

SOLDIER HEALTH AND NAVIGATION DEVICE

¹Arun Gupta, ²Amit Sharma, ¹Arushi Sharma, ¹Divyanshu Tomar, ¹Anirudh Mishra

¹Btech Student, ²Assistant Professor

Department of Electronics and Communication Engineering

Moradabad Institute of Technology, Moradabad-244001

Uttar Pradesh, India

ABSTRACT

In army search operations and wars, soldiers become lost and get injured. There are many developments which give ability to track the location of soldiers at any moment at any place. The aim of this project is to provide medical monitoring for soldiers in real time. From above proposed system, we can conclude that we are able to transmit data which is sensed from remote soldier to army control room using wireless transmission technology. The system is completely integrated and can track the location of soldier at anytime from anywhere on the earth using GPS receiver. This system helps to monitor health parameters of soldier using heart beat sensor to measure heart beats and temperature sensor to measure body temperature of soldier. This system helps the soldier to get help from army base station and/or from another fellow soldier in panic situation. This system provides the location information and health parameters of soldier in real time to the army control room. This system is very useful to military forces during war as it can be used in battlefield without any network restriction. With so much advancement coming in the field of electronics we should think about helping our soldiers by making gadgets which can be helpful to them during war times. Sometimes during war proper communication between the soldier and the base station becomes the main issue because soldier can get help from the base only when the base has the information about the exact location of the soldier. And the base station can also keep the track record of the condition of the soldier's health. This project will be helpful in tracking the location of the soldier as well as checking the health status of the soldier during the war, which enables the army personnel to plan the war strategies. This project will also help the soldier in finding the correct path if he lost in the battlefield.

KEYWORDS: GPS module, GSM module, Temperature Sensor, Heart Beat Sensor, Humidity Sensor, Flex Sensor.

I. INTRODUCTION

Soldiers spend most of their life serving on borders. The role of soldier in safeguarding the frontiers of his motherland is unique. He lives for the nation and dies for the nation. That's what makes Indian Armed Forces elite and best over all other Armed Forces. The defence of the country is soldier's primary mission. So, there is concern regarding the safety of our real Heroes. Several types of instruments have always been designed with the advent in technology to ensure their safety and tracking. We are introducing this project which will be very useful for providing health status of the soldiers and provide medical help to them at critical situation in battlefield. The Primary idea was of tracking the soldier and navigation between soldier to soldier health statuses along with knowing environmental situation of them during the war, which enables the army personnel to plan the strategies of war.

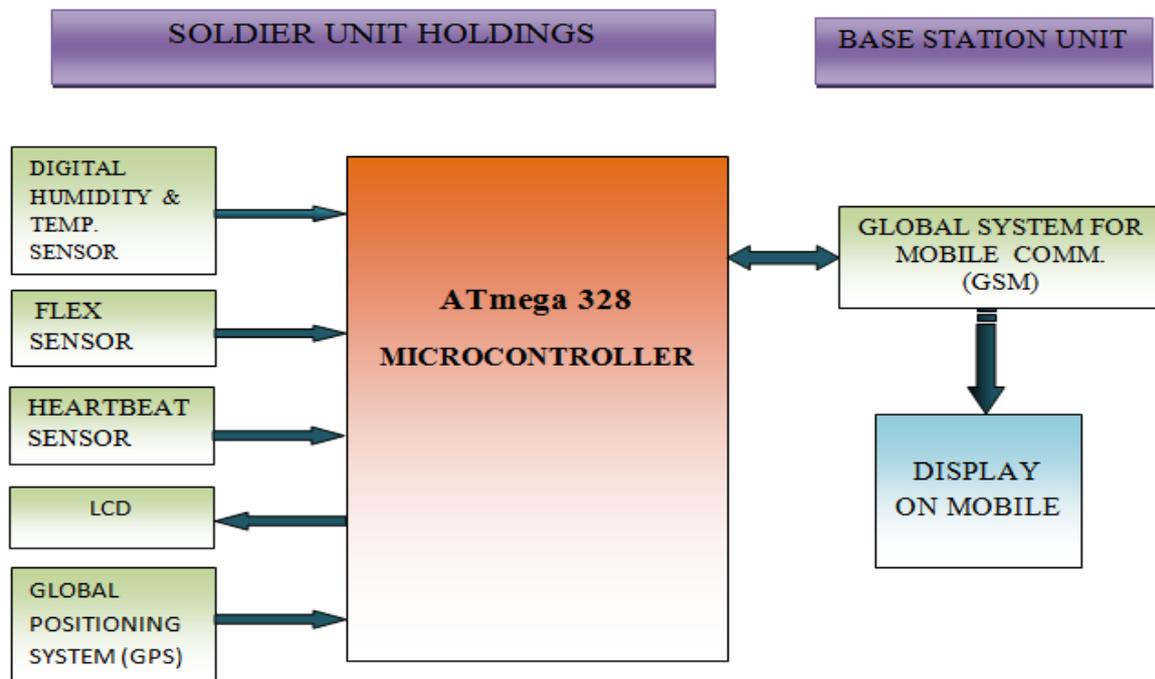


Fig.1: Block Diagram of Soldier Health and Navigation System

The control room gets location of soldier from GPS. Even in case of losing the battlefield it is the responsibility of the GPS to guide the soldier on correct path if he is lost in the battlefield. The base station can access the current status of the soldier which is displayed on the mobile phone as a text sms. And hence, officials at the base station can take immediate action by sending help for the soldier or sending backup. Using various biomedical sensor health parameters of soldier's are observed, as well as surrounding temperature, oxygen levels are observed. The position and orientation of soldier is trapped using GPS and the GSM Module helps in sending the messages from soldier unit to the base unit. In our system we are basically focusing on Soldier's health in terms of his heartbeats and his body temperature. If soldier gets injured and becomes unconscious by gunshot or due to any other reason, then his heart beats start increasing or decreasing gradually. In this type of situation where the information about current heart beat rate becomes the indispensable part of soldier, this project emerges out as best to acknowledge the doctors at server site with the correct and fast information. If heart beat either increases above critical level or decreases below the critical level, a message is automatically sent to server with the help of GSM modem. GPS tracker will give the current location of the soldier which will be useful for locating soldier's location and providing medical help as early as possible. In case if soldier is injured then by using the GSM modem attached to the device an SMS will be sent to hospitals in the vicinity or to the base station to provide help.

II. LITERATURE REVIEW

Pangavhane S.M., Choudhary Sohanlal and Pathak Bhavik^[1] proposed a model in which they are attaching the device in the soldier's pocket, this device will be tracking the location of the soldier and giving the health status of the soldier which includes pulse rate and body temperature of the soldier. They are using ARM LPC2148 microprocessor which is of 32 bit having 64 pins. The main reason behind using this IC is because it supports multiple pipelining which multiple instructions can be executed in a single cycle by which speed of operation increases. They are using SR87 GPS module and attaching its antenna to the soldier's jacket which provide the latitude and longitude value above the sea level. GSM will act as the messenger between the soldier and the base station. LM35 temperature sensor and heart beat sensor for the health status of the soldier. The main motive of device is to do the effective tracking of the soldier, to monitor and provide the health status of the soldier continuously and to maintain low cost, high reliability and compact size so that it can easily fit into soldier.

Shruti Nikam, Supriya Patil, Prajka Powar and V.S. Bendre^[2] using the concept of various wearable sensors for the monitoring of human physiological parameters. They are calculating two simple parameters of the soldier which are body temperature and pulse rate because no large and complex circuits are required in measuring them. They are using LM35 low cost temperature sensor because it does not require signal conditioning and pulse rate sensor for pulse rate measurement. For tracking soldier's location there is a GPS (SR87). They are using graphical LCD for displaying customized characters. RF transceiver (CC2500) is also been used in this project. GSM module for messaging purpose. And ARM LPC2138 microprocessor has been used for this project. Their main motive is to provide security and safety for soldiers by maintaining continuous communication between the soldier and control room station. They are using ARM processor and low power requiring peripherals to reduce overall power usage of the system.

Govindaraj A., Dr. S. Sindhuja Banu^[3]: In this paper they had focused on tracking the position of the soldier and measuring the various health parameters using different biomedical sensors. The main aim of using GPS is to track the position of the soldier so that the personnel at the base could guide them at the war field and side by side could check the body temperature of the soldier. Web cam (video camera) is also used. Keypad is used for giving any type of input if needed.

M.V.N.R. Pavan Kumar, Ghadge Rasika Vijay, Patil Vidya Adhikrao, Bobade Sonali Vijaykumar^[4]: They found their idea from the mountaineers as mountaineers uses wrist watch for tracking their position, to know the temperature of their surroundings, to know the direction.

R. Archana, S. Indira^[5]: In their paper they had given stress on the protection of soldier itself especially of those who go on special tasks or missions because if a soldier is safe then our nation is safe. For this GPS for tracking their position and different biomedical sensors are used for checking their health in a definite interval of time and also to monitor their movement. They focused on using light weight sensors and a power source which give more than sufficient power to these components.

Shweta Shelar, Nikhil Patil, Manish Jain, Sayali Chaudhari, Smita Hande^[6]: In this paper they have focused on helping the soldiers by providing medical assistance at the battlefield. They have considered the soldier's health in terms of heart beat and body temperature of the sensor. For providing this type of facility GPS is used for tracking the soldiers. In case if soldier is injured then by using the GSM modem attached to the device an SMS will be sent to hospitals in the vicinity or to the base station to provide help.

P.S. Kurhe, S.S. Agarwal^[7] their paper is concerned with real time tracking and health monitoring system of remote soldier using ARM 7. Their main aim is to develop a real-time wireless monitoring system which can medically monitor the soldier and can also provide the location of the soldier using GPS and providing continuous information about the health status of the soldier to the control room station with the help of the GSM module. Their soldier unit consist of two types of sensors which are temperature sensor and heart beat sensor, these sensors measures the parameters and convert those parameters into the digital form.

The ARM7 LPC2148 plays an important role as well in controlling all the devices and it has inbuilt analog to digital convertor. Their device will provide high level safety to human life and it suitable for Indian conditions as well and it is of low cost and has less complex circuitry. But sometimes the accuracy of the device may get affected by some factors such as weather and the environment around the mobile soldier unit.

Ingawale Kajal, Shinde Pooja, Pawar Poonam and Prof. Miss. Kadam M.M.^[8] they are focusing on the idea of GPS based Soldier Tracking and Health Indication System. For navigation they are using GPS module and GSM will act as the messenger between the soldier unit and base unit. They are using oxygen sensor, pulse rate sensor, body temperature sensor for health indication system. This system is designed for soldier's security and safety. In future instead of battery they can even upgrade their system by using solar cell battery. They are using oxygen sensor for environmental analysis. This sensor will measure the oxygen level in the environment and compare it with the threshold level. If the oxygen increases or decreases from this level then message is send to the control room station automatically.

III. PROBLEM IDENTIFICATION

The major challenge was to make the device as compact as possible so we have the limitation of the size of the circuitry, all the components used are very small in size and less in weight, all the sensors

and modules are very small and cover less area. Second challenge was to keep the device light weight so that soldier should not face any problem in carrying. If the soldier is not in the condition to operate the whole device and has to convey some important message we have given a emergency switch for it or he can use a flex sensor to give an instant message.

Sometimes sensors give false result so we can use better version of sensors to avoid these false results. At some places there is network issues so that we can use walky talky to resolve them. One of the fundamental challenges in military operations lays in that the Soldier not able to communicate with control room administrator. In addition, each organization needs to enforce certain administrative and operational work when they interact over the network owned and operated by other organizations. Thus, without careful planning and coordination, safety operations are not much effectively executed. There are a number of ways in which the soldier can communicate with the base station eg.- Bluetooth, Zigbee modules etc. But most of these technologies are short range and having certain drawbacks, while the soldier may be far away in the battlefield. Hence, GSM is a technology that can be used to communicate with the base station and it also has long range. Certain sophisticated GSM technologies can work even when there is fog or in a dense forests.

IV. DESIGN AND IMPLEMENTATION

In this project we will attach the device in the soldier’s pocket. This device will contain the heartbeat sensor which continuously gives the reading of heartbeat of soldier to the base station. The temperature sensor will give the data of body temperature. The system also composed of GPS and GSM. Through GPS the location of the soldier is traced and through GSM the soldier is able to communicate directly with the base unit. The other part of this system is base unit which act as receiver where the complete data of each and every soldier is recorded. The system work on two way communication. Firstly there can be query from the receiver side to know the status of the soldier. Secondly there can be the automatic response from the system side to know when the heartbeat of the soldier stops that is when the soldier is died.

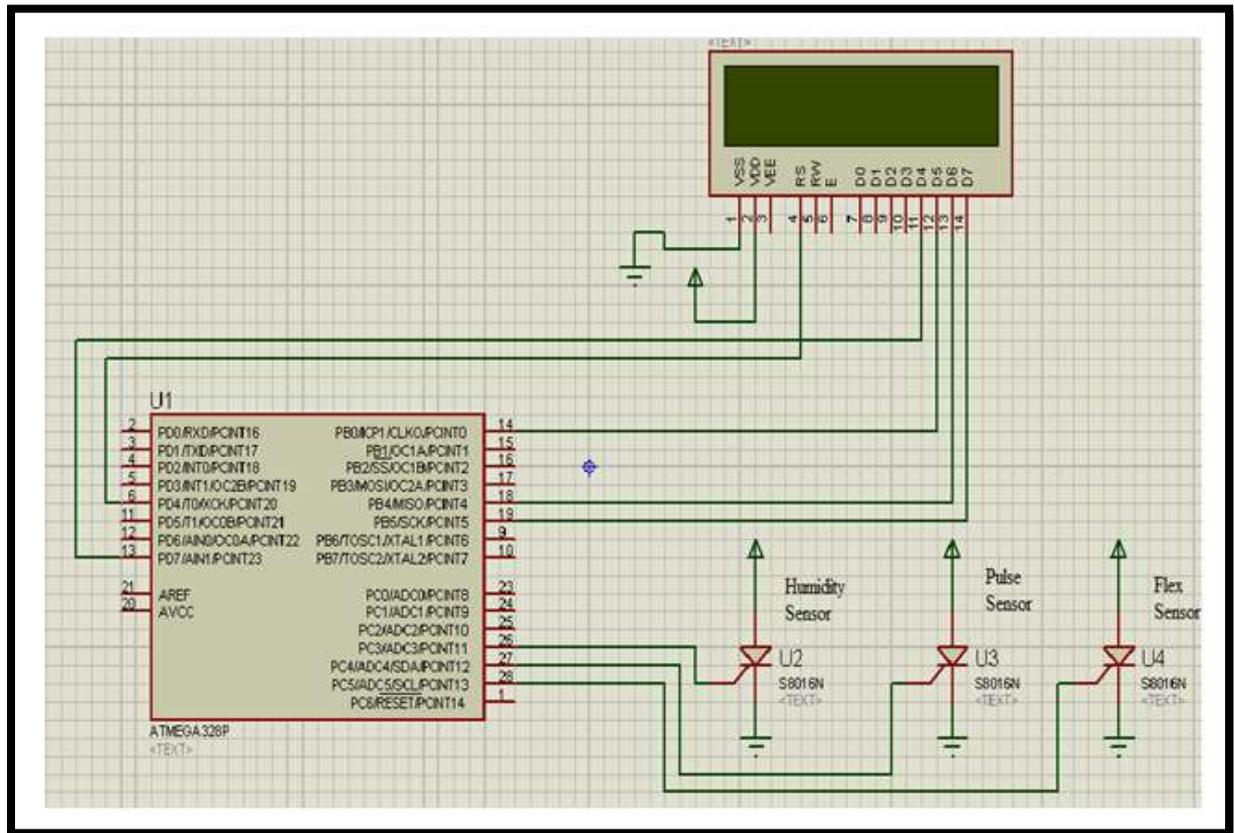


Fig.2: Simulation of the circuit

Soldier unit: This is carried up by the soldier

It has mainly 4 parts:

- 1) Sensors: Here to find the health status of soldier we are using a digital humidity and temp sensor, flex sensor as well as pulse rate sensor. These sensors will measure the body temperature and the pulse rate of soldier and will be stored in microcontroller memory.
- 2) GPS Receiver: The GPS is used to log the longitude and the latitude of soldier, which is stored in the microcontroller memory. GPS receiver receives and compares the signals from orbiting GPS satellites to determine its geographic position.
- 3) GSM Modem: The GSM unit sends the SMS to the army base camp containing the health parameters and the location of soldier. The core of data communication about this system lies in wireless communication control terminals that uses GSM Modules to transfer long-distance data extensively and reliably. It Support instructions of AT commands.

Base unit: Upon receiving the SMS, the text message in mobile shows the soldier's GPS co-ordinates also the health status is displayed. In this way the army official's can keep a track of all their soldiers. Contents of Text sms are as below:

Soldier = Mr. ABC XYZ

Temperature = 027

Heartbeat = 065

Longitude = 18 38.6878 N

Latitude = 73 45.3423 E

EMERGENCY HELP, will be displayed when flex sensor is triggered.

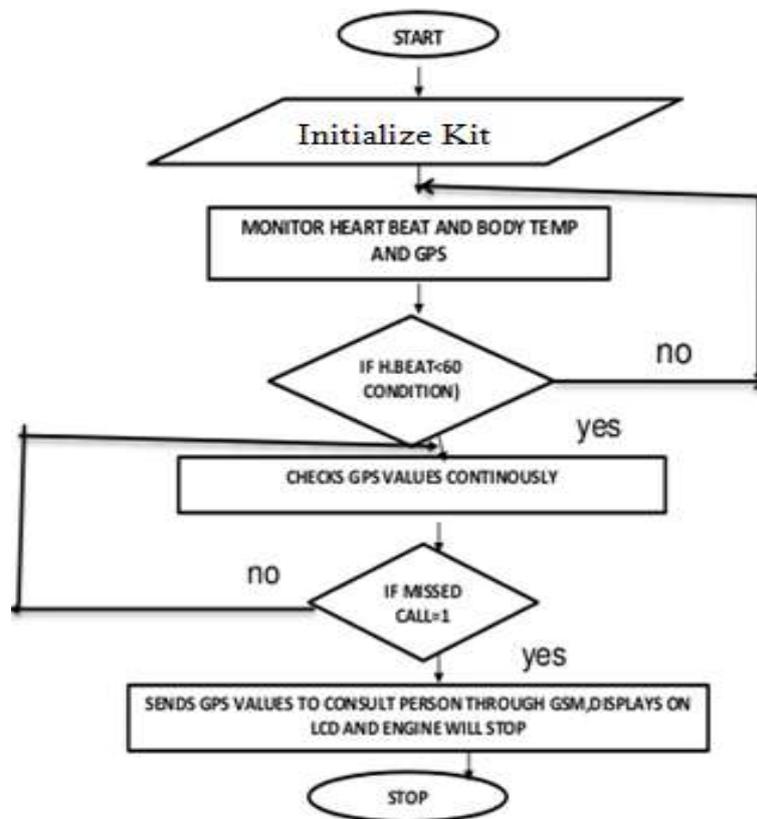


Fig.3: Flowchart of the model

V. RESULTS AND DISCUSSIONS

When switch is pressed on microcontroller board then commands shown in figure are send to the GSM module. When GSM module receives this commands, it will send the sms on particular mobile number wrote in commands, which shows that there is an emergency. During the war when soldiers are in war

field, army base station needs to get the information about the location as well as the health status of all the soldiers. We interfaced GSM modem, GPS Receiver, Flex Sensor, Digital Humidity and Temperature Sensor, Heart Beat Sensor and LCD Display with ATmega 328p. We have also done programming for interfacing all these devices with microcontroller.



Fig:4. Message received on Mobile

We have also checked GPS receiver by use of mobile and Terminal software and studied different types of commands in received code. And soldier himself also aware about his location and health status. By this system we overcome this purpose. We have also used USB programmer for nano microcontrollers. We have Implemented microcontroller development board and check microcontroller development board by loading simple LED blinking program in it with help of USB programmer for microcontrollers.

VI. CONCLUSION

From the above proposed model, we have come to the conclusion that we can transmit the data sensed from the soldier unit to army control room using GSM. Above system is integrated with various sensors telling about the health condition of the soldier. This system is capable of tracking the location of the soldier in terms of latitude and longitude. Overall the aim of Soldier Monitoring System is to provide safety and security to the soldier. With the help of this system soldier can get help from the base station in panic situations. This system is of great help in emergency conditions, it will keep the track of the soldier's heart beat rate, body temperature of the soldier, location of the soldier, temperature of the surroundings.

We are implementing a special sensor called flex sensor which will give the alert signal to the base station by the special gesture made by the soldier in the emergency times.. No need to go on field to check the soldiers. By implementing this system we can improve the security of our soldiers , thus improving the safety of our nation . It helps in critical information and warnings to soldiers and can apply to more of them to current weak locations thus strengthen the defence system . This project provides Higher reliabilty, Cost effective, Fast and efficient means of soldiers health and position tracking system , thus helps in improving their health and safety standards. During the war when soldiers are in war field, army base station needs to get the information about the location as well as the health status of all the soldiers. And soldier himself also aware about his location and health status. By this system we overcome this purpose.

VII. FUTURE SCOPE

The accuracy of system is affected by some factors such as weather, environment around the mobile soldier unit, GPS receiver. The future works include optimizing the hardware system, choosing a

suitable GPS receiver. Improving the routing algorithm can be improved by neural network. This system has many advantages such as large capability, wide areas range, low operation costs, effective, strong expandability and easy to use. Upgrading this setup is very easy which makes it open to future a requirement which also makes it more efficient. There is always chance to improve any system as research & development is an endless process. The following measurements can be done in future: Pulseoximetry and, Galvanic-Skin Resistance Amenia.

Other measurements can also be done in future:

1. Soldier Voice Recognition system: IC HM2007 can be used to recognize the voice samples of the soldiers for better security purpose.
2. A Camera can be fitted into the system so as to enable the base station to get a real time view of the battlefield.
3. We can dial an emergency call if the soldier health parameters crosses threshold value or soldier coordinates goes out of a certain / pre-decided track.
4. Less complex circuit and ultra-less power consumption.

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AUTHORS

Arun Gupta was born in Lucknow, and done his schooling from Sacred Heart Inter College Sitapur, Uttar Pradesh, India. Presently he is pursuing B.Tech from Moradabad Institute of Technology, Moradabad, India and his branch is Electronics and Communication Engineering.



Amit Sharma was born in Moradabad. He is working as an Assistant Professor in MIT Moradabad. He has 7 years of working experience in academics. He obtained his Bachelor's Degree in Electronics and Communication Engineering from MIT, Moradabad and Master's degree from Mewar University, Rajasthan.



Arushi Sharma was born in Meerut, and done her schooling from S.S. Children Academy, Moradabad, Uttar Pradesh, India. Presently she is pursuing B.Tech from Moradabad Institute of Technology, Moradabad, India and her branch is Electronics and Communication Engineering.



Divyanshu Tomar was born in Moradabad, and done his schooling from K.C.M School Moradabad, Uttar Pradesh, India. Presently he is pursuing B.Tech from Moradabad Institute of Technology, Moradabad, India and his branch is Electronics and Communication Engineering.



Anirudh Mishra was born in Mumbai, and done his schooling from V.K.S. School Moradabad, Uttar Pradesh, India. Presently he is pursuing B.Tech from Moradabad Institute of Technology, Moradabad, India and his branch is Electronics and Communication Engineering.

