Soldier Health Monitoring and Position Tracking System

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INTRODUCTION

- 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.

OBJECTIVE

- 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.

APPLICATIONS

DEFENCE FORCES

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

CIVILIANS

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

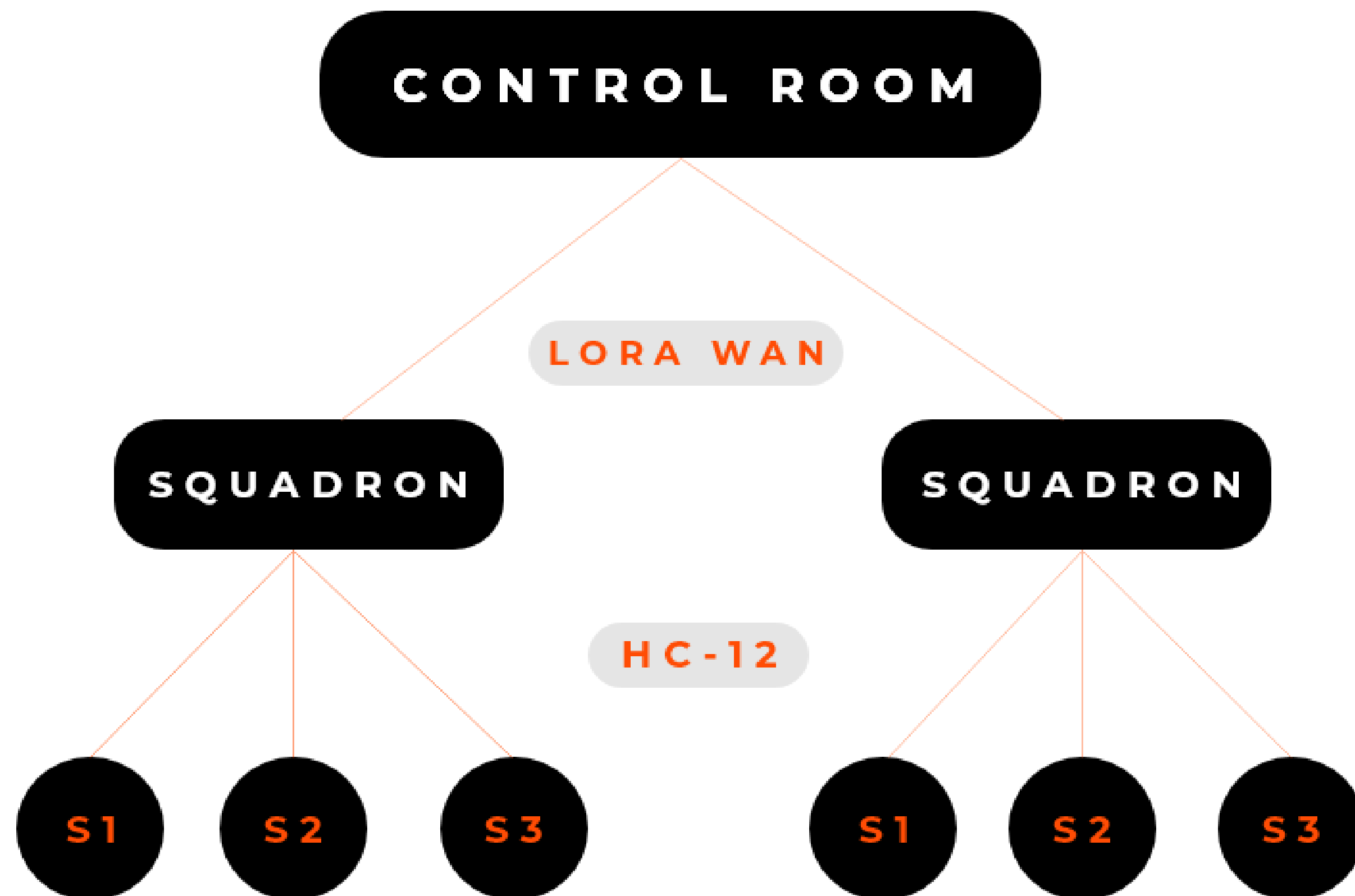Designing of the model based on the objective.

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.

S I M U L A T I O N

Temp Sensor (LM-35)

LM-35 is a precession 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.
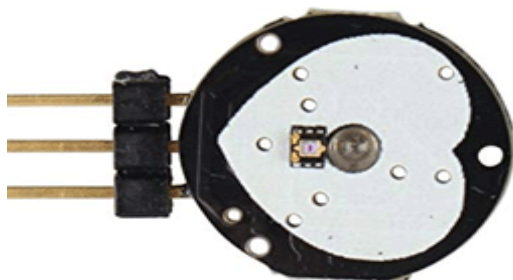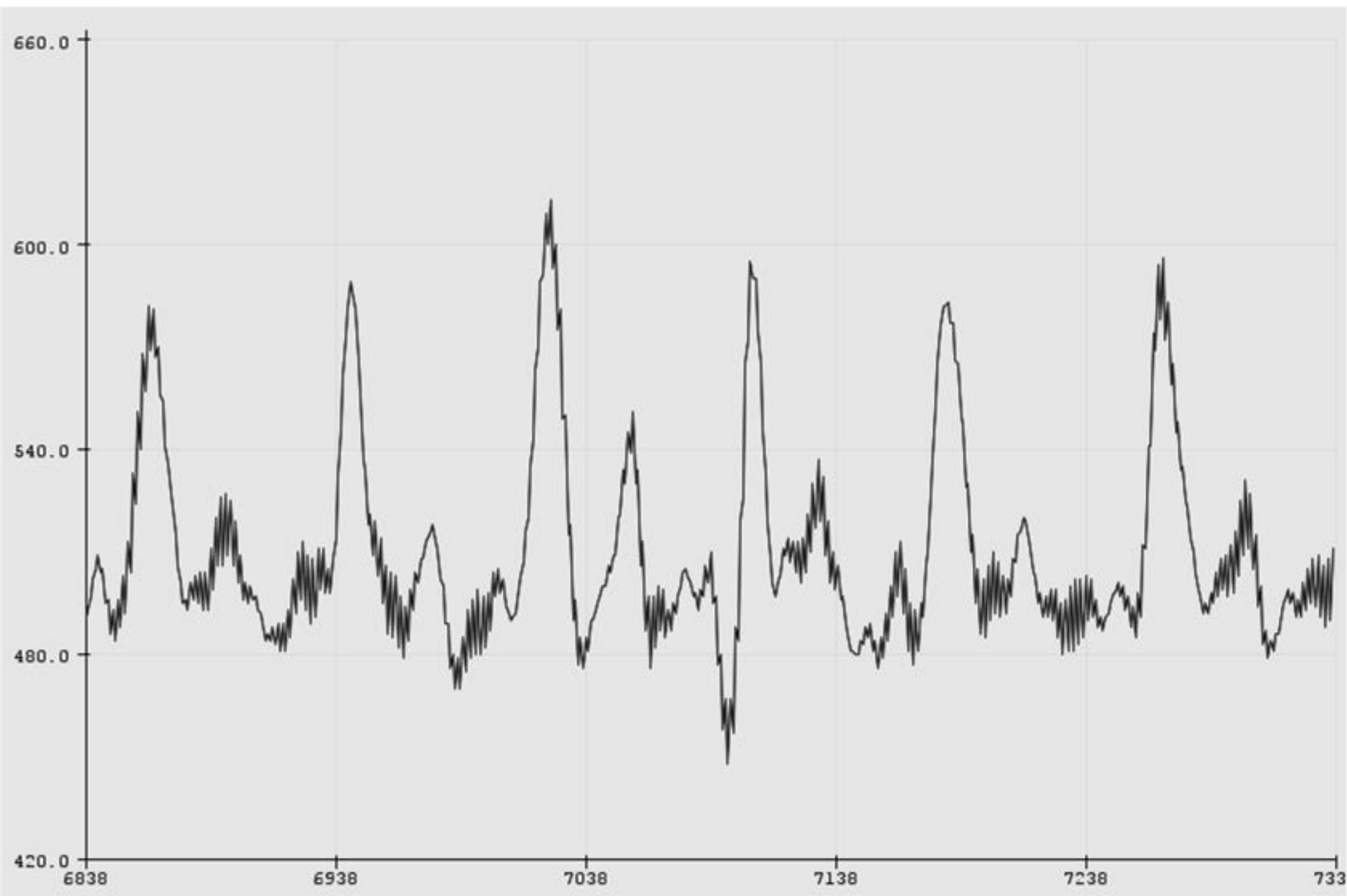
```
29.8    85.6
26.1    78.9
28.6    83.4
25.1    77.1
21.9    71.4
24.8    76.6
21.7    71.0
25.0    77.0
21.9    71.4
24.5    76.1
21.4    70.5
18.7    65.6
21.1    69.9
18.5    65.3
19.9    67.8
17.4    63.3
```

LM-35

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

S I M U L A T I O N

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 1.5 km.

```
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$GPGSA,A,3,32,16,31,10,26,,,,,,,,4.06,2.62,3.10*05
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$GPGSV,3,2,12,11,19,231,,16,30,166,22,21,31,201,,22,51,327,*76
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$GPGSA,A,3,32,16,31,10,26,,,,,,,,4.06,2.62,3.10*05
$GPGSV,3,1,12,01,40,267,,03,28,326,,04,14,293,15,10,16,132,25*7C
$GPGSV,3,2,12,11,19,231,,16,30,166,23,21,31,201,,22,51,327,*77
$GPGSV,3,3,12,26,50,119,33,27,02,178,,31,44,026,26,32,22,062,36*79
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```

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

Neo-6M (NMEA Data)   **Neo-6M(Lat, Lon and Date 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
  }
}
```
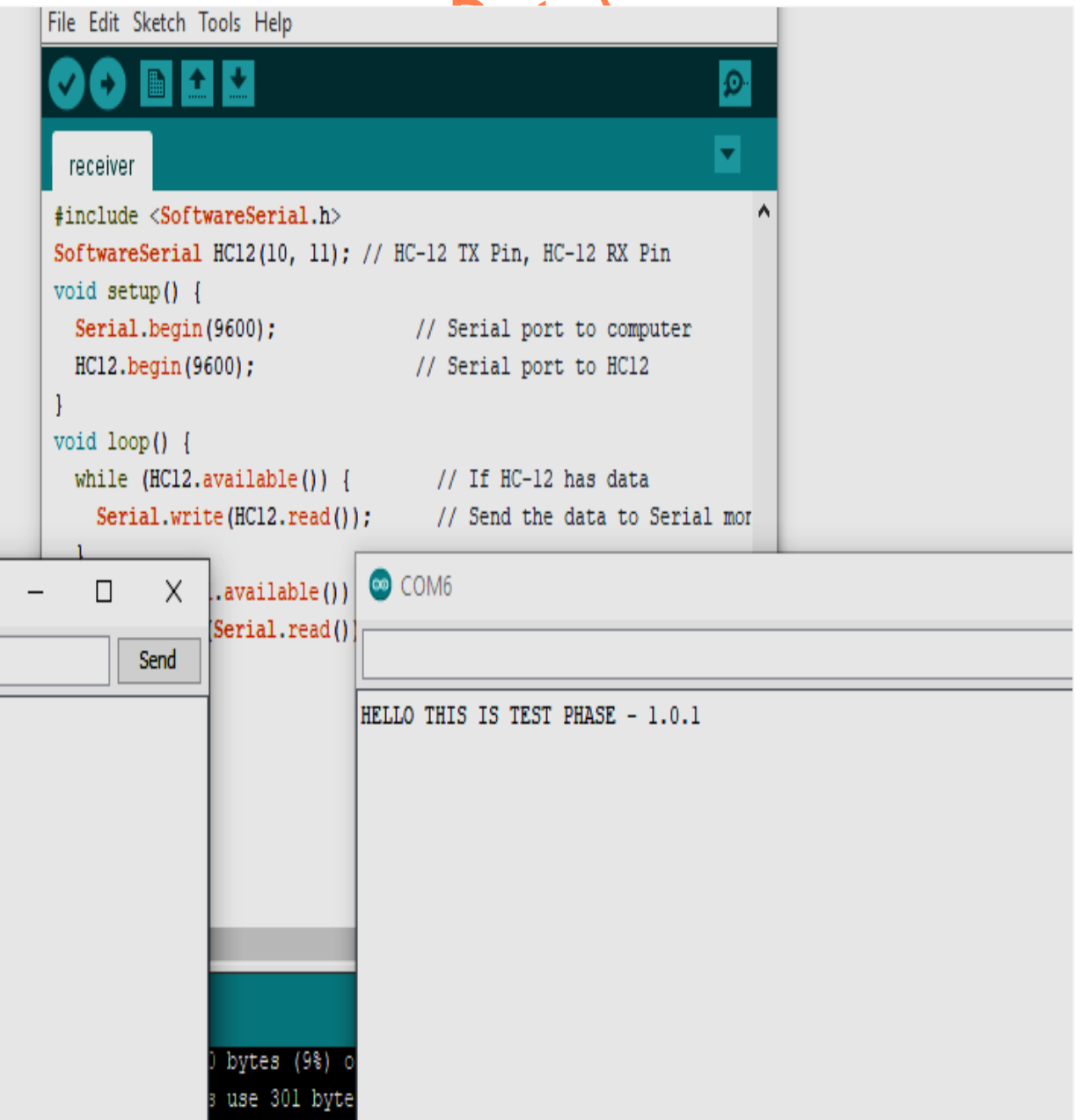
File Edit Sketch Tools Help

receiver

```
#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 mor
  .available())
  Serial.read()
```

COM5

HELLO THIS IS TEST PHASE - 1.0.0

Send

COM6

HELLO THIS IS TEST PHASE - 1.0.1

bytes (9%) o
use 301 byte

HC-12 (Transmitter and Receiver)

HARDWARE IMPLEMENTATION

HC-12

HC-12

LM-35

NEO-6M

Arduino UNO

Arduino UNO

RC-A-4015

SOLDIERS UNIT

SQUADRON UNIT

Block diagram

Soldiers unit (Health and Position data)   Squadron unit
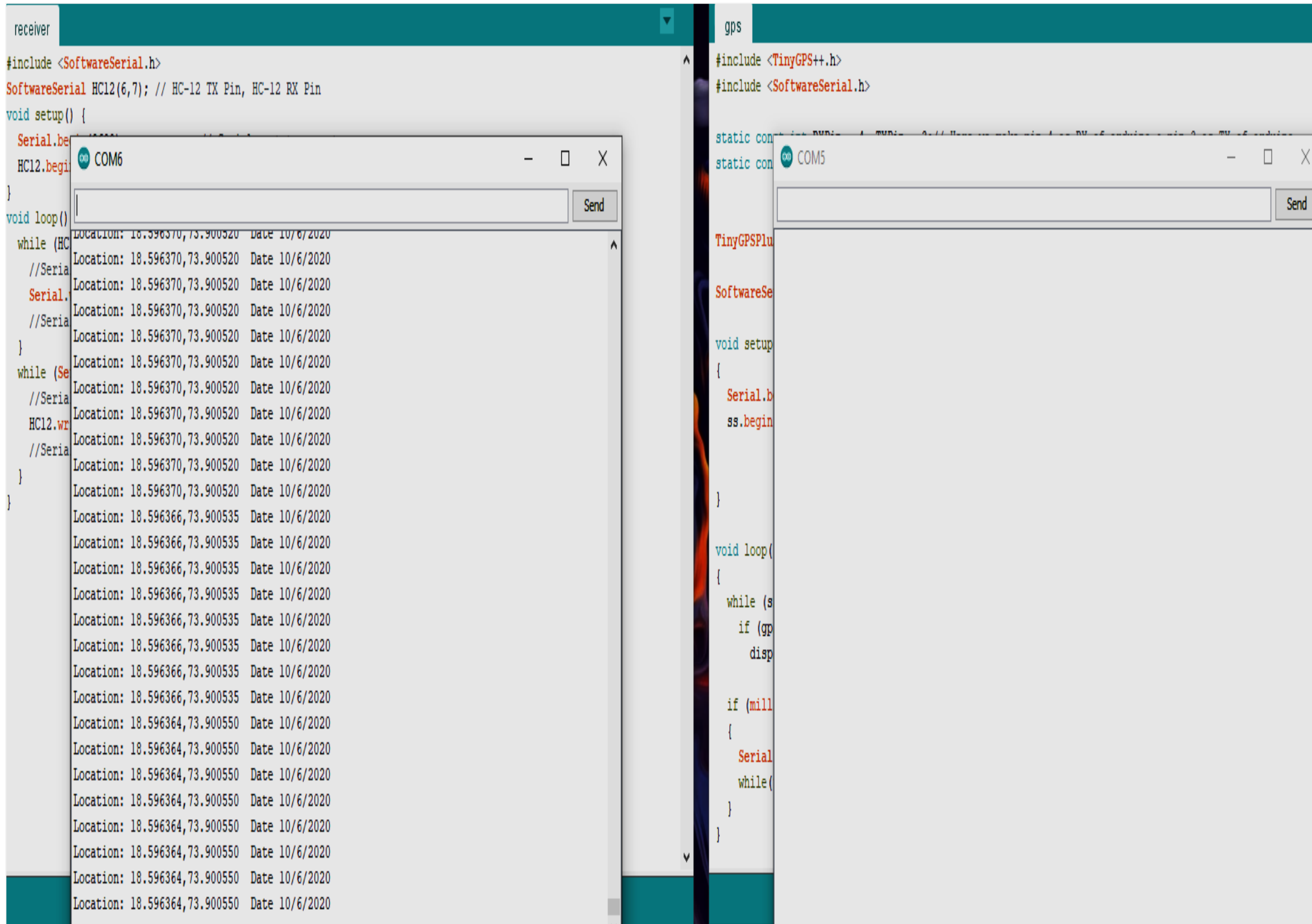
HARDWARE IMPLEMENTATION

- 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.

LM-35 and HC-12 Integrated

RC-A-4015 and HC-12 Integrated

HARDWARE IMPLEMENTATION

NEO-6M and HC-12 Integrated
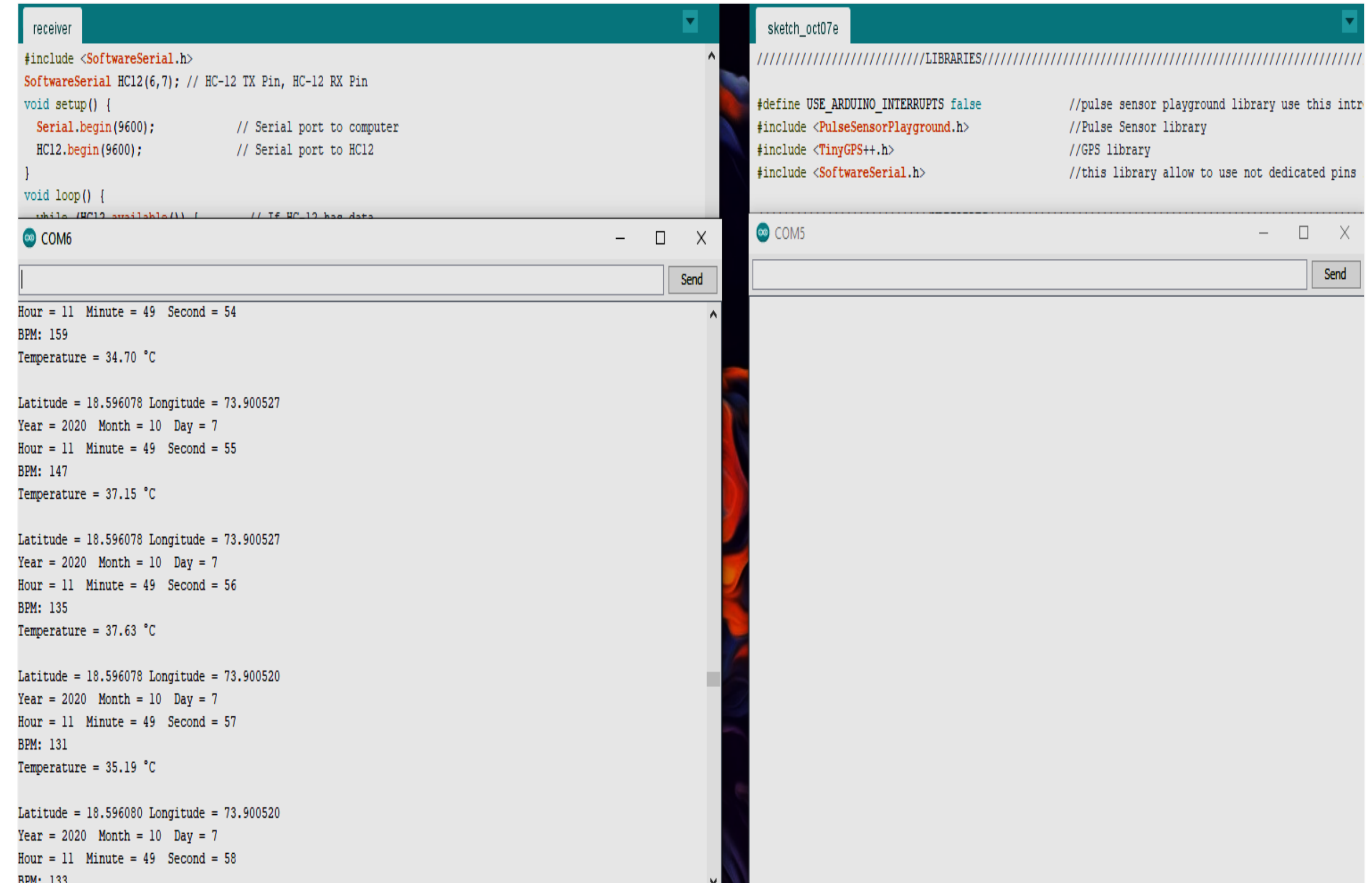
LM-35, RC-A-4015 and NEO-6M Integrated
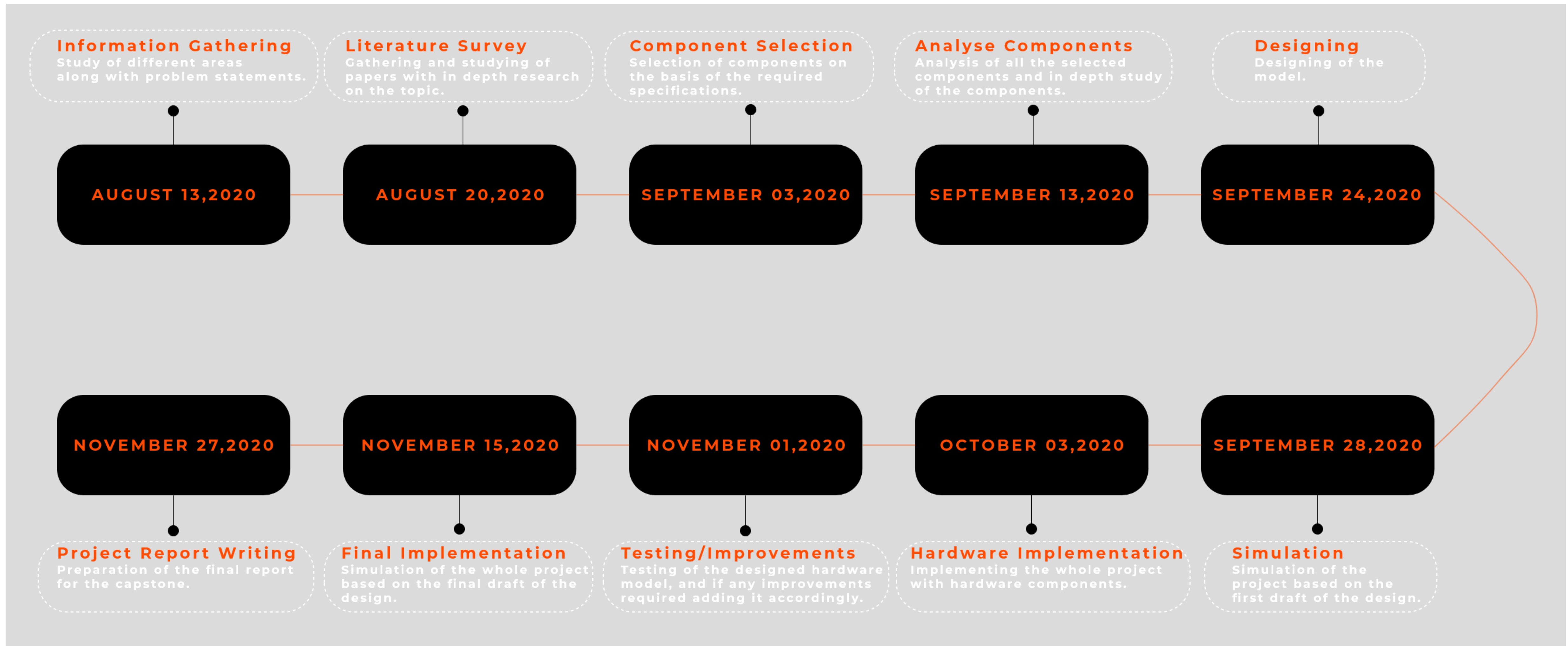
HARDWARE IMPLEMENTATION

HARDWARE IMPLEMENTATION
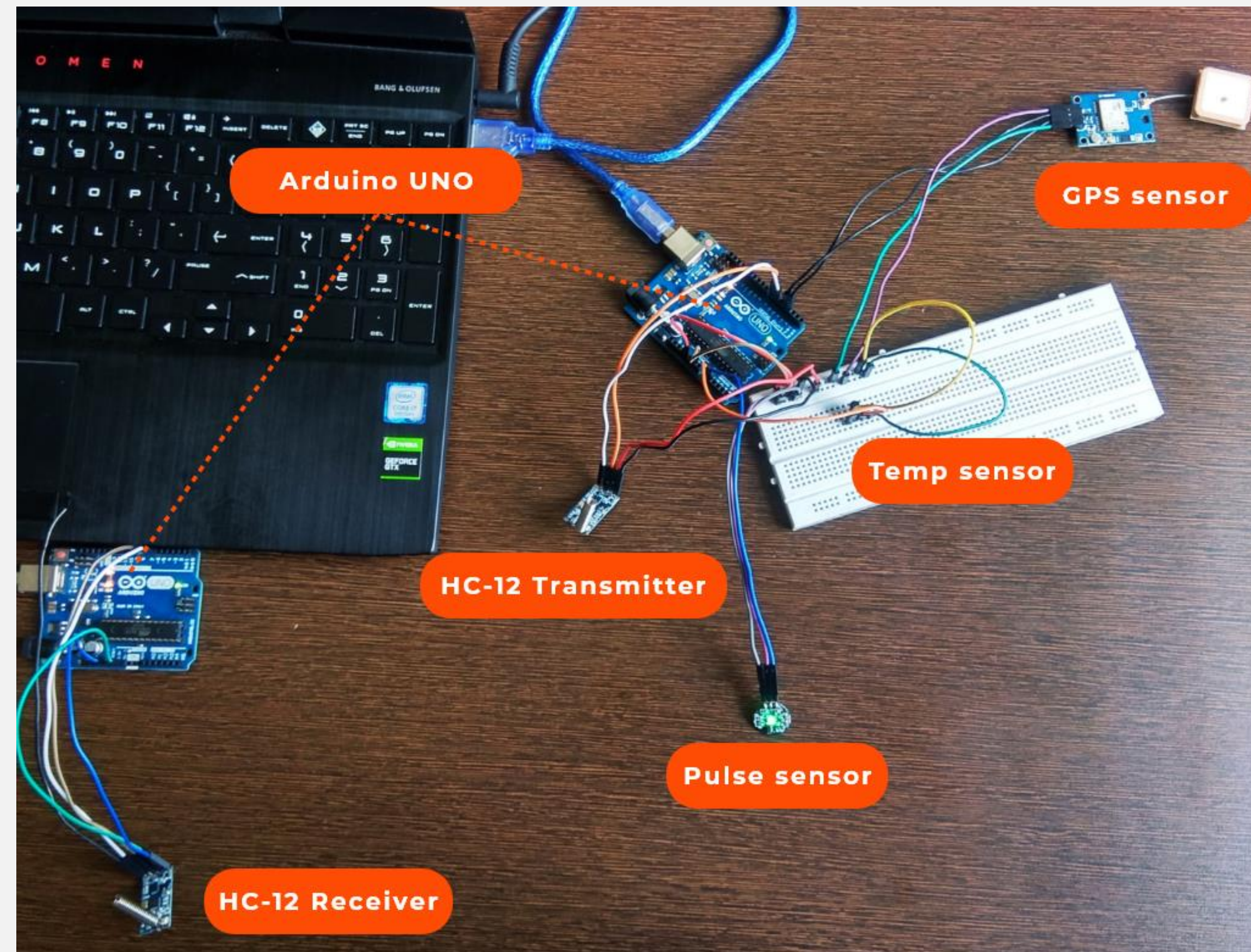
RESULT

- ▸ 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

Information Gathering
Study of different areas along with problem statements.

Literature Survey
Gathering and studying of papers with in depth research on the topic.

Component Selection
Selection of components on the basis of the required specifications.

Analyse Components
Analysis of all the selected components and in depth study of the components.

Designing
Designing of the model.

AUGUST 13,2020

AUGUST 20,2020

SEPTEMBER 03,2020

SEPTEMBER 13,2020

SEPTEMBER 24,2020

NOVEMBER 27,2020

NOVEMBER 15,2020

NOVEMBER 01,2020

OCTOBER 03,2020

SEPTEMBER 28,2020

Project Report Writing
Preparation of the final report for the capstone.

Final Implementation
Simulation of the whole project based on the final draft of the design.

Testing/Improvements
Testing of the designed hardware model, and if any improvements required adding it accordingly.

Hardware Implementation
Implementing the whole project with hardware components.

Simulation
Simulation of the project based on the first draft of the design.

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 ?