

# A Comprehensive Review on Health Monitoring and Tracking System Designed for Soldiers

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**Abstract:-** A defense system that has been properly managed is set in the country in order to protect the invasion from external sources and disturbances that are caused internally. This paper provides a report on a health monitoring and tracking system for soldiers based on Internet of Things(IoT). This paper proposes various studies conducted to aid the soldiers and the general public with health monitoring and improve the quality of healthcare. This also focuses on various technologies used by the authors in developing the mentioned projects.

**Keywords:-** Arduino, Heart Beat sensor, Panic Button, GP, Power Controller, Quality, RC Boat, Temperature Sensor, BP sensor.

## I. INTRODUCTION

A defense system that has been properly managed is set in the country in order to protect the invasion from external sources and disturbances that are caused internally. The force, Army and Navy are the pillars of defense system. The unit which is land-based is the Indian Army, while the air defense is dealt by the Indian Air force and naval unit is the Indian Navy. Hands are joined with agencies to deal with problems also saving lives in times of natural calamities like earthquake, etc.

In the current scenario of the current world the factor that is most important is the nation's security. The nation's security is dependent on the force of the army. There is no possibility to protect a nation without a soldier. The information which is not available to the soldier causes injuries which cause an increase in the death or permanent. An observation has been made those causalities are often caused because of injuries rather than that happen directly on the battlefield. The numbers can be reduced if there is availability of real-time information in the control room regarding the soldier's health and location. There are a number of issues regarding the soldier's safety like knowledge of soldier's current location, not able to have communication to the control room during operations, not

having attention and the operations under various environmental conditions are some of the protuberant issues with respect to safety. Therefore, a wireless, portable tracking system that is low-cost with higher reliability and is considered important to protect the life of soldiers fighting on battlefields.

During previous decades, some machineries such as walkie-talkie, cable-based systems, RF transceiver, ZigBee GSM tracking systems were extensively used technologies to track soldier's life. Nowadays we know how much the world has been modernized and upgraded so as we get upgraded, we need to upgrade the society with us. However, the previous technologies suffered from one or more disadvantages as mentioned below:

1. **High installation cost:** The cost to set up was very high and in some places, it was very difficult or say it as impossible to install even after spending so much of amount.
2. **Loss of signal:** In some geographical locations near country side border, mountains, dense forest and so on the old communication devices failed to communicate to the control room.
3. **High noises as well as the bulky nature:** The older communicating devices like walkie-talkie used to make a lot of noise while communication. Which may be very risky at any secret operations on large land scale.

The main motivation behind our project is to protect the country's soldier's life on the battlefield. There are many problems faced by the military such as soldiers want to know the location, he may not be able to do that and they might not get help during a panic situation. It is our duty to help the soldier's and ensure their safety in the war field. The technology is advancing and we can use it to aid in the safety of the soldiers who are constantly risking their lives to ensure the country's safety. If we can get help or forces before any casualties happens then we can minimize the mass injuries from taking place.

It can be seen that existing technologies are insufficient. The system can also be helpful in improving the communication between soldiers in situation of emergency and also provide the appropriate steering to the control room. Therefore, it can be said that the system acts as a lifesaver to the army everywhere. A transportable sensor device having advanced sensing choices can be established to help the armed forces.

## II. HEALTH MONITORING AND TRACKING SYSTEM

The system can be kept in the soldier's bag kit i.e. the soldiers always carry a bag which will contain weapons and device used for communication. This IOT model consists of finger based, heart beat sensor to keep track of the pulses of the soldier, Dallas temperature sensor to measure the body temperature, BP sensor to measure blood pressure, GPS receiver to determine exact position in real time and location of the soldiers and the panic button to help the soldiers during situations of emergency. These sensors are used to sense the health parameters of soldiers and track their location.

The figure 1 shows the Block Diagram of health care monitoring and tracking system. These collected data from the sensors is sent to the Arduino. Arduino UNO is a microcontroller board. The data present in the Arduino will go to the base station from the place that the military personal officer tracks location of the soldier and continuously monitor the health status using the monitoring application. If all these health parameters exceeds certain range, there will be a health status indicator in the continuous monitoring application which turns red and also a buzzer will be out which indicates that they need to take the action immediately to save the life of the soldier.

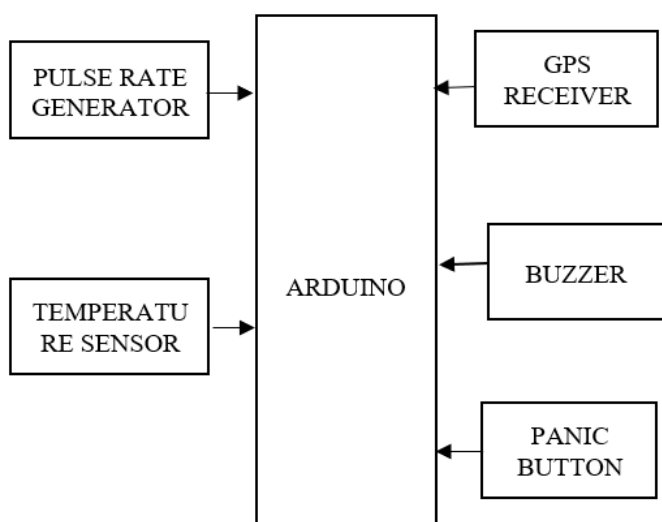


Fig 1:- Block Diagram of health care monitoring and tracking system

## III. LITERATURE REVIEW

Niket Patil et.al.[1] proposed a tracking and health monitoring for armed forces which is based on the Internet of Things (IoT). The system has been fixed on the soldier's form to monitor the location using GPS as well as wellness. The obtained data from the system is sent to the base station. The system consists of minor physical gear, sensors like temperature sensors and heartbeat sensors, transmission modules such as GPS modules, and WIFI That is wearable. Hence, a low-cost system is implemented to protect the valuable lives of soldiers on the fields.

Surbhi Sharma et.al.[2] proposed A Real-Time Autonomous Soldier Health Monitoring and Reporting System Using Commercial Off the Shelf (COTS) Available Entities. The reported system enables the detection of the position and position of the soldiers whenever essential. The transmitter contains a GPS module and pulse sensor which is programmed in such a way that the healthiness of the soldier is examined also, communication with the other end at any remote location is made possible. This paper approaches a utilizes the IEEE 802.15.4 standard framework and multifarious wireless network sensors. The performance of the device initially is tracked by using two personal computers. Also, the real-time functioning of the system boosts to extend this device for a wireless health monitor network. The paper also tells that further improvement can be made by integrating using the existing equipment. Interfacing is attained effectively and results suggest proper intimation of location and pulse rate when pulse value drops immediately. The device is Robust in nature and it works under any environmental conditions and climatic changes at the battlefield and borders of the country.

R. Kumar PG et.al [3] proposed A Patient Monitoring system using raspberry Pi based on IoT. In this paper patient's heartbeat, respiration rate, and body movement and temperature are observed using the Raspberry Pi board. Raspberry Pi has a Linux server on a small platform at a little budget. It behaves like a small clinic as it connects Respiration, Accelerometer, Heartbeat, and Temperature sensors. Raspberry Pi gathers data from sensors and transfers it to an IoT website wirelessly. Once the sensors are connected to the Raspberry Pi board, the output can be accessed in two ways. One is connected to the mouse, keyboard, monitor to the Raspberry Pi board where output is visible on the monitor screen. Another way is by using the data cable, Raspberry Pi board is connected to a computer or laptop in which putty software is installed where output is exhibited. Further, Raspberry Pi MAC Programs and address to the website is added. After the internet is connected to Raspberry Pi, it performs as a server that automatically sends a patient's health status to the website. A patient's health status can be monitored by anyone around the world at any place using this website link. Further, this system may be made better by Adding other devices like EEG and ECG to monitor patients' healthiness.

Hasmah Mansor, et.al.[4] proposed a Body Temperature Measurement for Remote Health Monitoring System. The main motive of this project is to develop a device to measure body temperature that can be observed by the doctor in real-time as well as historical data by the internet with an alarm/indication if any abnormalities. In the above health monitoring system, body temperature and heart rate wireless sensors were developed, but this paper only focuses on body temperature wireless monitoring systems. The readings will be sent to the microcontroller using Xbee wireless communication from the temperature sensors. WLAN which is Wireless Local Area Network can be used to send the real-time data to the health monitoring database. IEEE 802.11 standard-based Arduino with Ethernet shield is used for this purpose. Test results from a group of voluntary exhibits the real-time temperature reading that is successfully checked remotely (at doctor's computer) and locally (at home) and the readings are compared with the commercial thermometer. Improvement can be made in terms of integration and sizing between more measurement devices, such as, electrocardiography (ECG).

Yashash Jain, et.al.[5] proposed a state-of-the-art wearable technology for soldiers useful in monitoring their health on the battlefield including their exact locations using IoT. The device is capable of measuring body parameters like heart rate, temperature, oxygen levels and GPS location. All information will be transmitted through MANET system and LoRa transceivers so base-camp using IoT in encrypted format and these data can be used for individual soldiers analysis and base camp can provide help medical facility to the soldiers if needed. The result of the system reflects the real time information via MANET communication that can be useful to provide immediate help to the soldiers.

R. Gilang Fauzi Yusuf et.al.[6] proposed that the advances in technology in the world of medicine. The sensor measures the input from the body of the patient. The pulse and temperature sensor which is MLX90614 and the air pressure sensor namely MPX5050DP, is connected to the microcontroller. To design the hardware, the internet network is connected to the device. In the software design, the system program design has been carried out. This system is fully integrated which makes it possible to measure the human body parameters from anywhere at any time in real-time. In the blood pressure operation, we can add a parameter on an LCD to determine the pump value that is in mmHg. The output is through a Telegram Bot. Wi-Fi internet network should be used, for transmitting easily in areas with no internet network it is best to find better alternatives,

Manikandan, et.al.[7] have reported an AIoT based Real Time Environment Monitoring and Tracking System for Soldiers using SN-MQTT Protocol. The aim of the project is to monitor the environmental attacks on soldier's such as detecting the gun fire attacks, presence of toxic gases, and providing an alert when there is a threat. This is continued by a virtual fence that is created using Global Positioning System (GPS) that can be used for tracking and guarding the soldiers within zones that are safer and with including communication between the surveillance unit and the soldier that is wireless.

This is made using Wi-Fi Module to return in times of emergency therefore protecting from danger. Artificial Intelligence of Things is the collaboration of Internet of Things (IoT) with deep learning (RNN-LSTM Model) which can help to achieve information transfer between administrator and soldier and predicting the presence toxic gas in atmosphere. The component required are ESP8266Wi-Fi Module, Arduino Mega 2540, Power supply module, LCD, Alert switch, MQ135 Gas sensor, NEO-6MV2 GPS Module. Administrator present at the surveillance unit monitors the status of soldier on a webpage that is created. It is created using the Node Red Programming Tool where Sensor Networks - Message Queuing Telemetry Transport Protocol (MQTT) carry out the data. Therefore, the system makes sure of the soldier's security. This work can further be extended by using bio medical sensors that determine physiological and psychological status of the soldier and adding of Accelerometer and Gyroscope together to recognize the soldier's activity using weapon control and algorithms of machine learning. Therefore, meeting requirements using the mentioned methods can improve strength of the military field to large level.

Hari Krishna, et.al.[8] proposed a structure, an IoT based technology. An investigation was also done on the health recorder and tracking of soldiers by Unmanned Aerial Vehicles. This paper, represents the system of Work Breakdown System which will be scaled on the warrior's jacket and the details from WBS will be transmitted to the unmanned aerial vehicle then for the description of powerful communication, data is transmitted to the troop carrier. Nodemcu esp2866 WIFI module, Heart detector (EC -0567), GPS, DHT11, UAV, Gas sensor MQ135 are the hardware components used. LoRaWAN technologies cannot be used as they are meant for small range. So, in this paper it is resolved by using UAV. Also, the details transmitted can be seen by the secured official website in the receiver part so, the conveying between the transmitter will be stronger. The sheath of a soldier will consist of a heart beat pulse sensor, body temperature sensor, global positioning system humidity sensor, gas sensor, and medic space is the outcome which appear in website page where the exactness are equivalent to pragmatically of the commercial device. Suppose there is any disintegration in the UAV server, the warrior will provide the support aid as the server 2 which is the troop carrier where, module 2 details will be uploaded so that the problem in the data communication can be solved. The paper terminates that, large number of soldier lives will be saved if this system will be executed in the country.

Rolando P. Reyes Ch, et.al.[9] offered a new touch to IoT Solution on Model-Driven Engineering for warrior health Monitoring. Zheng & Carter cautioned about the IoT might have a rapid change in distribution of all forms of industry. The Ecuadorian military were trying to furnish their soldiers with an IoT based technology in order to monitor and to envisage the condition of health in warfare conditions instantaneously. Although, the execution and research, has been a special challenge because of two main problems: (1) the design organization, the integration of components. And (2) complex implementation due to fragmentation in the

technology between the armed contexts (e.g. navy, air force and army). It presents an approach towards solution to the execution of warrior health monitoring in various missions instantaneously, using a technology like Model-Driven Engineering (MDE) and Takeuchi & Nonaka's research model. Hence it is able to obtain meta-model associated with 4 domains of IoT which is embedded within the 4 factors of product line activity. The meta-representation has resolved the problem which was associated with execution as product line while increasing the intelligibility between the engineers and researchers.

E. Lai et.al.[10] proposed Digital soldiers: Transforming which involves a personalized health both in challenging, changing environments. Military is one among the major partner and also the driving force in the medical transformation. Therefore, it is very important to solve all the problems and implement the best available remedies and strategies for the protection of soldiers. Medicine supply in undesirable conditions, where there is no much power available and where network access is a challenge. And the new era of a low-level conflict by military is a further challenge which has changing operational things and particularly involving the increased human assistance in such unstable countries. Hence, the new solvable for the problems of medical science, technology can be with the help of mobile health monitoring, training i.e., the mobile applications an interoperable medical standard for the armed forces, and an individual digital health record.

#### IV. CONCLUSION

This technology is helpful in any type of critical condition and the accurate location of the soldier has to be tracked. This system also overcome the soldiers missing in action as their will be a live tracking. And it also develops a communication link between the soldiers and soldiers with the control room. It has various biomedical sensors such as temperature sensor, heartbeat sensors which senses the temperature and pulse of the soldier and sends it to the control room accordingly. This IoT sensor-based project has got the latest technology in it and many other advantages can be:

Nowadays this IoT based health-system is one of the most demanding factors in case of medical field. This project plays a very important role during emergency.

This project can be used by disabled/unwell soldiers who can't go to the hospital and also by those soldiers who need continuous monitoring

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