

IMPLEMENTATION OF SOLDIER HEALTH AND POSITION TRACKING SYSTEM USING GSM MODULE

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ABSTRACT

Implementation of Soldier Health and Position Tracking System Using GSM Module is a technology-driven solution designed to monitor the real-time health status and location of soldiers deployed in the field. This system integrates a GSM module with GPS and biomedical sensors to continuously track vital parameters such as heart rate, body temperature, and location coordinates. The collected data is transmitted to a central monitoring unit via GSM, enabling military personnel to ensure the well-being and safety of soldiers. In case of abnormal health readings or distress situations, an automatic alert system notifies the control centre for immediate action. This system enhances operational efficiency, improves response time during emergencies, and provides crucial insights for mission planning and soldier safety.

Keywords: Soldier, Monitoring, GPS, GSM, Sensors, Tracking, Wireless Communication.

I. INTRODUCTION

The Soldier Health and Position Tracking System is an advanced embedded technology designed to enhance the safety, monitoring, and efficiency of military operations. In the modern battlefield, real time monitoring of a soldier's vital parameters such as body temperature, heart rate, and location plays a crucial role in ensuring their wellbeing and effective command coordination. This system integrates sensors with GPS and GSM modules to continuously collect and transmit health and positional data to the control center. By doing so, commanders can make timely decisions during missions, identify injured or fatigued soldiers, and provide immediate medical or tactical support when needed.

Moreover, this system bridges the gap between soldiers in the field and the base station through reliable wireless communication. Using GPS for accurate location detection and GSM for seamless data transmission, the system ensures continuous situational awareness even in remote or hostile environments.

It not only improves individual soldier safety but also enhances mission success by providing strategic insights to military leaders. Overall, the Soldier Health and Position Tracking System represents a vital step toward intelligent defense solutions that prioritize both operational efficiency and human safety.

II. METHODOLOGY

The methodology employed in the **Soldier Health and Position Tracking System** focuses on the integration of biomedical sensors, GPS tracking, and GSM-based communication to ensure real-time monitoring of a soldier's health and location during critical missions. The system operates through the following sequential steps, ensuring continuous observation of health parameters and immediate communication during emergency situations.

Step 1: Initialization Process

Upon powering on, the system begins the initialization of its core components, which includes:

- Arduino UNO: Controls and processes the data from various sensors.
- Pulse Sensor(MAX30102): Monitors the soldier's heart rate and detects abnormal pulse variations.
- Temperature Sensor (LM35): Measures the soldier's body temperature to identify fever, overheating, or hypothermia.
- GPS Module (Neo 6m): Tracks the robot's location for GPS accuracy and emergency alerts.
- GSM Module (SIM800/SIM900): Sends emergency alerts, health readings, and GPS location to the control room via SMS.

- SOS Button: Allows the soldier to manually trigger a distress alert when facing danger or injury.
- Power Supply: Ensures stable and portable power for all components during field operation.

Step 2: Health and Location Data Acquisition

After initialization, the system continuously monitors the soldier's vital signs using the pulse and temperature sensors. At the same time, the GPS module collects real-time latitude and longitude coordinates. The Arduino UNO processes these values and checks whether the readings fall within safe limits. This ensures continuous assessment of both the soldier's health and position throughout the mission.

Step 3: Abnormal Health Condition Detection

The system continuously checks the soldier's heart rate and temperature against predefined safe limits. If any value becomes abnormal or suddenly fluctuates, the system identifies it as an emergency. The alert mode is also activated if the soldier presses the SOS button.

Step 4: Alert Activation and Data Processing

Once an emergency is detected, the Arduino immediately collects the latest health readings and GPS coordinates. It prepares a structured alert message to ensure accurate information is ready to be sent to the control room.

Step 5: Transmission of Emergency Alert

The GSM module sends an SMS containing the soldier's heart rate, temperature, and exact GPS location to the designated military number. This quick communication allows the command center to respond immediately.

Step 6: Location Tracking and Follow-up Updates

During an ongoing emergency, the GPS module continues updating the soldier's coordinates at regular intervals. The system can resend updated location data if the soldier moves or if their condition changes. This helps rescue teams accurately track and reach the soldier quickly in difficult or remote environments.

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Step 8: Ongoing Monitoring Throughout Deployment

Throughout the mission, the system operates continuously, tracking both health parameters and location. This ensures real-time awareness and immediate response whenever the soldier faces danger.

III. BLOCK DIAGRAM

The block diagram of the Soldier Health and Position Tracking System illustrates the integration of the Arduino UNO as the central processing unit, managing the connections of various biomedical sensors and communication modules for effective soldier monitoring. The pulse sensor continuously measures the soldier's heart rate, while the temperature sensor tracks body temperature to identify any abnormal health conditions. These sensors work together to provide real-time health analysis essential for soldier safety during missions.

The GPS module enables accurate location tracking by providing the soldier's latitude and longitude coordinates, which are crucial during emergencies or rescue operations. The GSM module is responsible for transmitting health data and GPS information to the control room through SMS alerts whenever an abnormal condition or emergency is detected. The inclusion of an emergency/SOS button allows the soldier to manually trigger an alert if immediate assistance is required. The combination of these components facilitates continuous health monitoring, real-time location tracking, and rapid communication, ensuring timely intervention and enhanced safety for soldiers in critical environments.

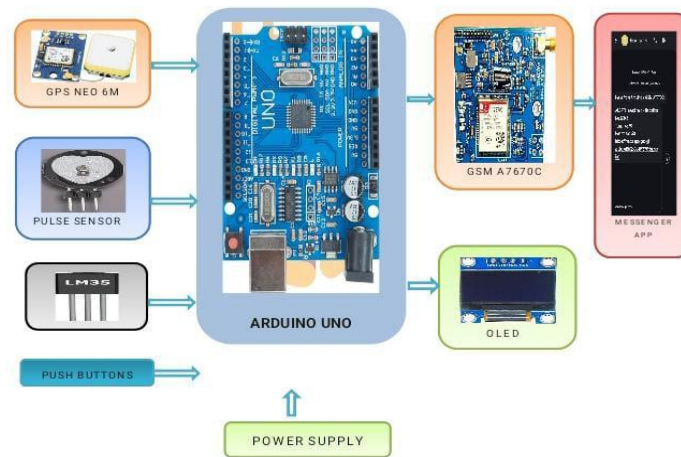


Figure 1: Block Diagram

IV. WORKING

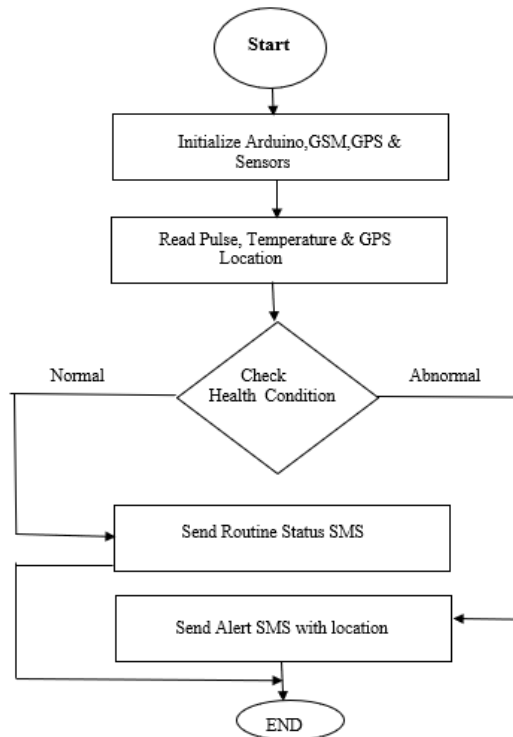


Figure 2: Flow Chart

The system begins its operation by continuously collecting data from the pulse sensor and temperature sensor to monitor the soldier's vital health parameters. At the same time, the GPS module updates the soldier's real-time coordinates. If the health readings remain within safe limits, the system continues regular monitoring. However, if an abnormal heart rate, unusual body temperature, or sudden fluctuation is detected, the system immediately enters emergency mode. The Arduino then prepares the latest health data along with GPS coordinates and sends them via the GSM module as an alert message to the control room. If no abnormal condition is detected, the system continues normal health and location tracking throughout the soldier's mission.

V. DESIGN AND CIRCUIT DIAGRAM

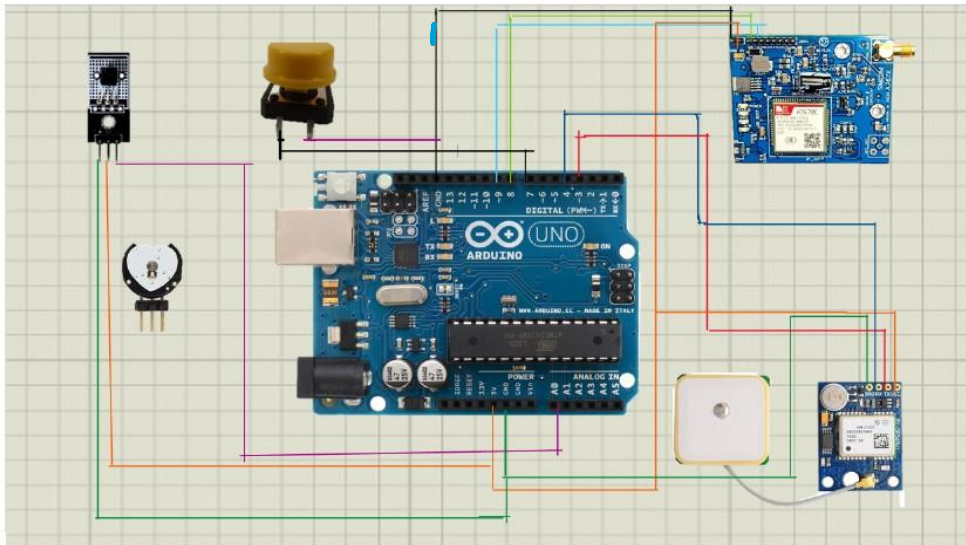


Figure 3: Circuit Diagram

The Soldier Health and Position Tracking System operates using a rechargeable battery that supplies power to the Arduino UNO and all connected modules. The pulse sensor and temperature sensor are interfaced with the analog input pins of the Arduino to continuously measure the soldier's heart rate and body temperature. For real-time location tracking, the NEO-6M GPS module is connected to the Arduino through the serial communication interface, providing latitude and longitude data. The SIM800 GSM module is also connected via serial pins and is used to send SMS alerts containing the soldier's health parameters and GPS coordinates to the control room.

VI. RESULTS AND DISCUSSION

The implementation of the Soldier Health and Position Tracking System has demonstrated significant improvements in monitoring and safeguarding soldiers during field operations. The key outcomes observed include:

1. **Accurate Health Monitoring:** The robot effectively navigates predefined paths, ensuring smooth and obstacle-free patrols, enhancing overall operational efficiency.
2. **Real-Time Location Tracking:** The GPS module consistently provided accurate latitude and longitude readings, allowing the command center to track the soldier's movement and location with confidence.
3. **Emergency Detection and Response:** The system effectively identified abnormal health conditions and SOS button triggers, sending immediate SMS alerts through the GSM module, including live GPS coordinates for rapid response.
4. **Enhanced Soldier Safety:** The automated health analysis and instant communication features strengthened overall safety protocols, ensuring that soldiers receive timely assistance in critical or life-threatening situations.

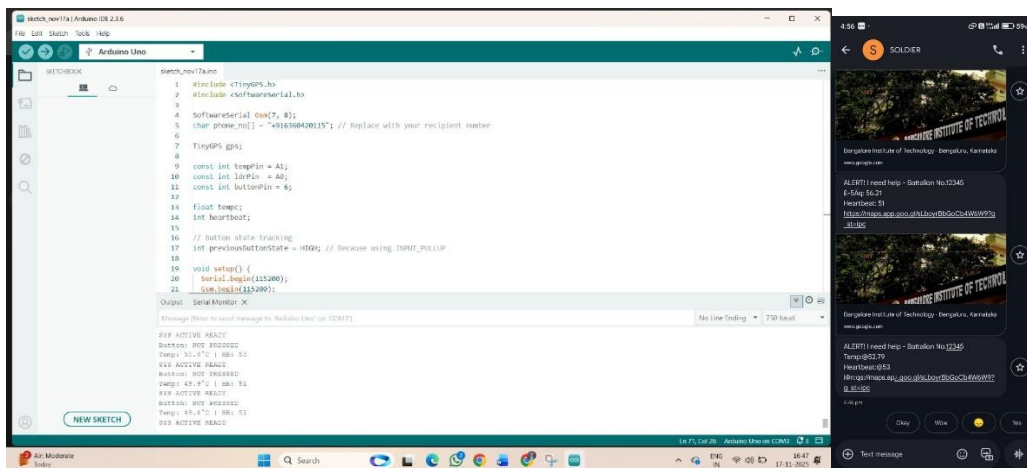


Figure 4: SMS Alert Showing Soldier’s Health Status and Real-Time GPS Coordinates Sent via GSM Module

VII. CONCLUSION

The Soldier Health and Position Tracking System successfully integrates continuous vital sign monitoring, real-time GPS tracking, and emergency alert communication to enhance safety for soldiers operating in critical and remote environments. Utilizing pulse and temperature sensors for accurate health assessment, along with GPS for precise location updates, the system demonstrates significant advancements in soldier support technology. Its ability to operate continuously, detect abnormal health conditions, and provide immediate alerts with exact GPS coordinates ensures rapid assistance during emergency situations. This research highlights the feasibility and strong impact of embedded systems in improving soldier safety through real-time monitoring, offering a practical and reliable solution for timely response in mission-critical scenarios.

VIII. REFERENCES

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