

Soldiers Navigation and Health Monitoring System using GPS and GSM

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Abstract: In today's world enemy warfare is one of the most important factor in nation's security. The Security of the nation mainly depends on army, air force. There are many concerns which regarding the safety of these soldiers. One of the important problems in the military field is that soldier does not able to communicate to the control room This proposed system is very useful for soldiers in the field, who involve in missions or in special operations. This system which enables GPS (Global positioning system) for tracking of these soldiers. It also helps to monitor the health status of the soldiers. This system helps to find medical parameters like temperature, heartbeat rate, pressure level. This information can be collected and implemented with a server for mobility. This server will provide the connection to the server at the base station using a wireless connection. Each soldier has a GSM (Global system for Mobile communication) module will enables the communication to the base station in case of any emergency.

Keywords: Pressure sensor, Temperature sensor, Heartbeat sensor, Soldiers tracking.

1. Introduction

The prominent aim of the project is to provide an ability to track the location and monitor health of soldiers in real time who get injured in battle field. In order to identify the health status of soldier's various sensors are included. The sensors used in the project are temperature sensor, heart beat sensor, metal detector, blood pressure sensor and IR sensors. These sensors are interfaced to a PIC microcontroller along with GPS and GSM module. With the help of GPS, the location of the soldier is tracked along with the latitude and longitude. The data from these sensors and from the GPS are collected and transferred to control room using GSM module. The salient role of GSM module is to send the alert message to the control room displaying the sensor value with latitude and longitude to indicate the soldier is in critical condition. By using the location sent by the GPS, biomedical sensors and GSM the control room can understand the health status and position of soldier.

2. Proposed system

A. Objectives

1. 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.

2. The proposed system uses GPS to track the direction of the soldier in the form of latitude and longitude values.
3. This information will be transmitted to the control room.

B. Block diagram

The block diagram describes our project idea which is going to be implemented. The idea of the project is tracking the soldier as well as to monitor the health status of the soldier in the war field.

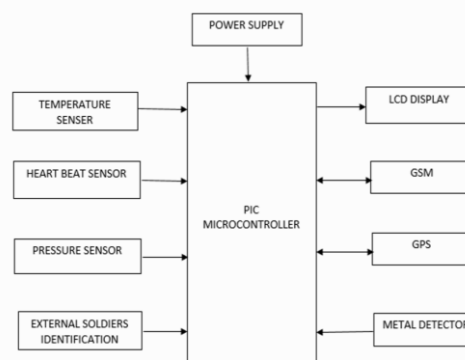


Fig. 1. Block diagram of proposed system

PIC Microcontroller 16F877A is used to process all the sensor's input data. GPS module are connected to PIC microcontroller for tracking the current location (longitude and latitude) of the soldiers. Temperature sensor is used for measuring the body temperature of soldiers. The normal range of body temperature is 98.6°F. Heartbeat sensor is used to measure the pulse rate of the soldier. The standard heartbeat rate for adults is 60 to 100 beats per minute. Pressure sensor is used for measuring the flow of blood in a body. Metal sensor is used for detecting metals like bombs, guns etc., it is similar to bomb detector. External soldiers can be identified by using Infrared

Sensor. The output of the external soldier identification is to indicate buzzer alarm. When other soldier come close to the sensor, it indicate buzzer alarm. Finally, all the sensors output data can be collected and pass to the control room administrator with the help of GSM module which is interfaced with pic microcontroller.

3. Components description

A. Programmable interface controller

The PIC microcontroller is the main basic component among all the other components as it is the controller that controls all the inputs given and produces the appropriate outputs. It accepts the input from the Ultrasonic sensor, Infrared Sensor, GSM module and GPS. It sends power to the motor to operate in the particular direction and displays every command via the LCD screen at emergency situation, it sends alert message to the nearby station through the GSM.



Fig. 2. PIC16F877A Microcontroller

B. Liquid Crystal Display (LCD)

The liquid crystal display screen displays the command received to ensure whether the command given by the user is correct. And it is also helpful in displaying the error messages along with the detail about what he had to do next. In emergency situation, the message will be displayed on the LCD screen along with the latitude and longitude measurements.



Fig. 3. 2x16 Liquid Crystal Display

C. Global Positioning System

The Global Positioning System is used for tracking the current location of the soldiers in the battlefield. The GPS detects the latitude and longitude of the soldier's location. This information sends it to the nearby base station through the GSM modem, which is interfaced with the microcontroller.



Fig. 4. GPS Module

D. Global system for mobile communication

The special type of modem called GSM modem which accepts a SIM card and operates just like a mobile phone. The number which is stored in the controller receives message from the Global System for Mobile communication. With the support of keypad in the system the user can change according to their convenience. The communication is achieved between a mobile device and a computing machine with the help of chip or circuit called GSM module.



Fig. 5. GSM Modem

E. Temperature sensor

The temperature sensor is a device which is used for measuring a surrounding temperature which is in the range between -55 and 150 degree Celsius. It provides an output voltage in degree Celsius. The sensitivity of LM35 temperature sensor is 10mV/degree Celsius. It has three terminals. When compare to thermistor, the output of LM35 is more precise. When temperature increases, the output voltage increases. The supply voltage of this sensor is 4V-300V.

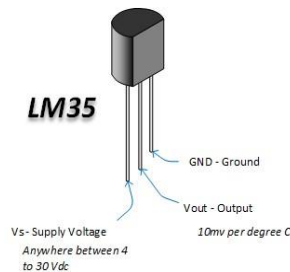


Fig. 6. LM35 Temperature Sensor

F. Heartbeat sensor

Heartbeat sensor is a device, which is used for measuring heartbeat per minute i.e. the speed of the heartbeat. The heartbeat sensor is a small and reading across fingertip or earlobe. The standard value of heartbeat in adult is 60 to 100 beats per minute. The output of heartbeat is expressed in beats per minute. It is based on the working principle of the light modulation by the flow of blood through their fingers at each and every pulse. It is compact in size.



Fig. 7. Heartbeat Sensor

G. Pressure sensor

Pressure sensor is a sensor which is used for measuring atmospheric pressure. It is also called as transducer. The unit of atmospheric pressure is atm, kpa. pascal is defined as force per unit area. The standard value of atmospheric pressure is 101.325 kpa. It is very simple and it is easy to integrate. It is acceptable for all wide range of devices. Basically, it is applicable for testing purposes only. It can also measure speed, altitude etc.



Fig. 8. Pressure Sensor

H. Metal detector

Proximity Sensor is a metal detecting sensor, which is used for detecting the metals nearby soldier's area without any physical contact. It has high reliability and long functional life. It adjusted to a very short range. Inductive proximity sensors only can detect the metals. A proximity sensor emits a beam of electromagnetic radiation or electromagnetic field and looks for changes in the field or return signal.



Fig. 9. Inductive Proximity Sensor

I. Infrared sensor

External soldiers can be identified by using Infrared Sensor. The output of the external soldier identification is to indicate buzzer alarm. Infrared sensor can operate with 0.5v to 3.5v. The range of this sensor is 15cm to 150 cm. The buzzer indicates some other soldier can near with our soldier. So it is used to alert our soldier.



Fig. 10. Infrared Sensor

4. Software description

MPLAB is an Integrated Development Environment (IDE) that integrates the toolset for the development of embedded applications. MPLAB IDE runs on a 32-bit application on MS Windows and it is easy to use. It also serves as a single or unified graphical user interface for additional Microchip and third-party software and hardware development tools. With the help of this software, the code can dumped on the Microcontroller.

Procedure for dumping code:

1. Pickit is interfacing to system through a serial port.
2. Open the software, which is already installed in the system.
3. Select "open" from the menu which is opening a code.
4. Change the settings according the program.
5. Finally, Load the program to the pickit.

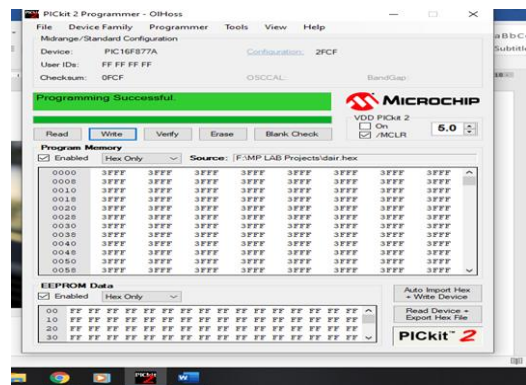


Fig. 11. Program successful image

5. Output

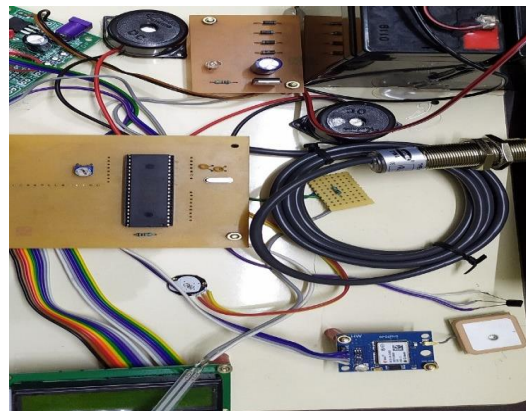


Fig. 12. Hardware Setup

The output of the various sensors used in this project is received at the control room followed by message indication. The temperature sensor senses the body temperature of soldier when it is above the normal range that is 98.6 degree Fahrenheit and it is sent to the control room in form of message. When the heart rate goes above 100 bpm the heart beat sensor automatically indicates message to the control room. The pressure sensor senses the blood flow rate when it goes above

the maximum level and further point out is shown to the control room. The metal detector identifies the presence of any metal around the limited surrounding and it is intimated to control room by the buzzer sound. Besides the location of the soldier is identified and sent to the control room. External soldiers can be identified by using Infrared Sensor. When other soldier come close to the sensor, it is indicated by buzzer alarm. Finally, all sensors output and location is shown to the control room by message indication with the help of GSM module.

The figure 12, shows the hardware setup of soldier's navigation and health monitoring system using GPS and GSM.

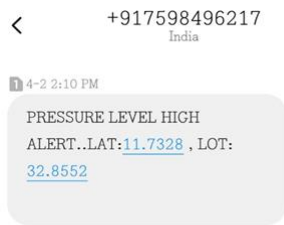


Fig. 13. GSM Output

6. Conclusion

The project is entitled "Soldier health monitoring and location tracking system using GPS and GSM" is an effective security and safety system which is made by integrating the advancements in wireless and embedded technology. It helps for a successful secret mission. This system can be used in critical conditions. It has real-time capability. 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.

References

- [1] Engr. Zeeshan Raza, Kamran Liaquat "Monitoring of Soldier's Health and Transmission of Secret Codes" The Sixth International Conference On Innovating Computing Technology (INTECH 2016).
- [2] Niket Patil "Health Monitoring and Tracking System for Soldiers Using Internet of Things (IoT)" International Conference on Computing, Communication and Automation (ICCCA 2017).
- [3] Deepa J, Ranjini, Parameshachari B. D. "Soldier health and position tracking system using GPS and GSM modem" International Journal of Engineering Research & Technology (IJERT 2018).
- [4] Thanga Dharsni, Hanifa Zakir, Pradeep Naik, Mallikarjuna, Raghu." Soldier Security and Health Monitoring" 2018.
- [5] P. Chakravarth, S. Natarajan and M. Anto Bennet, "GSM based soldier tracking system and monitoring using wireless communication," 2019.
- [6] Brijesh Iyer Niket Patil, "IoT Enabled Tracking and Monitoring Sensor for Military applications," 2018.
- [7] Krutika Patil, Omkar Kumbhar, Sakshi Basangar, Priyanka Bagu, "IoT Based Soldier Navigation and Health Monitoring System," International Journal of Electrical, Electronics and Computer Systems (IJECS 2017).
- [8] Jasvinder Singh Chhabra, Akshay Chhajed, Shamlee Pandita, Suchita Wagh, "GPS and IoT Based Soldier Tracking & Health Indication System," International Research Journal of Engineering and Technology (IRJET 2017).
- [9] Abrar shaikh, Mangesh Korde, Akshay Sonwane, Mayur Gaddekar, Sarita Patiluat, "IoT Enabled Soldier Health and Location Tracking System," 2018.
- [10] Dinesh Kumar Jaiswar, Sanjna S. Repal, "Real Time Tracking and Health Monitoring of Soldiers Using Zigbee Technology," International Journal of Innovative Research in Science, Engineering and Technology (IJRSET 2015).