IOT BASED MILITARY HEALTH SERVICE IN BATTLE FIELD AND GPS TRACKING

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***Abstract*— Now a days, preserving national security is of utmost importance and a key aspect of this is the battlefield. The soldiers in the army play a crucial role in ensuring safety and protection for the country. To ensure their safety, various measures are taken, including the use of advanced medical monitoring instruments integrated into their equipment. These instruments consist of a range of biosensors, peltier crystals, and transmission systems with processing capabilities, enabling low-cost wearable health monitoring solutions. Thermal jacket which gives better protection to them who are working in extreme weather conditions. Additionally, GPS technology is used to calculate latitude and longitude of soldiers, facilitating easy tracking and direction finding. In fact, some militaries are even considering embedding GPS devices into the vests and uniforms of their soldiers, enabling real-time monitoring by a central base station.**

Keywords – Health monitor, Wearable, Biosensors, GPS and Peltier crystal.

I. INTRODUCTION

THIS project's objective is to develop a soldier monitoring system that can track a variety of vital indications, such as heartbeat rate and body temperature. The system is made with Internet of Things technology, which is mostly used to track physiological data like body temperature and heart rate. Using Internet of Things technology, a prototype model have been developed to continuously track the body temperature and heart rate of troops. So that the appropriate steps may be taken, The technology has the ability to communicate the soldier's medical data and location to the base station. The soldier's whereabouts is monitored via the Internet of Things and Global Positioning System(GPS) and vital signs like heart rate and body temperature are measured. The project's mastermind is a programmable integrated circuit (PIC 16F877A) with 368 bytes of RAM memory and 8 kb of Flash ROM.

The following circumstances can result in the soldier being rescued:-

1- Having a life-threatening illness, like a soldier's heart attack.
2- In a circumstance that might result in the emergence of a potentially fatal ailment.
3- In an essential physiological condition.
4- In extreme weather conditions - Thermal jacket gives better protection.
5- To find the soldier's precise position.

II. EXISTING SYSTEM

This paper's goal is to present a model that keeps track of a number of important health indicators for a person, such as blood pressure, body temperature, Electrocardiogram (ECG) and heartbeat rate (BPM). The collected data is transmitted through the internet to the patient's smartphone application. The registered doctors can access this data on their smartphone application or standalone computers. The system displays results based on the data, the doctor can prescribe suitable medication to the patient.

III. PROPOSED METHODOLOGY

The project comprises two units: Soldier Unit and Server Unit. To enable wireless communication, we haveutilized the Internet of Things (IoT) technology. We have incorporated a programmable IC (PIC16F877A) with a Flash-type ROM of 8K and a RAM memory of 368 bytes to oversee project operations.

The GPS is linked to Soldier unit, which is moving unit and relays the soldier's present position in the area of conflict to the server unit via the IoT module. The signal is received by the server unit's receiver and keeps track ofthe position. The Soldier Unit is equipped with a temperature and heartbeat sensor that can communicate with the server unit and ascertain whether or not a soldier is alive. Soldier can be use the keypad linked to the device to hit a button to call the server in case of an emergency.

To avoid bodily parts becoming inactive such as leg, hand, fingers, and hand because of a lot of snow, we have integrated thermoelectric cooling, which employs for the soldier to keep warm, when two dissimilar materials come together, in order to induce a heat flux, the Peltier effect is used. Status is shown on an LCD display. Server Unit is monitored through PC (personal computer), and the status is displayed on an LCD screen.

IV. LITERATURE REVIEW

In 2019, Global Positioning System and Internet of Things are proposed as the foundation for a military location and health signal system by Jasvinder Singh, et al (IoT). It's feasible to communicate continuously. Because troops can communicate from wherever, they can always reach out to one another in an emergency. The combination of an ARM Processor and low-power peripherals lowers the total energy use of the module. Peripherals are more lightweight and compact so that soldiers may transport them safe andsecurely. Security and safety are provided by the ability to trace a soldier's whereabouts utilising GPS from any location on earth and by a health system that monitors important healthmarkers.

Niket Patil et al. [2] suggested a method for assessing and observing health, in 2018. This project resulted in an Internet of Things based tracking and system for monitoring troop health. The module may be attached to the army soldier body and utilise GPS to detect position and state of health. The base station will get this data via IoT. The shown module permits the usage of a low-cost circuit to protect a valuable soldier's life on the front lines.

In 2018, William Walker A.L.,et al.[3] suggested a portable system of health monitoring. The writers debated numerous biosensors that are light, portable, wearable and tiny devices designed to assess military health. The BSN is composed of sensors that may be applied to a soldier's body to track their health status in real time, including heart rate and temperature. An technique for establish a BSN-based system for monitoring the soldiers health in real time is given inside this paper.

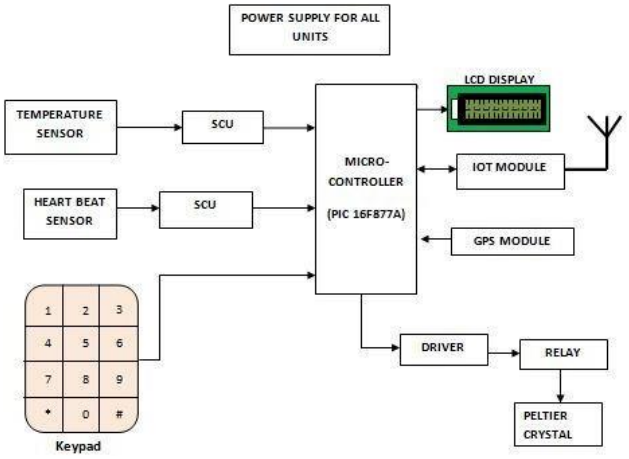
An Internet of Things-based heath monitoring system for soldiers engaged in war was developed by Akshay Gondalic, et al. in 2018 [4]. This technology allows an army base station to track soldier movements and keep an eye on their wellbeing by using GPS, temperature sensors, heart rate monitors, and other equipment. Wireless sensor and GPS data transmission between the other soldiers will be accomplished using ZigBee technology. Moreover, it has been suggested that the LoRaWAN network be used in conflict zones with no cellphone network coverage nonexistent or does not allow data transfer between the leader and base station. The acquired information will be uploaded to the cloud to be utilised for that K denotes data analysis using the clustering approach and forecasting in the next stage.

Afef Mdhaffar, et al.[5] published a paper in 2017 on Internet of Things based Health Monitoring using LoRa WAN, in which collected biosensor data is transmitted to be analysed module using low power, low cost, and secured communication utilising a LoRa WAN network architecture. Heartbeat rate, temperature and blood sugar levels has been monitored in isolated locations where cellular network coverage is either limited or non-existent or does not permit data transfer. The typical region served by LoRa WAN is around 33 km when the LoRa WAN gateway is located outdoors at a 12 metre height. Other long-range cellular systems like GPRS/3G/4G have a claimed power consumption that is five times higher than that of this monitoring module.

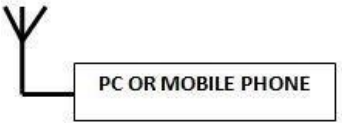
V. RELATED WORK AND COMPONENTS

Fig.1 displays a graphical depiction of the system's components are Soldier Unit and Server Unit.
The primary goal of the study is to present an Internet of Things based the system for keeping track of troop's whereabouts and keeping tabs on their health. The system consists of input devices including temperature sensor, GPS and heartbeat sensor, as well as a power source for the device's processing. A block diagram is used to depict the different components of the system.

(a) Soldier Unit:



(b) Server Unit:



SCU – Signal Conditioning Unit
PC – Personal Computer

Fig.1 The system's block diagram

The primary purpose of this system is to enhance the safety of military operations during emergencies. The system is made up of a number of parts, including a heartbeat sensor that gauges heart rate by observing blood flow at the fingertip. The ambient temperature is also measured using a temperature sensor, which provides data in Celsius. To locate soldiers, the system incorporates GPS technology, which provides precise location information. The GPS modem is utilized to receive signals from satellites and determine the soldier's latitude and longitude, which are subsequently transmitted through serial data to the controller.

A microcontroller board with open source software built on the programmable IC (PIC16F877A) microcontroller and developed by IoT module. It examines location, body temperature and heart rate. The IoT module triggers the buzzer if the heart rate exceeds or falls below its threshold value, as well as if the temperature exceeds or falls below its threshold value, it activates the heater or cooler. IoT module gets temperature, heart beatrate and location data through serial connection. It reads and receives serial data when Wi-Fi is available, uploads data to the IoT and compare the data to see if any threshold values deviate and then does all of this in real time,it will display on the army base station. In case of an urgent situation, the soldier has the capability to communicate with the server by pressing a button on the keypad connected to the device. The software running on a PC to monitors the status of the Server Unit, and the relevant information is exhibited on an LCD display.

COMPONENTS:

The heart of the project consists of some components are programmable microcontroller IC(PIC16F877A), Heartbeat Sensor, Temperature Sensor, Peltier crystal , 4x3 matrix Keypad & 2X16 LCD and GPS.

Temperature sensor :

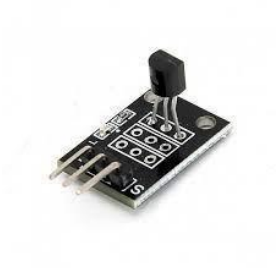


Fig.2 Temperature sensor

Temperature sensor is shown in Fig.2. LM34, to measure the surface body temperature, a high precision integrated circuit temperature sensor is used, having a linear change in output voltage with temperature measured in degrees Fahrenheit.

GPS module :

Fig.3 GPS module

GPS module is shown in Fig.3. GPS module it offers NMEA0183 standard strings. It offers the time, date, latitude, longitude, speed, and direction of travel. Unfortunately, the strings were simply used to retrieve the latitude and longitude data.

Heartbeat sensor :

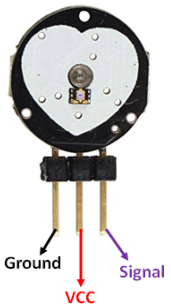


Fig.4 Heartbeat sensor

Heartbeat sensor is shown in Fig.4. When a finger is placed on heartbeat sensors, the sensors are made to produce a digital heartbeat. The LED blinks in unison for each pulse as soon as the heartbeat detector begins to function.

Peltier crystal :

Fig.5 Peltier crystal

Peltier crystal is shown in Fig.5. Over linked conductors, To create an electric current, a voltage is applied. When current travels via the connections of two conductors at a junction, heat is dissipated and cooling occurs. The opposing joint receives heat. It creates a hot side and a cold side.

Keypad and 2X16 LCD :

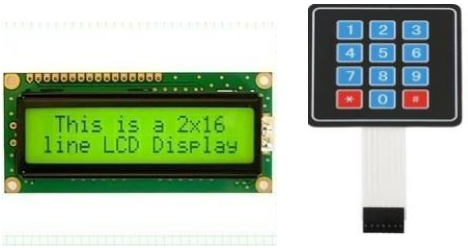


Fig.6 Keypad and LCD

Keypad and LCD are shown in Fig. 6. The device's interface is made up of a 2X16 LCD and a 4X3 matrix keypad. The keypad is used as an input device to read and process the user's keystrokes.

IC(PIC16F877A) microcontroller :

Fig.7 IC(PIC16F877A) microcontroller

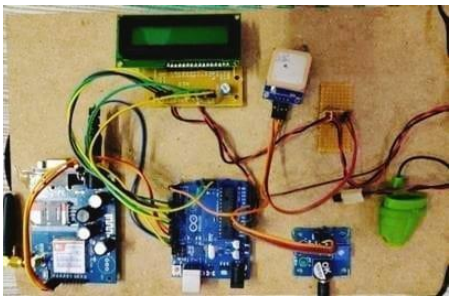
Fig.7 shows IC(PIC16F877A) microcontroller. The 200 nanosecond instruction speed of the IC(PIC16F877A) microcontroller is not the sole basis of its power, according to Microchip. Many embedded applications, including home automation systems and bank security systems, frequently use this 40-pin microcontroller.

VI. RESULTS & DISCUSSION

Table 1 and Fig.8 illustrate the result. An acknowledgement message including GPS position information is sent to the intended receiver. If the soldier's vital signs deviate from the specified threshold values, The base station receives an alert message including the soldier's specific position. Therefore mentioned procedure can gather and evaluate the soldier's critical bodily measurements and location data. If the ambient temperature exceeds the threshold value of 30 degrees, the cooling system will be activated. Similarly, if the temperature drops below the threshold value of 22 degrees, the heating system will be activated. If the soldier's pulse rate deviates from the normal range, the system will sending message to Base station including the soldier's location. The gadget was attached to the army unit's jacket and used GPS to track their health status and current position.

Table 1: Sensor parameters and their output

Parameters	Sensed values
Heart Beat/minute	**69 bpm**
Temperature	**20°C**
Latitude	**38.23977**
Longitude	**-97.81568**
Peltier	**Heater On**



Circuit Setup

Solider Unit

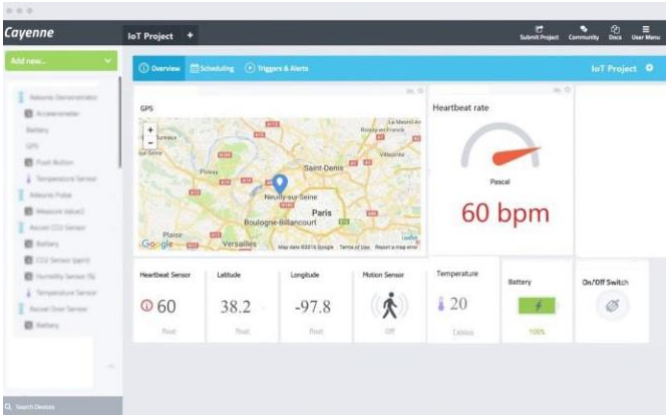


Fig.8 Final Results

VII. CONCLUSION & FUTURE SCOPE

This paper's goal is to share information regarding the effective implementation and execution of the Soldier Monitoring system, which is capable of gathering and processing physiological data from the human body. In the

future, if the user comes into contact with the sunlight, we may improving system even further by including a solar collecting device that automatically recharges the power source. We may also incorporate a camera into the device so that medical professionals or other interested parties can remotely observe the soldier's actions. The system may be altered to better serve patients, and a camera that records video can be utilised to remotely monitor their activities while also providing information such as the time, date, latitude and longitude as well as the speed and direction of movement. The strings were only used to extract the latitude and longitude data, though.

The proposed system utilizes a fixed interval transmission system that delivers accurate readings. Transmission of data from the military unit to the command and control centre is accomplished by the system using zigbee transceivers. This enables the military control unit or another soldier to aid the soldier in an emergency case by monitoring their health parameters, the environment, and their whereabouts. This system is highly advantageous during war and rescue operations due to its unrestricted use. It ensures the safety and security of soldiers and is highly effective due to its well-matched component interfaces. The system is easily attachable to the soldier's hand. However, the system can be improved by using a better routing algorithm to enhance reliability and energy efficiency. Additionally, the security of data can be enhanced through encryption and decryption techniques.

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