



# **Soldier Position Tracking and Health Monitoring System: A Review**

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**ABSTRACT:** During wars and military search operations, soldiers get injured and sometime become losses. To find soldiers and provide health monitoring, army base station and need Global Position System device for locating soldiers, wireless base station to sense health related parameters of soldiers and a wireless transceiver to transmit the data wirelessly. Upon losing in the battlefield it is necessary for the base station to guide the soldier. The base station can access the current status of the soldier which is displayed on the Personal Computer. The proposed system can be mounted on the soldier's body to track their health status and current location using Global Positioning System. These information will be transmitted to the control room through Internet of Things. The proposed system comprises of tiny wearable physiological devices, sensors, transmission modules. Hence, with the use of the proposed system, it is possible to implement a low cost mechanism to protect the valuable human life on the battlefield.

**KEYWORDS:** Arduino board, Biomedical sensors, GPS, IoT, Oxygen Analyzer, Remote health monitoring, Tracking.

## **I. INTRODUCTION**

In today's world, the science and technology is growing rapidly with new inventions, innovations and with advance level of their implementations. These emerging advance technologies are firmly adapted by defence services to provide some safety systems to our soldiers. There are many parameters by which defence services can provide safety to the soldiers. The nation's security is monitored and kept by army, navy and air-force. The important and vital role is of soldiers who sacrifice their life for their country. There are many concerns regarding the safety of the soldier. Soldiers entering the enemy lines often lose their lives due to lack of connectivity, it is very vital for the army base station to know the location as well as health status of all soldiers. So many soldiers lost in war fields as there was no proper health backup and connectivity between the soldiers on the war-fields and the officials at the army base stations.

All must be really concerned about the safety of the soldiers, so decided to build a project which will efficiently keep a check on the health status of the soldier, and his precise location to equip him with necessary medical treatments as soon as possible. Soldier's tracking is done by using GPS and Wi-Fi module, which is used to provide wireless communication system. For monitoring the health parameters of soldier we are using bio medical sensors such as temperature sensor and heart beat sensor. An oxygen level sensor is used to monitor atmospheric oxygen so if any climatic changes the soldiers will be equipped accordingly. The infantry soldier of tomorrow promises to be one of the most technologically advanced modern warfare has ever seen. Around the world, various research programs are currently being conducted, such as Future Force Warrior (FFW) and Future Infantry Soldier Technology (FIST), with the aim of creating fully integrated combat systems. Alongside vast improvements in protective and weaponry subsystems, another major aspect of this technology will be the ability to provide information superiority at the operational edge of military networks by equipping the dismounted soldier with advanced visual, voice, and data communications. Helmet mounted visors, capable of displaying maps and real time video from other squad members, ranges of physiological sensors monitoring heart rate, core body temperature etc. These devices will improve situational awareness not only for the host but also for collocated military personnel who will exchange information using wireless networks. The challenge was to integrate these piecemeal components into a lightweight package that could achieve the desired result without being too bulky and cumbersome or requiring too much power. One of the fundamental challenges in military operations lies that the soldier's are not able to communicate with control room



# International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: [www.ijircce.com](http://www.ijircce.com)

Vol. 6, Issue 3, March 2018

station. In addition, the proper navigation between soldier's organizations plays important role for careful planning and co-ordination. So in this paper we focus on tracking the location of soldier from GPS, which is useful for control room station to know the exact location of soldier and accordingly they will guide them. Also High speed, short range, soldier-to-soldier wireless communication using IoT based Wi Fi module. Sensing, GPS navigation, Bio-medical sensors, Wireless communication.

Hence, a portable, wireless low cost tracking system with high reliability is the need of hour for the protection of valuable life of the soldiers on the battlefields. Further, the said mechanism must also be real-time in nature so that the immediate and effective rescue operations can be initiated. Motivated from these issues, a portable real-time tracking mechanism is proposed in this paper. The proposed system is based on IoT concept. The proposed system will be helpful in the real-time continuous monitoring of soldier's health parameters and location. Pulse rate, humidity with body temperature, and oxygen level in an environment can be monitored along with the location tracking of the soldiers using GPS can be monitored using the proposed system. The transmission of these parameters to the control room is carried out by IoT. The control room receives the position and orientation of soldier from GPS. Further, soldiers can be guided for the correct directions during the operations using GPS.

## II. RELATED WORK

Many efforts were reported by different academicians and researchers to track the location of the soldiers along with their health condition on the battlefield. Technological developments are taking place at an accelerated pace. However, people's awareness of the current situation varies, depending on the information they possess and their ability to interpret it critically, in the specific context of the society or social group they belong to, live and work in. Technological evolution is inevitable, as is the quest for new knowledge about the natural world. Hock *et al.*[1] had discussed on recent advances in growing technology, and on various wearable, portable, light weighted and small sized sensors that have been developed for monitoring of the human physiological parameters. The Body Sensor Network (BSN) consists of many biomedical and physiological sensors such as blood pressure sensor, electrocardiogram (ECG) sensor, electro dermal activity (EDA) sensor which can be placed on human body for health monitoring in real time and describe an idea to develop a system for real time health monitoring of soldiers, consisting of interconnected BSNs. The location tracking has great importance since World War II, when military forces realized its usefulness for navigation, positioning, targeting and fleet management. Kurhe *et al.*[2] had introduced a system that gives ability to track the soldiers at any moment. Additionally, the soldiers will be able to communicate with control room using GPS coordinate information in their distress. This system is reliable, energy efficient for remote soldier health monitoring and their location tracking. It is able to send the sensed and processed parameters of soldier in real time. It enables to army control room to monitor health parameters of soldiers like heart beat, body temperature, etc. using body sensor networks. The parameters of soldiers are measured continuously and wirelessly transmitted using GSM. While in another Nikam *et al.*[5] had presented an idea for the safety of soldiers. There are many instruments which can be used to view the health status of soldiers as well as ammunitions on them. The Bio sensor which consists of various types of small physiological sensors, transmission modules have great processing capabilities and can facilitates the low-cost wearable solutions for health monitoring. GPS module can be used to log the longitude and the latitude by which directions and location can be traceable easily[6]. RF module can be used for high speed, short-range data transmission, for wireless communications between soldier to soldier that will help to provide soldiers health status and location data to control room. So by using these devices and modules, we are trying to implement the basic health observing system for soldier in low cost with high efficiency and high reliability. GPS tracking device and RF transceiver module provide the wireless system to monitor the health parameters and location tracking of soldiers. Wararkar *et al.*[4] had proposed an idea of tracking the position of soldier as well as to give the health status of the soldier, which enables the army base station to plan the strategies according to current situation during war. By using this system, the army base station will come to know the position of soldier and the health parameters such as body temperature and blood pressure of soldiers. However, all these systems are stuck-up by one or more reasons like costly implementation, delay in response and bulky nature. Hence, a portable wireless real-time system based on IoT concept is proposed in this paper which will be an effective alternative to the existing technologies in the area of soldiers health and location tracking on the battlefields.

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Vol. 6, Issue 3, March 2018

## III. PROPOSED SYSTEM

The proposed system not only performs the task of health monitoring but also does the tracking of soldiers using IoT. The control room can acquire the details about the position and orientation of soldier from GPS. Even in case of losing their direction, it is the responsibility of the GPS to guide the soldier in correct direction. The base station can access the current status of the soldier using IoT as the different tracking parameters of the soldier get transmitted via Wi-Fi module. These information will be stored on the Cloud and can be extracted on the PC of control room, as and when extracted. Based on these information, the authorities can initiate immediate action by deploying a medical, rescue team or any backup force for their help. Using various biomedical sensors, health parameters of a soldier is observed along with its surrounding environment condition observed. The proposed system is divided into two unit i.e. Soldier unit and control room unit. LM35 temperature sensor, Pulse Rate sensor and oxygen level detector sensor for continuously monitoring health status of soldier. GPS is used to determine real time position and orientation. Data originating from sensors and GPS receiver is processed and collected using Arduino (ATmega328P) processor. The specific choice of processor is due to the facts that, as compared to the other data processors used in existing system; Arduino board is a low cost and easily available with flexible interfacing capability. So ATmega328P better than other processors.

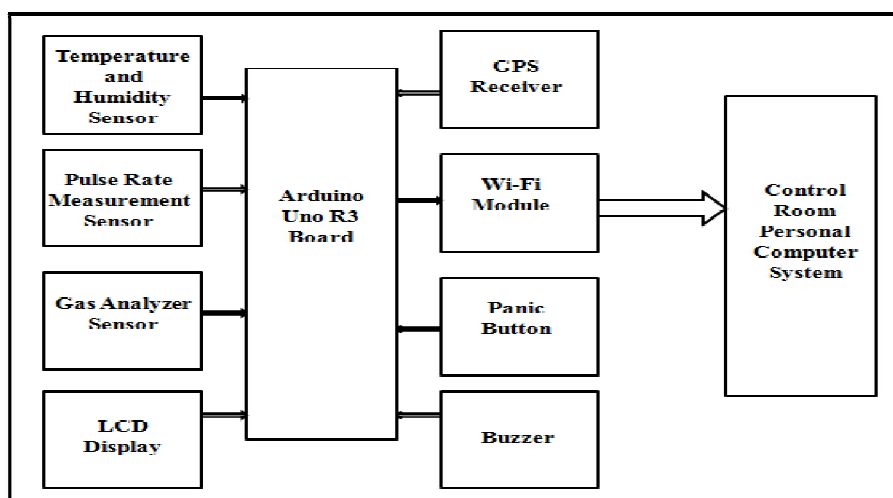


Figure 1. Block diagram of Arduino based soldier unit and control room base station unit

This system is deployed along with the soldiers kit. The ATmega328P processor will act as the brain of the unit. Soldier unit consist of LM35 Temperature Sensor, Pulse rate sensor, Grove - Gas Sensor, GPS Receiver, Arduino, Panic Button, Buzzer, 16\*2 LCD display, (Nodemcu ESP8266) Wi-Fi module. The threshold values of the desired parameter is set and pre-programmed in the Arduino as per the surrounding environment and the person under test. In the proposed experiment we have considered body temperature for the verification purpose. Whenever the temperature is deviated from the set threshold value, system gets alert and sends the data to the control room with a buzzer beep.

## IV. CONCLUSION

In military operations, one of the fundamental challenges is that the soldiers are not able to communicate with control room and sometimes not even with the other soldier. The protection of the country is primary mission for soldiers. So, there is concern regarding the safety for real Heroes. Several types of instruments have always been designed with the advent in technology to ensure safety and tracking of soldier. But the one or more reason, all the



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systems might have some drawback. Hence by proposing a portable wireless real-time system based on IoT concept it can directly connect with the control room with a maximum distance. And by using Arduino based soldier unit it becomes less complex and portable. This system can be helpful to provide the accurate location of missing soldier in critical condition and overcome the drawback of soldiers missing in action. The proposed system is also helpful to improve the communication between soldier to soldier in emergency situation and provide proper navigation to control room.

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