Soldier Health Status Detection and Location Tracking System using Internet of Things

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Abstract

In this paper we present an Internet of Things based Soldier Health Status Detection and Location Tracking System using Internet of Things for the safety purpose of the soldier. The soldier is the critical unit of the nation and their life is valuable. Lot of soldiers are facing many problems such as communication with the control room and no proper medical help at a proper time which leads to the death of the soldier. To minimize such cases, we have proposed a continuous alert system to track location and monitor the health of the soldier. The proposed system is very useful in detecting location of the soldier in real time using GPS and communicating the health status parameter continuously using GSM module embedded in microcontroller. The tiny sensors can be fixed to the Soldier body or dress of the soldier to detect body parameter and transmit the information to the control room and other soldiers when there is a low body rate or when it falls than the defined threshold value. The soldier can send an alert message to the guardian and control room for the help in the panic situation using an application. The control room/guardian also uses android application to request the location of the soldier automatically in the panic situation. The soldier can also request for the nearest hospital information in the emergency.

Keywords: Microcontroller board, medical sensors, GSM and GPS, and Threshold.

I. INTRODUCTION

In the world, the Indian army stands second largest force. The role played by the soldier is very important for the nation security. However, the army is suffering from lot of health issues in the remote place due to unavailability of medical treatment at a proper time which may result in the death/loss of the soldier. The lack of
communication with the control room regarding the health status and location of the soldier would lead to loss of the soldier too. This can be reduced if the real time information is available to control room as well as another fellow soldier who are nearer to the victim soldier. The cost of the soldier life is very important. During the battle the soldier may accidentally land up in the enemy location without his knowledge, so he may need guidelines to know his current location. Other than the battle field injuries, the soldier may also suffer from extreme climate condition and fall sick, in such situation if care is taken then the life of the soldier would be saved. This can be achieved by using the IOT. The health parameter such as heart rate, ECG and body temperatures are monitored continuously and communicated with the control room automatically. When the soldier feels that he is lost, he can send an emergency message voice message alert to the control room and request for location using an android application which provides the longitude and latitude of the soldier using GPS.

II. PROBLEM STATEMENT

The objective of the system is to provide the real-time continuous monitoring of soldier’s health parameters and location tracking using IOT and GSM and GPS module. In emergency situation it helps the soldier by providing a panic button which sends an emergency message as well as he voice alert using which he can communicate with command officer and other soldiers. Depending on the message the control room takes the necessary action to save the life of the soldier.

III. PROPOSED SYSTEM

This project provides an IOT based health detection and location tracking of the soldier in a panic situation by using the hardware consisting of the sensor with GSM module for communication purpose and an android application. The sensor components are mounted on the soldier body which reads the body parameters of the soldier such as heart rate, ECG rate and body temperature and reports to the control room and guardian/other soldier automatically using GSM communication when it is not normal. The android application is used by the soldier in the emergency to request for the help from the control room and other soldier who are near to him, it is also used by the control room to track the current location of the soldier and take necessary action. The soldier can also request for medical center details near them using this application. The proposed system is not only used to monitor and track the soldier only during the war time but also when the soldier is travelling from one place to other places and even in the places where extreme weather condition.
IV. RELATED WORK

In [1], the author has worked on the safety of the soldier by tracking his health condition during the war which provides the control room to plan the war strategies and tracks the location if by chance the soldier is lost. When the control room notices the soldier is lost in the battle field then they guide the soldier in the right path. The soldier’s health information is transmitted to the control room and keeps track of the injured soldier and take necessary action to save the life. This system mainly focuses on the soldier who have involved in the warfare and tracking the health of the injured soldier.

In [2], the author has focused to improve the communication of the soldier with the control room people and control plane operation continuously. He has also focused to track and guide the position, direction and the surrounding temperature of the soldier by using the wrist watch mountaineers and by providing headphones to guide the soldier to the right path. He has also used the technology like the Radio collar strapped to ankles, so the movement of the soldier can be tracked and displays the current location at the base station. Microcontroller is used to record the body parameters of the soldier’s and transmitted to the base station.

In [3], the author has focused to provide the embedded wireless system for the soldier and to minimize the time to track the location of the soldier, rescue and search operation and their health status using GPS module and wireless body sensors, the data are collected from the GPS and sensors are transmitted using the ZigBee technology to the base station/control room. It also allows the soldier to communicate with the other fellow soldiers within the wireless transmission range, they can also request help from the control room.

In [4], the author has worked on the location tracking system using GPS with the Google Maps based monitoring for vehicle. This system provides tracking irrespective of weather condition. It gives the shortest route to track. This idea is deployed in the proposed system to track the current location and movement of the soldier along with the shortest path to him, which is need for the rescue operation.

In [5], here the author focus is on monitoring the ill patient, continuously and reports the change spontaneously to the concerned person using the ZigBee technology,
which helps in protecting the life of the individual. In this paper only, the ill patient is considered for monitoring. Once the patient is discharged from the hospital, the body sensor is mounted on them to monitor their health condition and take necessary action in case of emergency by reporting to the guardian.

In [6], the author has worked to track the location of the soldier and monitor the health status using an Arduino board. For the transmitting of data to control room he has used WIFI module for connectivity.

In [7], the author focus is to provide a good connectivity between the control room and the soldier by using ZigBee module and LoRaWAN module. The monitoring is based on master slave approach by Machine learning concepts.

V. SYSTEM ARCHITECTURE

The system architecture is as shown in the figure 2.

A. Hardware: The architecture is comprised of 8051 micro controller, GPS receiver, GSM component, panic button, LCD display and various biomedical sensors such as temperature sensor, Heart beat sensor, ECG sensor and an additional bomb detector sensor with buzzer.

The GSM and GPS component is used to communicate with the control room regarding the health status and location of the soldier. The soldier normal body parameters rates are recorded in the memory of the micro controller. When it falls certain defined threshold, an alert voice message is sent automatically to the control room. For example, if ECG sensor detects that the ECG of the person is not normal, and then it sends a voice message as ECG abnormal repeatedly for 5times to the control room and also it displays on the LCD. The temperature sensors record the body temperature of the soldier based on the environmental condition. The heart beat sensor initially records the normal heart beat rate of that particular soldier and stores in the memory of the controller, once the heart rate falls below or exceeds the threshold value, then a message is sent to the control room. The body rate of the soldier is measured for every 2sec and reports it if it is not normal. On receiving the message, a necessary action can be taken to provide the medical help at a proper time.

We have also implemented a button also known as panic button so that when a soldier is in a panic situation like enemy are attacking or if he feels that he is lost, then he can communicate with the control and other fellow soldier by pressing the panic button which in turn sends an alert voice message to the concerned control room/other soldier as EMERGENCY. Once the control room receives the Emergency message they track the location of the soldier and communicate with them to provide the required help.
An additional feature bomb detector is also used for the safety purpose of the soldier. When a soldier is moving around if any mines are detected then the buzzer alerts the soldier and displays a message in the LCD display it also sends a normal message to the control room.

Figure-3: Snapshot of Hardware System
B. Android application: There are two applications, a one is known as IOT application and second one is controller/guardian application installed in smart phone for the safety of the soldier.

1. Soldier side: In IOT application, we have to define certain parameters such as Threshold value, phone number of control room and other fellow soldier who are in the same team and Email id.

The threshold is an accelerometer value which measures the vibration of the body, when it exceeds the defined value it automatically sends an voice alert message to the control room and other soldier repeatedly for 5 times as “THE PERSON IS IN THE PROBLEM NEED HELP”.

2. Control room side/other fellow soldier: The control room application has a phone number field, loc, and photo, complaint, nearest info and view data.

Once the control room receives a message from the soldier, then by using the phone number of that particular soldier, we can track the location using loc button which extracts the longitude and latitude of the soldier and opens a Google map on the control side automatically and displays the location and the shortest distance to reach.
that panic soldier. The photo button is used to capture soldier surrounding automatically and sends this image to the email which is specified in the IOT application.

The complaint menu is used by the other fellow soldier or by the soldier itself for requesting the control room to send the medical help to the specified location. When this button is pressed it sends a message to the control room along with the location details for help. The nearest info is used to view the nearest hospital details in the surrounding area near to the soldier who requires help. The view data is used to view the biomedical sensor rates.

VI. RESULTS

![Figure-5: Snapshot of soldier side application](image)

![Figure-6: Snapshot of control room side.](image)

VII. CONCLUSION

The major problem in the military is lack of proper communication between the soldier and the control. From the proposed system we can conclude that the various biomedical sensors sense the body parameters in real time and transmit the data to the
control room, there by tracking the current location of the soldier using GSM and GPS technology and even the bomb near the surrounding of the soldier. It also provides the spontaneous communication with control room and other fellow soldier in a panic situation to get help.

REFERENCES


