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SOLDIERS HEALTH MONITORING AND POSITION TRACKING SYSTEM

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***Abstract*— In today's security landscape, safeguarding the well-being of soldiers is paramount to national security. Conventional troop safety measures often rely on coordinate-based methods to track soldiers' whereabouts. However, these methods lack the ability to monitor their health status, leaving them vulnerable in situations where they may be facing medical emergencies.To address this critical gap, a novel approach has been developed that integrates wearable sensors, global positioning system (GPS) technology, and GSM communication modules. This comprehensive system provides real-time monitoring of soldiers' vital signs, including heart rate and body temperature, while simultaneously tracking their location.This project aims to monitor soldiers' bodies and continuously collect health data. This data is then transmitted wirelessly to a base station via the GSM modem. The base station monitors the soldiers' health parameters and triggers alerts when any abnormalities are detected. Additionally, the GPS module embedded in the system provides real-time location updates, enabling commanders to track the whereabouts of their troops with precision.In the event of an emergency, soldiers can activate an emergency button on the device, which immediately sends their location information to the control room, prompting a swift response from medical personnel or rescue teams.**

Keywords*— *Soldier safety, GSM Modem, Heartbeat data, Temperature condition, Emergency situation)

I.INTRODUCTION

With over two million active and reserve personnel, the Indian Armed Forces stand as the world's secound-largest standing army. However, the lack of seamless communication between soldiers and base stations can significantly increase the risk of injuries and fatalities. This gap can be bridged by implementing a system that continuously relays real-time health information, enabling timely medical intervention in case of emergencies.Currently, soldiers face various health challenges due to the demanding nature of their operations. The inability to maintain continuous communication with base stations, delayed medical assistance, and operations in diverse geographical conditions pose major safety concerns.Conventional soldier tracking methods, such as cable-based systems, radio frequency transceivers, walkie-talkies, ZigBee, and GSM-based tracking systems, have proven inadequate due to their limitations, including high installation costs, signal loss, interference, and bulky nature.To address these shortcomings, this project proposes the development of a portable, real-time tracking system that prioritizes soldier safety. This system will enable continuous monitoring of soldiers' health and location, providing critical information to commanders and medical personnel.The system will utilize wearable sensors to track soldiers' heart rate and body temperature, providing valuable insights into their overall health status. Additionally, an integrated GPS module will continuously monitor their location, enabling commanders to track their movements effectively.Real-time location and health parameter’s data will be sent to a central base station via a GSM system. This data will be analyzed to identify potential health issues and alert medical personnel when necessary. Furthermore, GPS data can be used to guide soldiers to their desired destinations during operations.

II.OBJECTIVE

The main objective of the given project is to empower the military with the ability to track the current GPS coordinates of soldiers and monitor their health parameters, including heart rate and body temperature. By integrating GPS technology with wearable sensors and a GSM communication module, this system provides a comprehensive solution for safeguarding the well-being of troops while enhancing operational efficiency. The GPS modem embedded in the system continuously captures the soldier's current position and transmits it to the base station using a unique link pattern. This real-time location data enables commanders to track the whereabouts of their troops with precision, facilitating effective coordination and deployment strategies. Simultaneously, the wearable sensors attached to the soldiers' bodies collect vital health data, including heart rate and body temperature. This data is wirelessly transmitted to the base station via the GSM module, where it is analyzed to identify any potential health issues. In the event of abnormalities, alerts are promptly triggered, notifying medical personnel and enabling timely intervention.

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III.EXISTING SYSTEM

While the current system focuses solely on health monitoring, it lacks the capability to track the soldier's location. This limitation hinders the ability to locate soldiers in emergency situations or coordinate troop movements effectively.To address this shortcoming, we propose the integration of a GPS module into the system. This enhancement will enable real-time location tracking, providing commanders with a comprehensive picture of their troops' whereabouts. The combined health and location data will empower informed decision-making, optimize operational strategies, and ensure the safety and well-being of our soldiers.

IV.LITERATURE SURVEY

By using heartbeat sensor using fingertip through Arduino board we can able to detect the heartbeat of the person if they are facing any health issues.[1]

Sleep disordered breathing issues for long term is a major problem for everyone facing nowadays and by using IoT enabled polymer sensor embedded fabrics we will find a solution for that issue. [2]

The implemented garments and devices are used to ensure the proper functioning of series of 12 full sets have been tested functionally and recording done using The cardiogenic biopotential, temperature values and the skin response. The results that the researchers got after the experiment shows that the given wearable measurement system that they implemented operates according to all the values and specifications that are being used for metal stress experiments it will be used for the dozens of health volunteers in the upcoming project phases.[3]

The region by-region analysis of the military and economic development in military balance in 2014 shows the affecting defense and security policies including the weapon trade and equipment in military.[4]

The main training drills of the United nations and non-united nations deployments and paper also discusses the international comparisons of expenditure of defense and military personnel are given in detail in the comprehensive tables. These number can be reduced only if the health status and location of the soldier is available at the base station. While in remote areas soldiers faces many health issues.Lack of communication inability to find their current location and lack of medical attention these are the major problems regarding the safety issues of the soldier.[5]

Majorily caused heart issues and varying in body temperatures in soldiers are monitored by gps tracking systems and send details to the base station. [6]

Currently the second largest standing army in the world with 1,200,255 active troops and 990,960 reserve troops is the Indian Military Forces. Due to the problems like lack of communication with the army suffers a lot while the soldier is facing any major injuries or any different health issues this may increase the death ratio of the soldier. I t had been found that the deathrate of the soldiers die d due to health issues are more when compared to soldiers died in the battlefield.[7]

The region by-region analysis of the military and economic development in military balance in 2014 shows the affecting defense and security policies including the weapon trade and equipment in military. By displaying the key equipment inventories and economics in defense it shows the detailed entry description of 171 military capabilities.[8]

The security policies of many countries are mainly disturbed by the threats of enemies in past few years. So that the soldiers in the military plays a major important and vital role. The security of these soldiers are concerned by various considerations. There are many numbers of equipment and devices attached to them to monitor their health status.[9]

While the soldiers are in any mission this system will be useful for them in many ways. Using this system we can find the relative position of the soldier using Global Positioning System that is GPS at any given time. It can be possible with the help of M-health. The mobile computing, medical sensors and communication technologies for health Care are known as M- Health.[10]

Wireless technology using zigbee helps to monitor the patient health status and send an information immediately to the doctor if they are facing any issues so that the doctor can provide them an instant help. [11]

For the real time health monitoring system, we use the Body Sensor Network which can be placed near or within a body and it consists of many physiological and biomedical nodes. In this paper, we mainly discuss about the interconnected BSNs which act as a system and it also plays a major role in the real time health monitoring of the soldiers.[12]

V.METHODOLOGY

FLOW DIAGRAM:

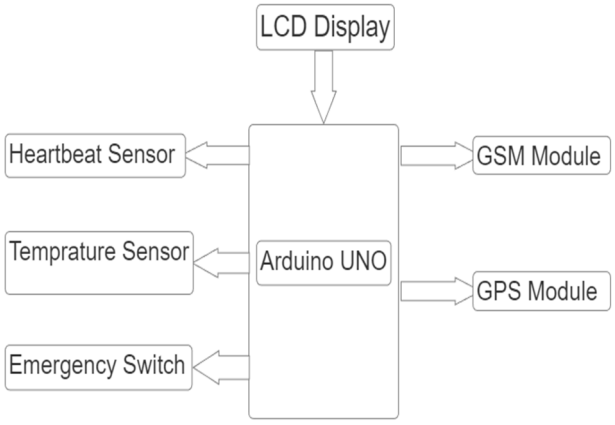

Fig.1.Proposed Flow Diagram

Aim of this project was to develop a real-time soldier health and position monitoring system using Arduino, GPS, LM35 temperature sensor, LDR, push button, 16x2 LCD, and I2C GSM module.These sensors can be mounted on soldiers such that their body parameters such as temperature heartbeat and their real time position can be sent to the central base station.In case of any emergency if emergency button is pushed by the soldier the base units gets the notification with soldiers location and they can act upon the signal.The system will continuously monitor the soldier's vital signs (heart rate and body temperature) and location (latitude and longitude) and transmit this data to a base station in real time. In case of an emergency, the soldier can trigger an alert by pressing the push button, and the system will send an emergency SMS message to the control room containing the soldier's current

location coordinates. advanced Soldier Health and Position Monitoring System designed to enhance the overall well-being and safety of military personnel in the field. The system integrates key sensors, including the LM35 temperature sensor for the temperature monitoring, a Light Dependent Resistor (LDR) for continuous heartbeat monitoring, a GSM module for real-time communication, a GPS module for accurate positioning, a 16x2 LCD display for local data visualization, and I2C for efficient sensor communication. Additionally, a push button is incorporated for emergency situations, enabling soldiers to send distress signals instantly.

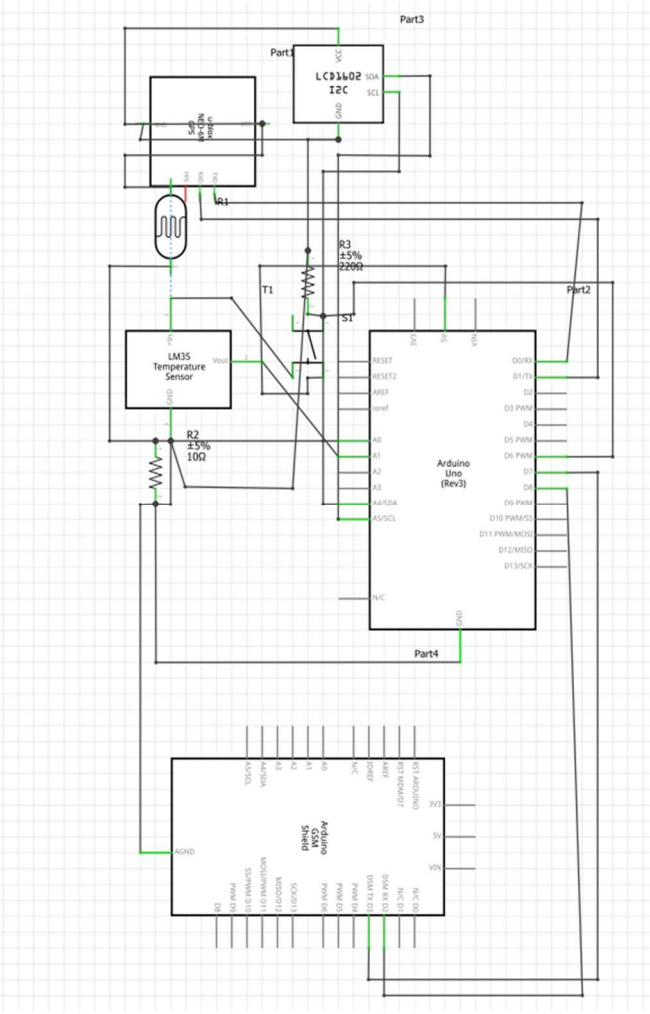

Fig.2.Circuit Diagram

This project involves integration of The LM35 temperature sensor and LDR for real-time temperature and heartbeat monitoring. These sensors are calibrated to ensure accurate and reliable data collection under varying environmental conditions. The GSM module is incorporated to establish a robust communication link, allowing soldiers to transmit health data and receive emergency alerts. Simultaneously, the GPS module provides precise location information, enabling effective monitoring of soldiers' positions in the field. A microcontroller Arduino UNO is employed to interface with the sensors, GSM module, GPS module, and LCD display. The microcontroller processes the data from various sensors and facilitates seamless communication between the components. The collected data is processed in real-time to extract relevant health information and positional data. The 16x2 LCD display is employed to present vital statistics locally, providing soldiers with immediate feedback on their health status. The push button is configured as an emergency response trigger. When activated, it initiates an immediate distress signal transmission to the central monitoring station, alerting them to the soldier's critical situation.This push button can be used by the soldier when he is any emergency or critical situation and he needs help and wants to send distress signal to base station to inform them that he needs help.The main motive for this push button was to provide immediate necessary help to the soldier for his safety. Key steps include sensor data acquisition for monitoring body temperature and heartbeat using LM35 and LDR, respectively. The push button enables user-triggered actions it can be used in case where the soldier needs to send an emergency alert to base.The SIM900A GSM module facilitates communication, allowing the system to send emergency alerts via SMS. The Arduino code governs system logic.

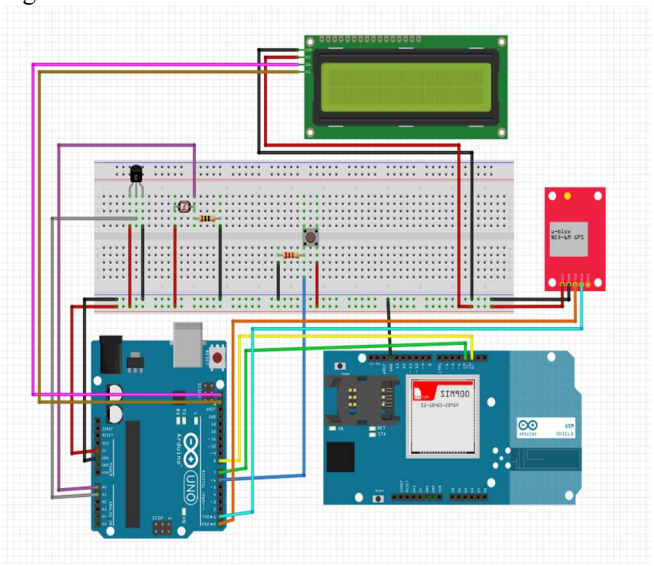

Fig.3.Circuit Simulation

VI. CHALLENGES

Addressing the potential challenges related to GSM network failures and the suitability of Arduino for military operations is crucial for the reliability and effectiveness of the soldier health and position monitoring system.In a war field, the GSM network may face disruptions due to various reasons such as jamming, network congestion, or infrastructure damage.In such cases a backup communication method or a hybrid system that can switch between different communication technologies can be used.Satellite communication modules can be used for more reliable connectivity in remote or disrupted areas. Satellite communication can provide a robust and global solution, overcoming the limitations of terrestrial networks.Also Offline Data Caching can be considered as a solution where the system can store critical data like location and health parameters locally on the soldier's device. This information can be transmitted once the network becomes available again. Suitability of Arduino for Military Operations is also a challenge in the project.As Arduino boards are not designed for military-grade specifications, and they might lack the durability and robustness required in harsh military environments.We can explore the possibility of using ruggedized or military-grade microcontrollers and sensors

designed for harsh environments.For military-grade operations, where durability, reliability, and ruggedness are crucial, you might consider microcontrollers or microprocessors designed specifically for such environments. ATmega128RFA1, STM32H7 Series, NXP LPC54000 Series can be considered for the military level operations.

VII.RESULTS

The developed soldier health and position monitoring system demonstrated its effectiveness in providing real-time monitoring of vital signs and location data. The system accurately captured and transmitted sensor readings, including heart rate, body temperature, and GPS coordinates. The push button function and emergency alert system functioned as intended, providing a reliable mechanism for triggering emergency responses.The system's ability to provide continuous real-time monitoring was successfully evaluated under various conditions.User feedback indicated that the LCD display interface was user-friendly and intuitive.In conclusion, the developed soldier health and position monitoring system proved to be a valuable tool for enhancing soldier safety and operational effectiveness. The system's ability to provide real-time monitoring, reliable emergency response, and user friendly interface makes it a promising solution for military applications.

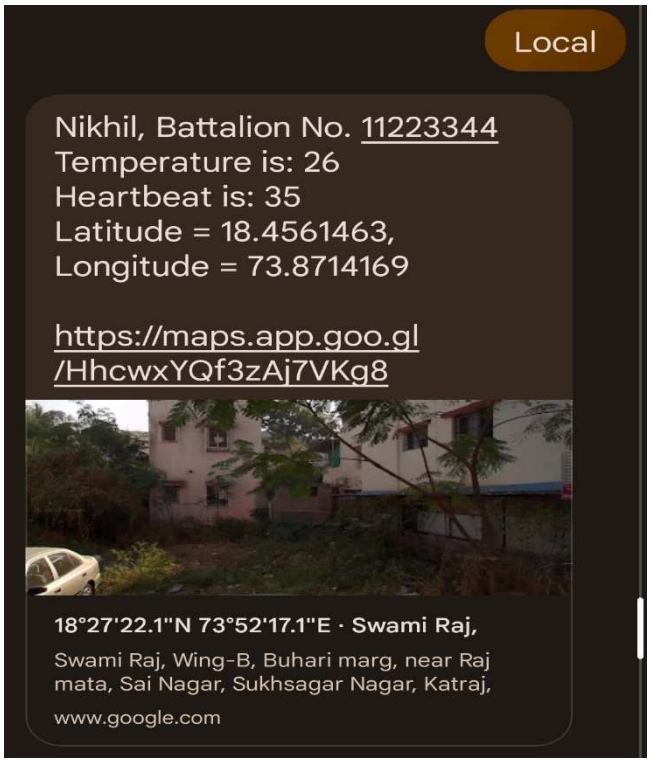

Fig.4.Location and health parameters of soldiers received through message

VIII.CONCLUSION

Soldier Health and Position System represents a crucial advancement in military technology, offering a holistic approach to enhance the overall well-being and operational efficiency of military personnel.By seamlessly integrating real-time health monitoring and precise position tracking, this system provides commanders with invaluable insights for informed decision-making on the battlefield.The fusion of health and position data not only enables swift responses to emergencies but also contributes to optimizing strategic planning. As we navigate the complexities of modern warfare, investing in such comprehensive systems is imperative, ensuring the safety, health, and effectiveness of our armed forces in the face of evolving challenges.

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