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A Real Time Autonomous Soldier Health Monitoring and Reporting System Using IOT

D V Madhuri[a],N V Sai Sri Prasad[b], S Moksha Saranya[c] , Mohan Babu C[d]

[a,b,c] Student, Department of Electronics and Communication Engineering, SJC Institute Of Technology,Chickballapur562101

[d]Assistant Professor, Department of Electronics and Communication Engineering, SJC Institute Of Technology,Chickballapur562101

dvmadhu205@gmail.com[a], sai7993690288@gmail.com[b],Mokshasaranya1053@gmail.com[c], mohanbabu015@gmail.com[d]

ABSTRACT:

The Soldier Health Monitoring and Reporting System is a comprehensive system created to continuously track vital health indicators in order to guarantee the welfare of military personnel. This system has a variety of sensors, including a GPS, temperature, vibration, and heartbeat sensor, which are connected to an Arduino microcontroller and Nodemcu to offer real-time data collection and analysis. In the case of an abnormality, the technology allows for immediate intervention by providing valuable information regarding a soldier's health status.The system's primary components are a temperature sensor that measures body temperature, a vibration sensor that detects abnormal movements or external impacts, and a heartbeat sensor that checks pulse rate. An Arduino microcontroller is connected to these sensors, processing the data and displaying it on an LCD screen. The Soldier Health Monitoring System includes a Peltier device and a relay for body temperature management. The system improves situational awareness and communication by utilizing a Nodemcu module for wireless connectivity. The Soldier Health Monitoring System is intended to alert designated users via email or SMS in the event of abnormal health metrics or emergency circumstances.

KEYWORDS: Sensors, GPS, temperature sensor, vibration motor, heartbeat sensor,Arduino microcontroller, Nodemcu, LCD screen,GPS module, Peltier device, relay, body temperature control, wireless connectivity, SMS notification.

1.INTRODUCTION

A lot of soldiers' lives are lost as a result of inadequate health and emergency monitoring in combat zones, search and rescue facilities, border patrols, and training periods. The intention of selecting this project is to offer solutions for these issues. The project's goal is to add artificial intelligence to a soldier's uniform—intelligence that will allow it to continuously connect Using the command center and monitor parameters like wound formation and heart rate. Enemy warfare plays a crucial role in any country's security in the modern world. Army (ground), Navy (sea), and Air Force (air) are the primary forces that support national security. The army soldier has a crucial and significant role. Regarding these soldiers' safety, many people are worried. To ensure national security, a nation's defense department and troops must both be functioning well. To this end, we are launching the "SOLDIER MONITORING AND REPORTING SYSTEM." Both the telemedicine and GPS tracking of these soldiers are made possible by this system A personal server is installed in these to allow for total mobility. Via a wireless connection, this personal server will offer connectivity to the server located at the base station. Along with the jacket is a GPS monitoring tool that enables the tracking of each soldier's location. This could make it easier for the control station to understand the circumstances of the mission.

2. OBJECTIVES

- **Real-time Health Monitoring:** Continuously monitor vital health parameters, including heart rate and body temperature, in real-time. Provide immediate feedback on the soldier's physiological condition for proactive health management.
- **Abnormality Detection:** Detect anomalies in health parameters, such as irregular heartbeats or abnormal body temperature, to enable early intervention in case of health issues.
- **Emergency Alert Mechanism:** Integrate an Emergency Switch to allow soldiers to manually trigger emergency alerts in critical situations. Implement a relay system to activate predefined emergency protocols, ensuring rapid response to emergencies.
- **Environmental Adaptation:** Utilize the Peltier device to regulate the soldier's body temperature, adapting to extreme environmental conditions for optimal performance and well-being.
- **Situational Awareness:** Incorporate a GPS module for real-time tracking of the soldier's location during missions. Enhance situational awareness for mission commanders and rescue teams to respond promptly to changing operational scenarios.
- **Communication and Notification:** Employ the Nodemcu module for establishing wireless connectivity. Implement a notification system to send instant alerts via SMS or email to designated recipients in the event of abnormal health parameters or emergencies.

2.1 LITERATURE SURVEY

A. IOT based soldier health and position tracking system .

J Lakshmi Prasanna, M. Ravi Kumar, Chella Santhosh, S V Aswin Kumar, P. Kasulu, 2022, International conference on computing methodologies and communication (ICCMC), IEEE Currently, preserving national security is under the purview of the armed forces. To defend themselves in this regard, their better health and tracking, respectively, are more crucial. The Internet of Things (IoT) and GPS were employed in this study's live track applications to track and monitor the health issues affecting the military.

B.Soldier strap for health monitoring and tracking a proposed solution,

Rahul S G, Rajnikant Kushwaha, Sayantan Bhattacharjee, Agniv Aditya, K Somasekhar Reddy, Durri Shahwar, 2021 Innovations in power and advanced computing technologies (i-PACT). A military operation's or a military patrol's success depends on information and data, two important components. Monitoring a soldier's condition andlocation, along with gathering ground intelligence, is essential during any active circumstances or interactions. In the desired circumstances, the heart rate, temperature, humidity level, and GPS position should all be continuously tracked in order to provide prompt and effective medical or tactical help in the event of any emergency.

C. Health monitoring and tracking system for soldiers using internet of things (IOT),

Niket Patil, Brijesh Iyer, 2020 International conference on computing, Communication, and automation (ICCCA), IEEE. The article describes a system that uses the Internet of Things (IoT) to track and monitor soldiers' health. The soldier's body can be fitted with the suggested system, it keeps tabs on their whereabouts and wellbeing using GPS The suggested systemconsists of tiny, transmittable modules, sensors, and wearable physiological equipment. Because of this, it is possible to create a low-cost system that uses the suggested technology to protect irreplaceable human life on the battlefield

D.Novel wearable device for health monitoring and tracking of soldiersbased on LoRa Module,

Yashash Jain, Bhupesh Soni, Ayush Goyal, ChetnaSharma, 2020 Conference on Information and Communication Technology (CICT), IEEE The internet has altered our way of life, but the internet of things (IoT) is about to transform everything once more. using IoT to check their health on the battlefield. Body factors including heart rate, temperature, oxygen levels, and GPS position can all be measured by this device.

E.A simple and Cost-Effective Real-time Soldier Health and Position Tracking System

Authors: Prof. (Dr.) Vijay Mane, Shivangi Shardul, Sahil Shah, Chaitanya Sawant Working: This article mainly focuses on a simple and cost-effective real-time soldier health and position tracking system involves integrating various technologies to ensure accurate monitoring, data transmission, and analysis while being mindful of cost constraints. Mainy used by LDR, NEO6M GPS Module, LM35

3. SENSORS USED

3.1 Arduino UNO

The Arduino UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family.
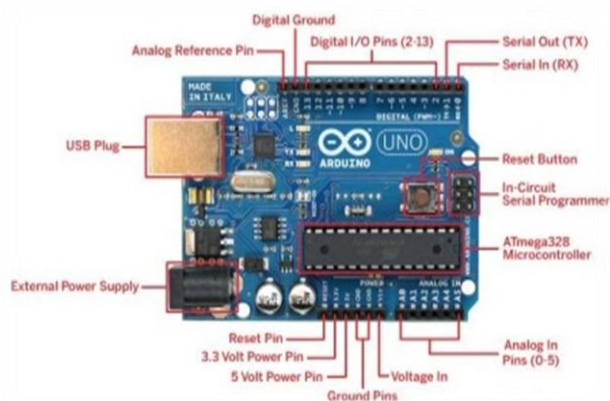

Figure:3.1:Arduino UNO

3.2Vibration motor:

A vibration motor is a tiny electric motor that spins a weight off-center, creating a vibration. The intensity of the vibration can be changed by varying the speed of themotor.Vibration motors are relatively inexpensive and simple to manufacture, which makes them a popular choice for a wide variety of applications. Vibration motors are mostly divided into two categories:eccentric rotating mass (ERM) motors and voice coil motors (VCMs).

Figure:3.2:Vibration Sensor

3.3 Pulse rate sensor :

Reflection-type pulse sensors (Optical Sensors for Heart Rate Monitor) emit infrared, red, or green light (~550nm) towards the body and measure The quantity of light reflected using a photodiode or phototransistor.
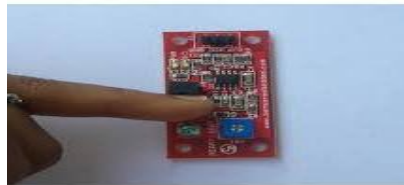

Figure:3.3:Pulse rate sensor

3.4Temperature sensor:

A temperature sensor is a device that detects and measures hotness and¬ coolness and converts it into an electrical signal. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. Specification : LM35 series.

**Figure:3.4:Temparature sensor**

3.5 Relay:

The Single Channel Relay Module is a convenient board that can be used to control high voltage, high current load such as motor, solenoid valves, lamps and AC load. It is designed to interface with microcontroller such as Arduino, NodeMCU, etc. The relay's terminal (COM, NO and NC) is being brought out with screw terminal.The relay is the device that opens or closes the contacts to switchON/OFF other appliances operating at high voltages.

Figure:3.5:Relay

4.BLOCK DIAGRAM
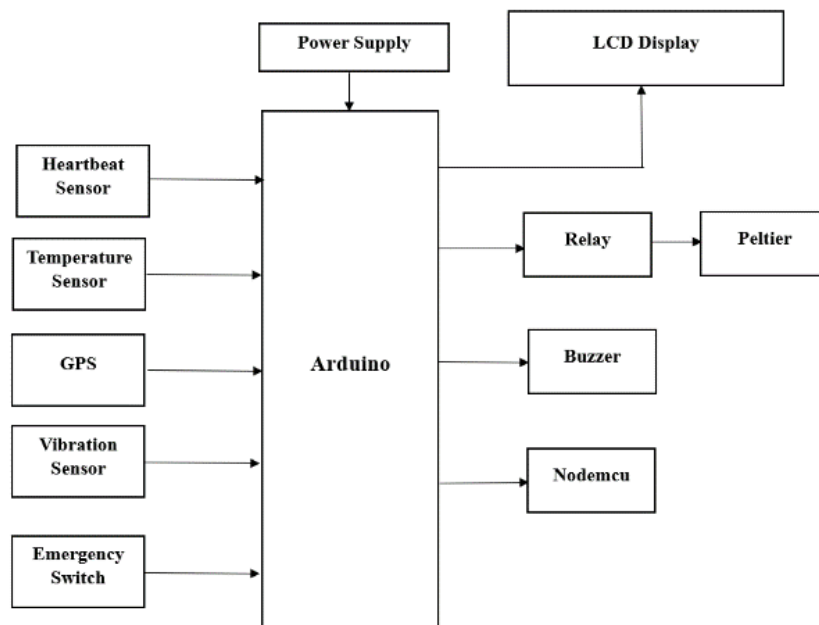
The solider health monitoring and position tracking system retrieves the exact location and the health status of a soldier. The sensors collect all the health information such as heart rate, body temperature of the soldier. GPS module gets the exact location of the soldier in terms of latitude and longitude send it to the Arduino board. These data will be fed to the Arduino, Arduino IDE code contains the base station number to which the message has to send, which is interfaced to a Nodemcu modem.The Nodemcu and GPS component is used to communicate with the base station regarding the health status and location of the soldier. The Arduino retrieves the exact location details from the GPS and sends an SMS to the concerned base station over Nodemcu modem. An LCD display is connected to the Arduino for displaying the data received before being sent over Nodemcu.

5. METHODOLGY

The proposed approach for assessing the health of soldiers using machine learning and the Internet of Things is intended to assess the health of soldiers in real time. It uses a hardware configuration with several sensors, including an Arduino Uno microcontroller, a heartbeat sensor, an ECG sensor, and an LM35 temperature sensor. The microcontroller is connected to the sensors, and the LCDs are the values. The collected data is then used to make predictions on soldier health severity using a logistic regression algorithm. A Graphical User Interface (GUI) is developed using Flask to provide a user-friendly way of inputting and outputting data. After registration, soldier details such as name, blood pressure, spo2, heart rate, ECG rate, and temperature are entered into the system. Based on the data gathered, the program then forecasts whether the soldier is in a normal or critical state. A buzzer and vibrator are used to create an alarm system that will alert the appropriate authorities in the event of an emergency. In an emergency, the soldier's whereabouts can be tracked using the GPS module. The system recommends giving the soldier common medications in urgent situations. This methodology is expected to enhance the monitoring and tracking of soldiers' health, minimize response time in case of a medical emergency, and provide immediate care to those who need it. The system has the potential to improve the healthcare of soldiers in remote areas where medical facilities are limited.

6.WORKING MODEL

The working model of this project is for soldiers involves several interconnected components. The system comprises biometric sensors that collect health data such as heart rate,temperature and blood pressure from the soldiers. The location information is gathered by the GPS module and sent to a microcontroller together with the health information. This data is processed by the microcontroller, which then uses wireless communication devices to send it wirelessly to a cloud-based platform. Military personnel can receive real-time monitoring and alerts from the cloud-based technology, which also saves and analyzes the data. The battery is charged by solar panels, which is how the power management unit makes sure the system never stops. To guarantee user-friendliness and reduce military operations' interference with soldiers, the complete system is made to be lightweight, durable, and small.All things considered, the functioning model of the solar and IoT-based soldiers' health monitoring and position tracking system is a complex and trustworthy system that can deliver vital health and location data in real-time, facilitating quick action and guaranteeing the troops' safety in the field.
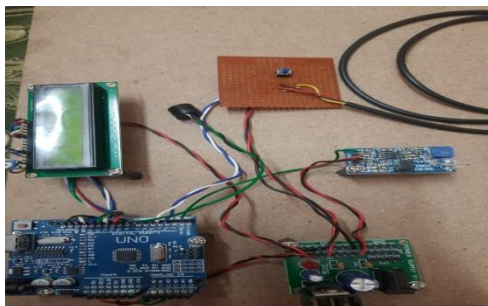

Figure 6.1: Functional model

The gadget comes with a 3.7V battery that may be increased to 5V by using the boost regulator that is included. This is necessary for the operation of the sensors and other parts of the gadget. The supplied solar panels can be used to recharge the battery. When the soldier is in the field, the device is turned on. It then continuously monitors the soldier's temperature and heart rate, and the data is supposed to be transferred via cloud and indicated through the telegram bot.
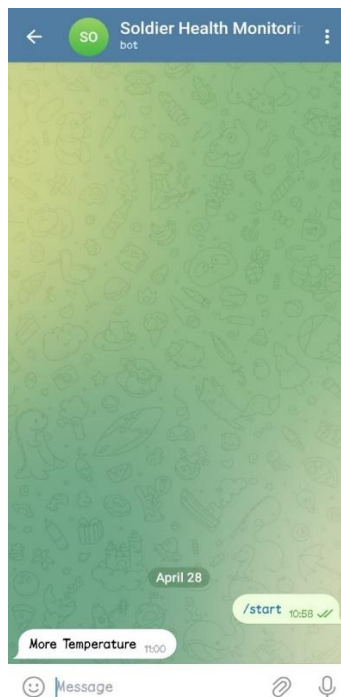
7. Results

System initialization confirmation:
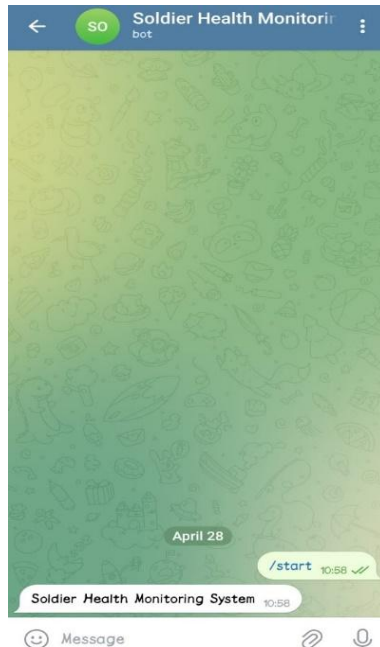
Emergency Notification:

High Heartbeatalert:

High Temperature alert:

8. Conclusion

 By including heart rate sensors, temperature sensors, Nodemcu, and GPS modules for military location and communication, this system can increase soldier safety. The soldier's physical condition can be tracked by the base station using this sensor. Additionally, they might receive medical guidance to help them solve the issues. This project can have a display component added. By having a computerized map that displays every soldier's position to the unit, it will be easier for them to find the target and prevent attacks.

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