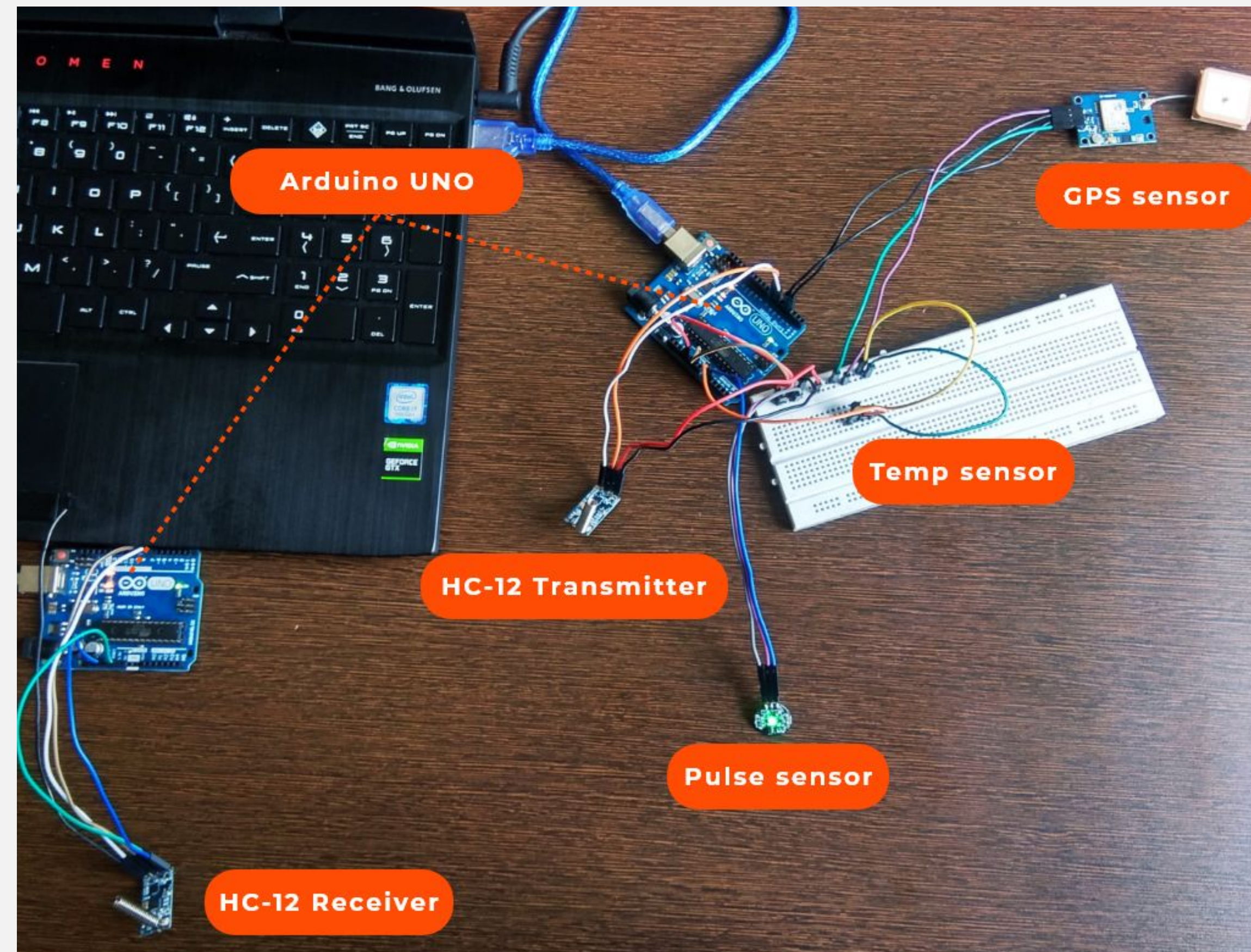


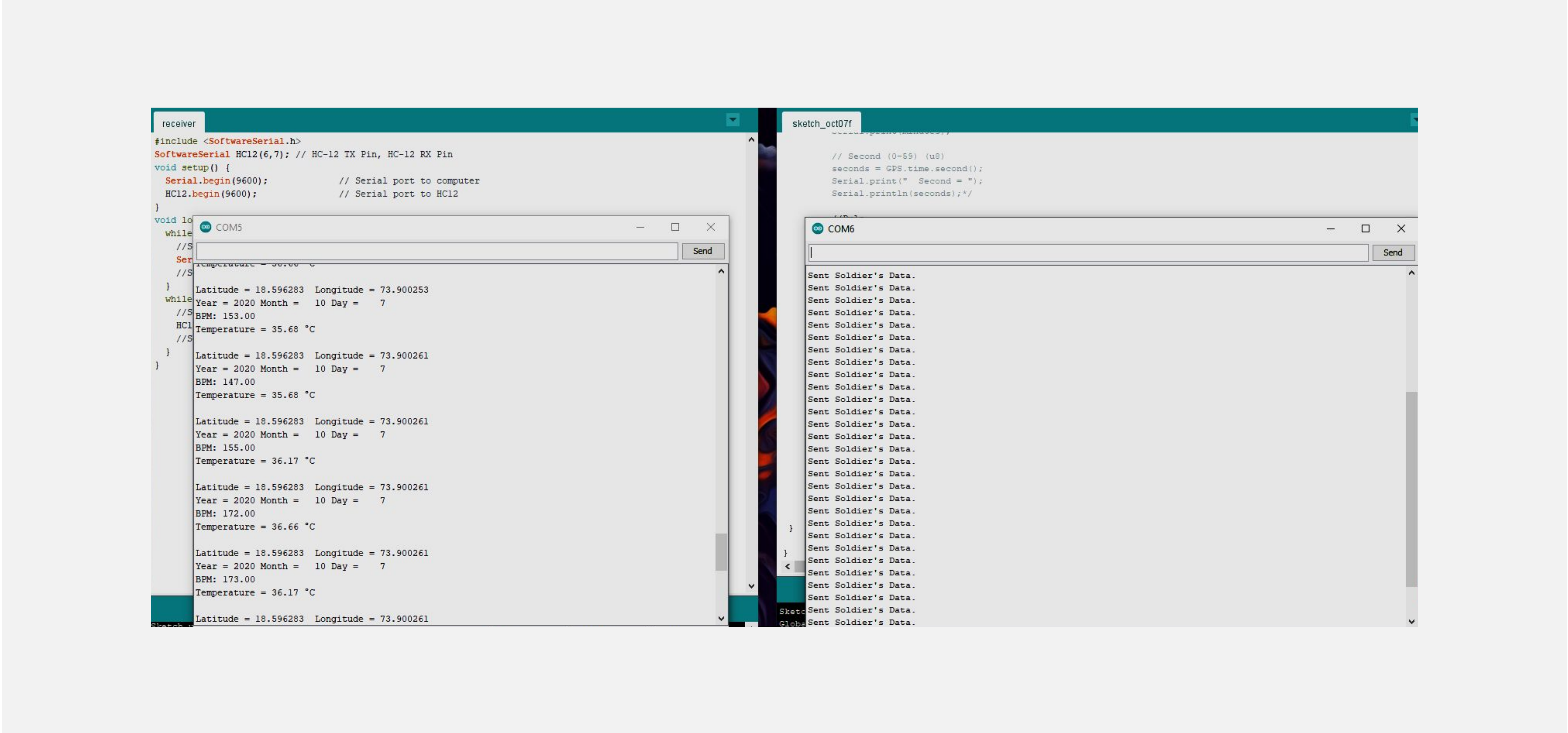
NEO-6M and HC-12 Integrated



LM-35, RC-A-4015 and NEO-6M Integrated

HARDWARE IMPLEMENTATION

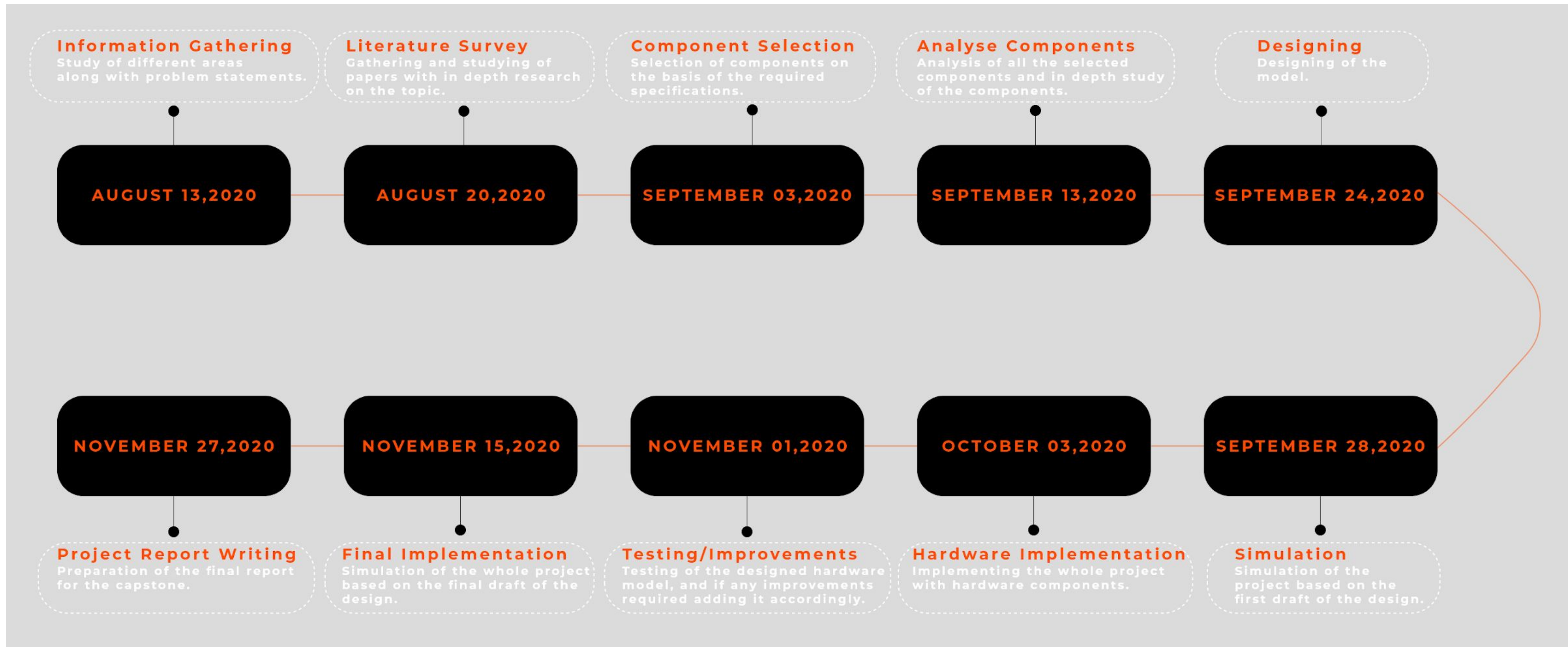




R E S U L T

- ▶ Successfully designed a model that meets the requirement of our objective.
- ▶ Successfully simulated all the acquired components.
- ▶ Successfully simulated the base level of the design..i.e. sending the data collected from the soldiers S-Health system to the squadron's unit through RF module(HC-12).

PROJECT SCHEDULE



REFERENCES

- Hock Beng Lim, Di Ma, Bang Wang, Zbigniew Kalbarczyk, Ravishankar K. Iyer, Kenneth L. Watkin (2010); “A Soldier Health Monitoring System for Military Applications”.
- William Walker, A. L. Praveen Aroul, Dinesh Bhatia; “Mobile health monitoring system”.
- Shweta Shelar, Nikhil Patil, Manish Jain, Sayali Chaudhari, Smita Hande; “Soldier Tracking And Health Monitoring Systems”.
- P.S. Kurhe, S.S. Agrawal (2013); “Real Time Tracking and Health Monitoring System of Remote Soldier Using ARM 7”.
- www.allaboutcircuits.com/projects/understanding-and-implementing-the-hc-12-wireless-transceiver-module

THANK YOU

ANY QUESTIONS ?