

SOLDIER HEALTH AND POSITION TRACKING SYSTEM

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OBJECTIVE

- The objective of the system is to provide the real-time continuous monitoring of soldier's health parameters and location tracking using GSM and GPS module.
- In emergency situation it helps the solider by providing a panic button which sends an emergency message to command officer and other soldiers.
- Depending on the message the control room takes the necessary action to save the life of the soldier.

INTRODUCTION

- All over the world a lot of research is going on to develop the technologies in which soldier's safety and nation's security is a priority.
- On the war field soldiers have to face many challenges like loss in war, low ammunition, health issues, crossing borders ,etc ,in these situations to get help soldiers have to communicate with their base station or there should be some facility to guide them.
- A way to overcome this issue is to provide a device to the soldiers that can track the health levels and also their live location and send it to their base station.

TIMELINE



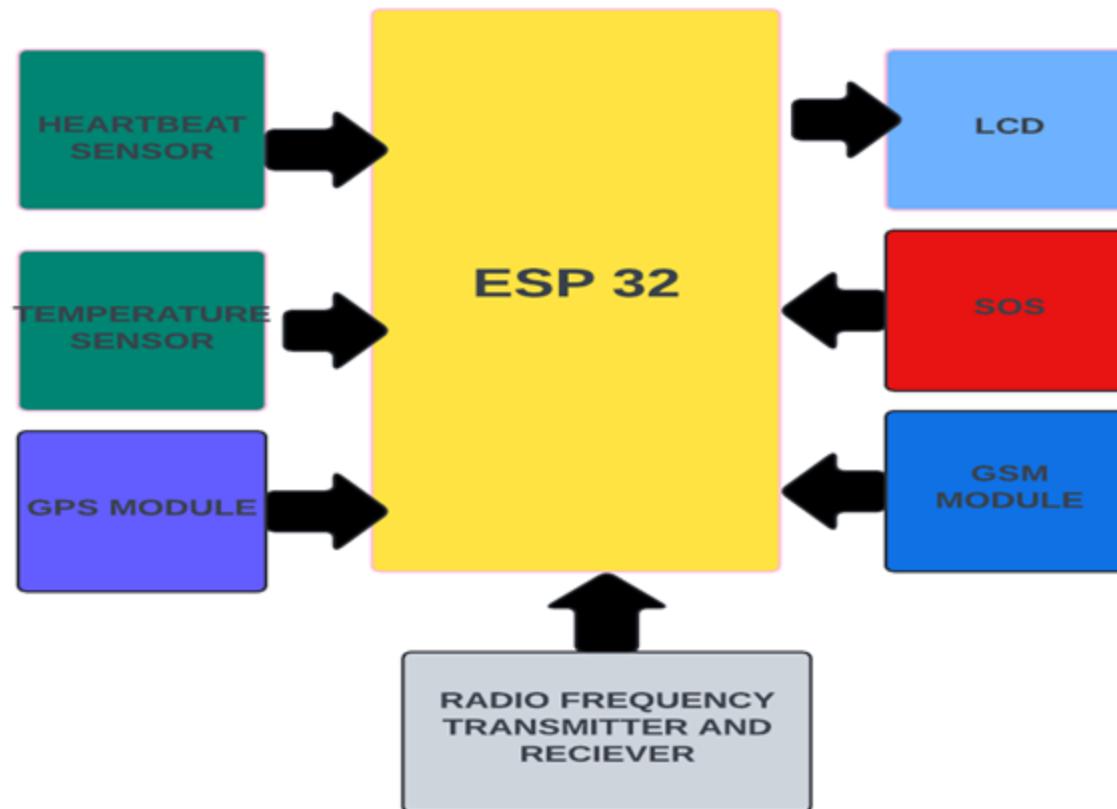
- Project planning and research

- Setting up environment on Esp 32.
- Develop software for pulse oximeter to detect heartbeat and oxygen levels.

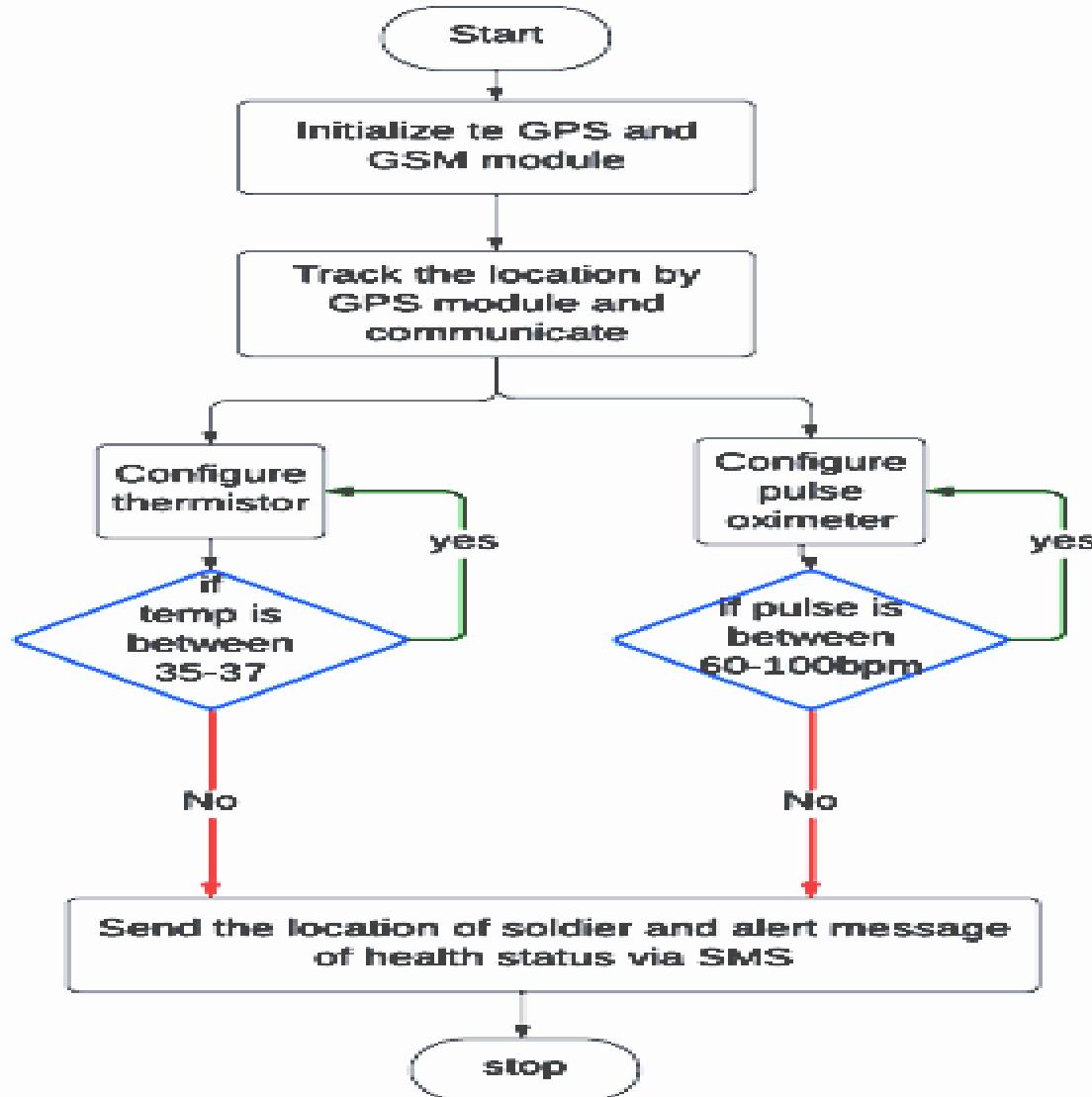
- Developed software for thermistor , GPS and Sos button.

- Designed, implemented interfacing and software of GSM and RFTR
- Ensured that the health and position details about the soldiers are sent through sms to the base station

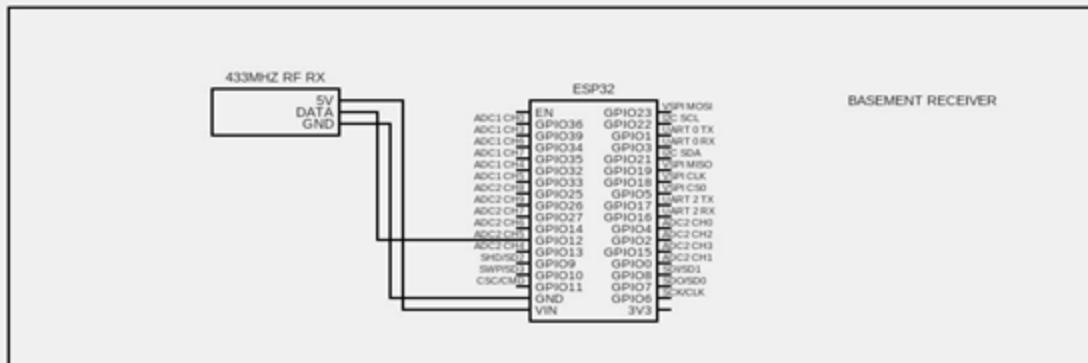
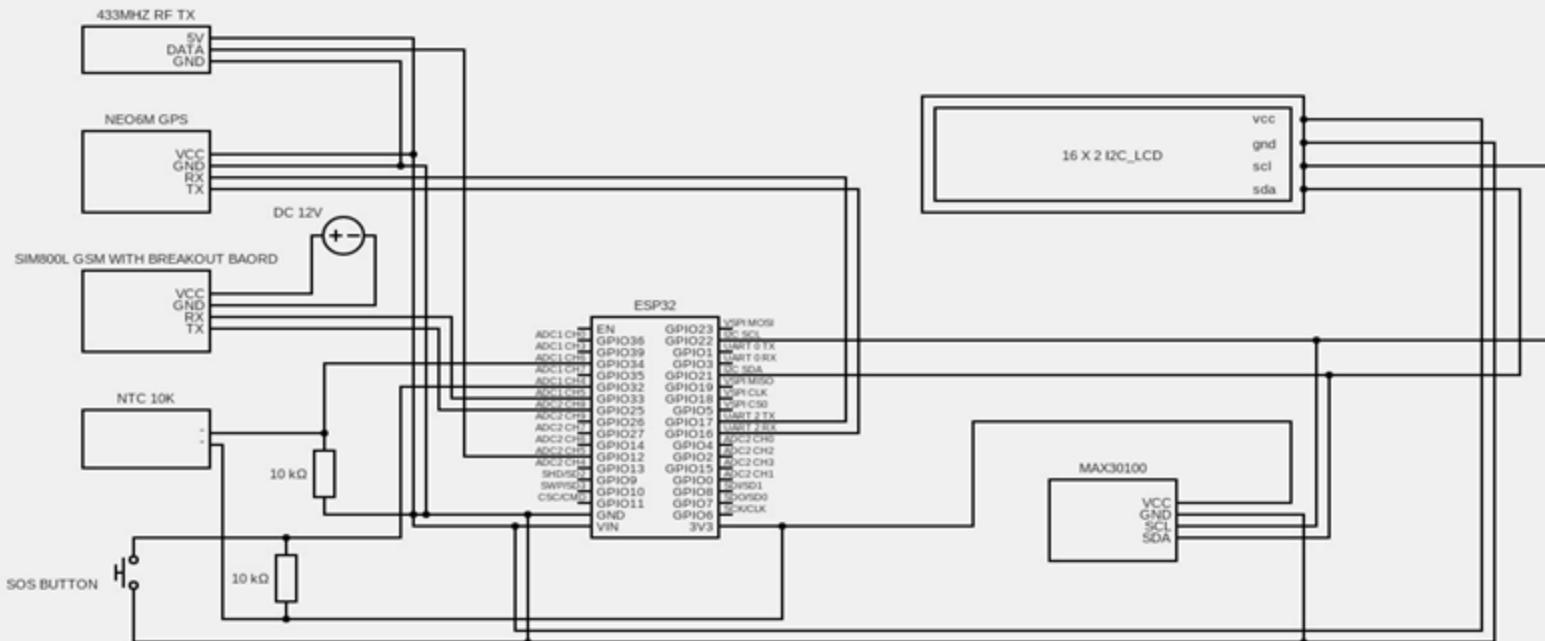
SYSTEM MODEL(BLOCK DIAGRAM)



FLOWCHART



CIRCUIT DIAGRAM



PROJECT OVERVIEW

- Once the device is turned on, the GSM and GPS modules are initialized.
- The sensors read the data such as temperature from the NTC thermistor, heart rate (BPM) and SpO₂ from the Pulse Oximeter, and GPS coordinates.
- In case of an emergency, the SOS button has to be pressed for a minimum of 5 seconds for a notification to be forwarded to the base station.
- The base station receives the SOS and decides the next course of action.

COMPONENTS

- ESP32 WROOM
- Pulse Oximeter Max30100
- NTC Thermistor 10k ohm
- Radio frequency transmitter and receiver-433MHz
- I2C LCD Display
- u-Blox NEO-6M-0-001 GPS Module
- SIM800L GSM Module
- Resistors-4.7kohm,10kohm
- Cables and Connectors
- PCB and Breadboards
- Push Button

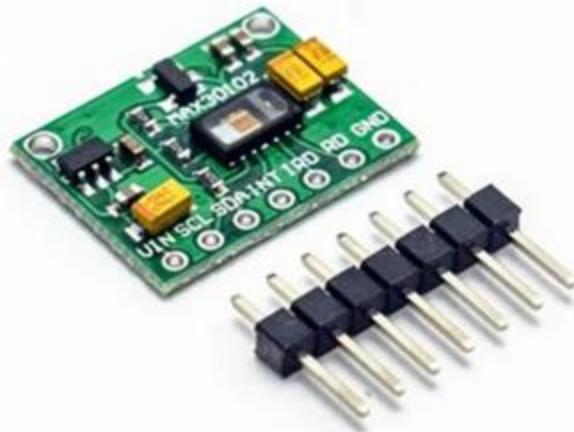
ESP32 WROOM

- Processor: Dual-core Tensilica LX6 (up to 240MHz)
- Memory: 520KB SRAM, 448KB ROM, 4MB Flash (program storage)
- Operating Voltage: 2.2V to 3.6V
- GPIO Pins: 30 (General Purpose Input/Output)
- ADC Pins: 18 (Analog-to-Digital Converter)
- UART, SPI, I2C, I2S, CAN Interfaces: Available for communication with other devices
- Power Supply: 5V via USB or external power source (with appropriate voltage regulation)



Pulse Oximeter Max30100

- The MAX30100 is an integrated pulse oximetry and heart-rate monitor sensor solution.
- Voltage Range: 1.8V and 3.3V .
- The device has two LEDs, one of which emits red light of wavelength 660nm and the other is infrared light of wavelength 940nm.
- Only infrared light is required to determine pulse rate.



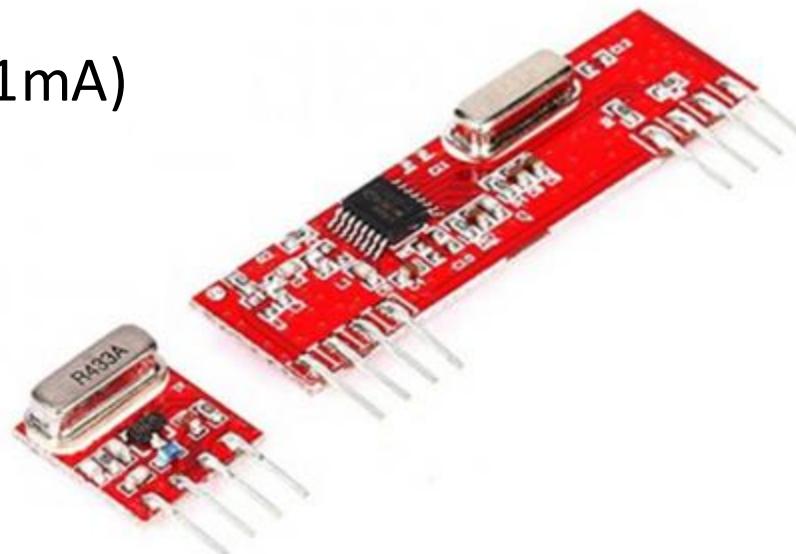
NTC Thermistor

- NTC thermistor is an acronym for Negative Temperature Coefficient thermistor.
- Resistance: $10 \text{ k}\Omega$ at 25°C .
- Temperature range: -55°C to 125°C .



Radio frequency transmitter and reciever-433MHz

- Range in open space: 5m-100m
- RX IF Frequency: 1MHz
- Very Stable Operating Frequency
- Low Current Consumption (Typ 11mA)
- Wide Operating Voltage (1.5-5v)



I2C LCD Display

- Easy to use. Less I/O ports are occupied, only four - VCC, GND, SDA (serial data line), SCL (serial clock line).
- Support IIC protocol. The I2C LCD1602 library is provided, so you can call it directly.
- Power supply: +5V



GPS Module

- GPS (Global Positioning System) is a satellite-based navigation system. It provides time and location-based information.
- Operating temperature range: -40 TO 85°
- EEPROM to save configuration settings
- Rechargeable battery for Backup
- Supply voltage: 3.3 V
- Configurable from 4800 Baud to 115200 Baud rates.
- SuperSense Indoor GPS: -162 dBm tracking sensitivity
- Separated 18X18mm GPS antenna



GSM Module

- SIM800L is a miniature cellular module which allows for GPRS transmission, sending and receiving SMS and making and receiving voice calls.
- Low cost and small footprint and quad band frequency support long range connectivity.
- GSM SIM800L module has two antennas included
- Supply voltage: 3.8V - 4.2V
- Recommended supply voltage: 4V
- SIM card socket: microSIM (bottom side)
- Working temperature range: -40 do + 85 ° C
- Supported frequencies: Quad Band (850 / 950 / 1800 /1900 MHz)



SOFTWARE USED

- Arduino IDE
- MC Programming Language: C++

ARDUINO IDE

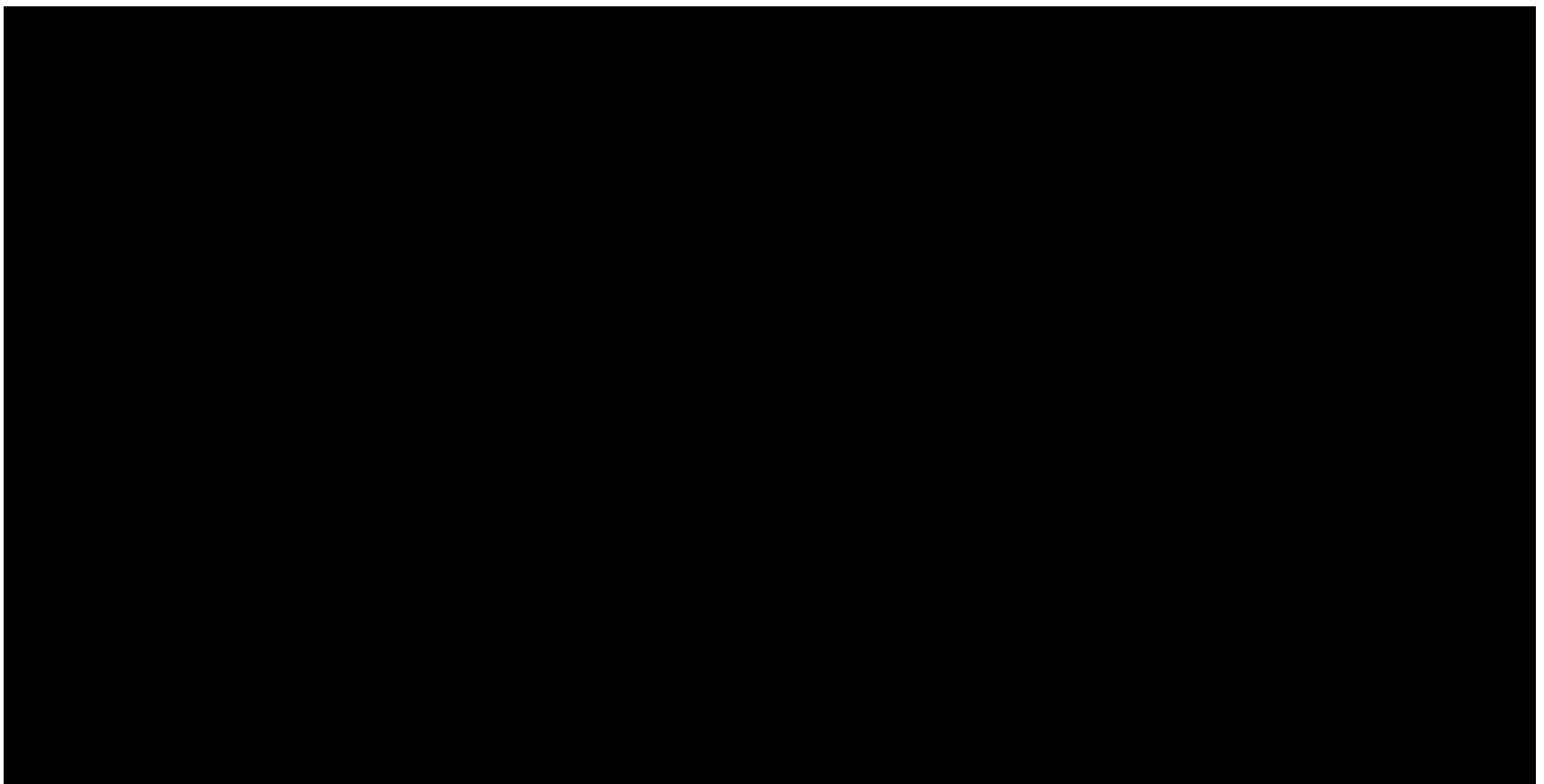
- Arduino IDE, short for Integrated Development Environment, is a software platform used to write and upload code to the boards.
- It provides a simple and beginner-friendly interface for programming microcontrollers .
- With Arduino IDE, users can write code in the Arduino programming language (based on C/C++), compile it, and upload it.
- It's a popular choice for hobbyists, students, and professionals.

PROCEDURE

- **Imported libraries:** Imported necessary libraries for esp32.
- **Initialize Hardware:** Initialize hardware components such as the GSM module, GPS module, Pulse Oximeter (MAX30100), and any other peripherals like the LCD display.
- **Read Sensor Data:** Continuously read sensor data such as temperature from the NTC thermistor, heart rate (BPM) and SpO2 from the Pulse Oximeter, and GPS coordinates.
- **Update Display:** Display sensor readings (BPM, temperature, SpO2) on an LCD screen.
- **Check SOS Button:** Monitor the state of the SOS button. If pressed for a continuously for a minimum of 5 seconds then the base station is notified with the data related to the soldier.
- **Send SMS Function:** Function is implemented to send SMS messages using the SIM800 module.

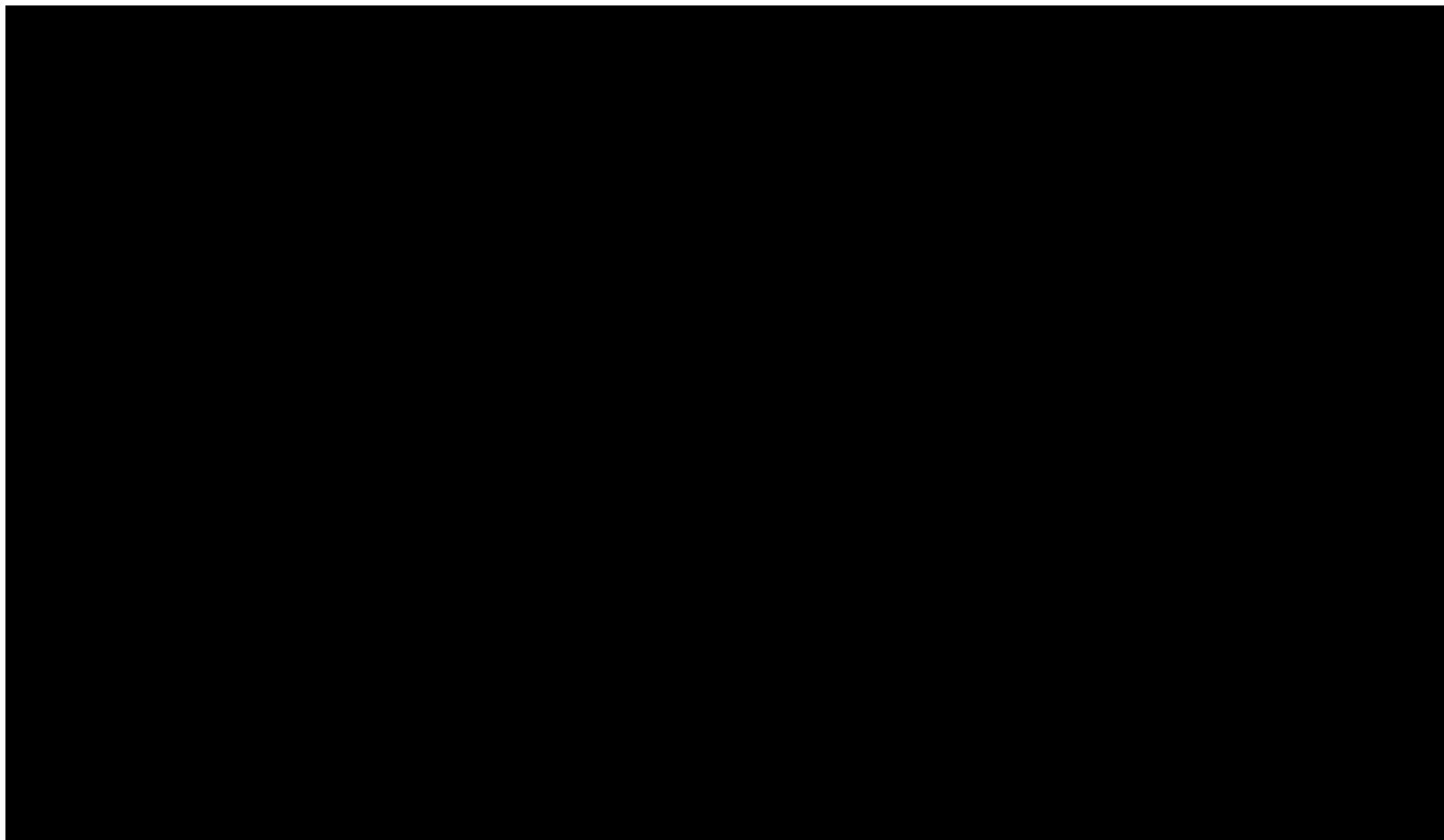
OUTPUT 1

HEARTBEAT AND PULSE SENSING



OUTPUT 2

SMS TRANSMISSION



RESULT

The normal readings are as follows:

Pulse Rate: 60 bpm to 100 bpm

Temperature: 35°C to 37°C

CASE 1: WHEN BOTH TEMPERATURE AND PULSE ARE ABNORMAL

CASE 2: WHEN THE PULSE IS ABNORMAL

CASE 3: WHEN THE TEMPERATURE IS ABNORMAL

Pulse Abnormal
Temperature Abnormal
Soldier No: 345689
Temp: 37.38
BPM: 0
Spo₂: 0
<http://www.google.com>
[/maps/place/9.993655872,76
.358037256](http://maps/place/9.993655872,76.358037256)

C
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CASE 1

Pulse Abnormal
Soldier No: 345689
Temp: 36.40
BPM: 0
Spo₂: 0
<http://www.google.com>
[/maps/place/9.993655872,76
.358037256](http://maps/place/9.993655872,76.358037256)

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CASE 2

Temperature Abnormal
Soldier No: 345689
Temp: 28.31
BPM: 92
Spo₂: 98
<http://www.google.com>
[/maps/place/9.993655872,76
.358037256](http://maps/place/9.993655872,76.358037256)

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13:00 • BSNL

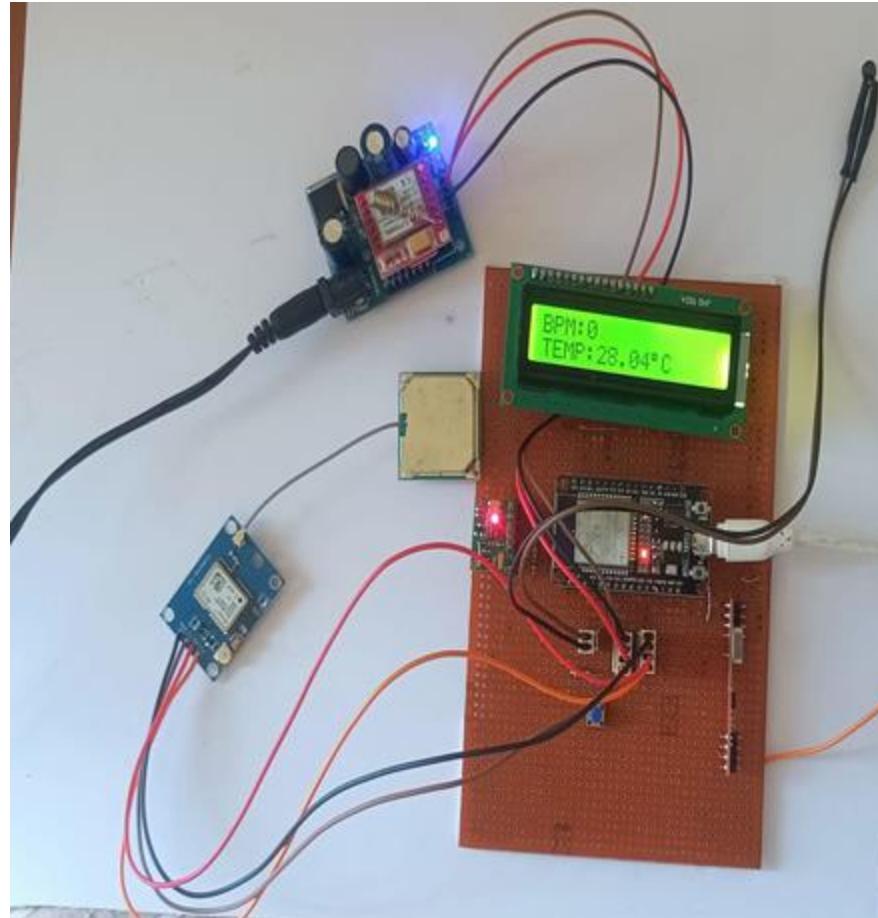
CASE 3

RESULT ANALYSIS

TEST CASES	OBSERVATIONS	ABNORMAL	NORMAL
CASE 1	TEMP:37.38°C BPM:0 SPo2:0	PULSE AND TEMPERATURE ARE ABNORMAL	—
CASE 2	TEMP:36.40°C BPM:0 SPo2:0	PULSE IS ABNORMAL	TEMPERATURE IS NORMAL
CASE 3	TEMP:28.31°C BPM:92 SPo2:98	TEMPERATURE IS ABNORMAL	PULSE IS NORMAL

HARDWARE

Transmitter



Receiver



WORK DIVISION

ALKA DENNY	INTERFACING OF GPS, GSM, THERMISTOR, OXIMETER, RFTR
ANITHRA ROSS AJITH	IMPLEMENTATION OF HARDWARE OF GPS,GSM,THERMISTOR,OXIMETER, RFTR
ANNA JOJU	INTERFACING OF GPS, GSM, THERMISTOR, OXIMETER, RFTR
ANU XAVIER	IMPLEMENTATION OF HARDWARE OF GPS,GSM,THERMISTOR,OXIMETER, RFTR

PRICE ESTIMATION

COMPONENTS	COST
ESP32	2 X 680
PULSE OXIMETER MAX30100	290
NTC THERMISTOR	8
RFTR	190
12C LCD DISPLAY	260
BOD GPS UBLOX MODULE NEO-6M-0-001	500
SEN GSM 800L BREAKOUT BOARD	275
SEN GSM 800L GSM MODULE	450
PUSH BUTTON	4
BREADBOARD	75
PCB	70
TOTAL COST	3,482

CONCLUSION

- We have successfully completed the device using ESP32.
- Testing and validating of the system were conducted successfully.
- Designed system is very useful for soldiers.



FUTURE SCOPE

FUTURE SCOPE

- Communication can be established from soldier to soldier.
- Improvement of the base station software system

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THANK YOU