

A Study on “Radar Helmet for Soldiers”

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ABSTRACT

Soldiers are very essential part of any nation’s security system. During, wars and search operations soldiers get injured and some of them go missing. As we all know soldier’s health is important because they are the savior of our country who protects us from terrorist attacks and from many suspicious activities which can harm us and our nation too. This project will give an ability to track the location and monitor health of the soldiers in real time which goes missing at battlefield. It will minimize the time and rescue operation efforts of army control unit. It will help the army base station to track the location and monitor health of soldiers using GPS module and sensor such as temperature sensor, heart beat sensor, etc. The data coming from sensors and GPS receiver is transmitted wirelessly using Zigbee module having the range of 10 to 100m. A soldier can ask for help from control room using a panic switch and we have also used RADAR which will alert the soldier using vibrator within the range of 3cm to 4m.

Keywords: RADAR, Zigbee, GPS, Temperature sensor, Pulse oximeter, Atmega16 microcontroller

INTRODUCTION

In today’s word, the science and technology is growing rapidly with new inventions, innovations and with advance level of their implementations. These advance technologies are adopted by defense services for safety purpose of our soldiers. The system proposed by us composed of two parts, one is small and portable unit for soldiers and other is for army control unit. The soldiers unit consists of an ATmega16 Microcontroller, GPS tracking device, Zigbee transceiver, heart beat sensor, temperature sensor, etc. With the help of satellite communication system GPS device is use to track the location of the soldiers. The heart beat sensor is use to sense the pulses or heart beats of human heart, and temperature sensor is used to sense the temperature of human body. All the processed and sensed data are transmitted wirelessly through a Zigbee module, which having low power, low data rate transceiver used to transmit and receive the data.

In this paper, our main aim to improve the communication between soldiers and army control room by using advance and highly efficient, powerful systems. This paper helps in to solve above mentioned problems as follows:

1. It is possible to provide proper information about the location of soldiers when it is needed using GPS device..
2. Using Zigbee technology it will become possible to help the soldiers in panic situations when it is ask, by communicating with them.
3. When soldiers get injured it will become possible to provide medical help.

SYSTEM DEVELOPMENT

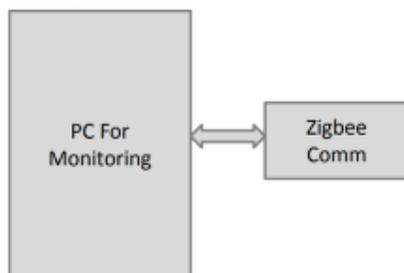


Fig.1 (a) Control unit

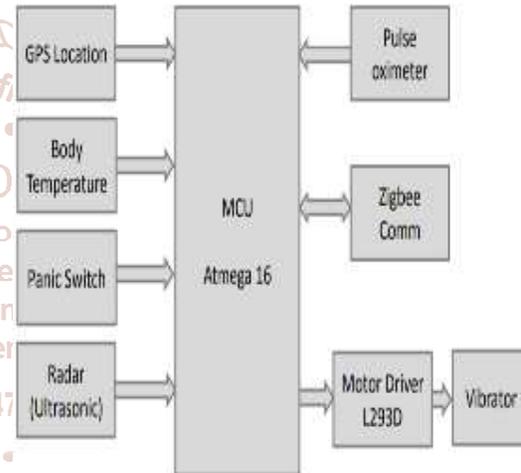


Fig.1 (b) Soldier unit

Fig.1. Block Diagram of Proposed System

As shown in fig.1 block diagram, the input section consists of temperature sensor, pulse oximeter, panic switch and GPS module. The processing module consist of microcontroller Atmega16, low- power, high performance, CMOS 8-Bit microcontroller with 16k bytes of In-system programmable flash memory. Whereas in output unit there is a LCD display which displays action performed by microcontroller.

COMPONENTS USED

1. IC LM35 SENSOR

The LM35 series are accurately combined circuit that works as a temperature sensor, which has output voltage directly proportional to °C Celsius (Centigrade) temperature. It is most useful temperature sensor. The temperature sensor LM35 has essential standardization so that it is possible for interfacing and control circuitry particularly also it has low output impedance, linearly generated output. LM35 operates easily on single supplies of power and some time may require any plus minus supplies. The LM35 has series that is 44 existing in form of bundled hermetic TO-46 transistor packages, whereas the LM35C and LM35D also exist in plastic TO-92 transistor package.



Fig.8. LCD Display

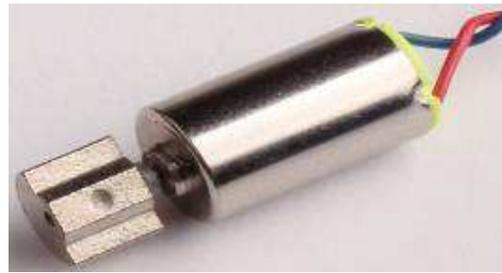


Fig.10.Vibrator

8. Power Supply

In every electronic circuit, power supply is the most important part. The necessary power for each component is provided by power supply and also protects it from excess voltage supply.

In this paper, the following voltage regulators are used to provide necessary power supply:

1. A constant voltage regulator LM7805 is used to supply 5V to all the peripherals except the main microcontroller which works on 5V.
2. The LM7805 with adequate heat sink to deliver output current in excess of 1A and has internal thermal overload protection. Internal short circuit current limiting with output transistor for safe operating area protection.
3. It is a low dropout regulator with a dropout of 1.2V at 800mA of load current. It offers current limiting and thermal protection.

9. Motor Driver L293D

The Device is a monolithic integrated high voltage, high current which accept standard DTL or TTL logic levels. It has four channels which use two bridges and each pair of channels is equipped with an enable input. A separate supply is provided for the logic, allowing operation at a lower voltage. This device has frequencies up to 5 kHz which is suitable for switching applications. The L293D is used for heat sinking. The L293D is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heat sinking.

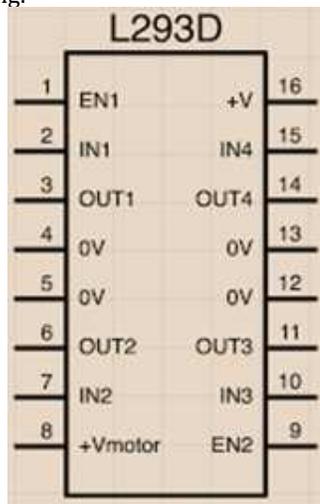


Fig.9. IC L293D

10. Vibrator

An eccentric rotating mass vibration motor (ERM) uses a small unbalanced mass on a DC motor when it rotates it creates a force that translates to vibrations. A small internal mass attached to a spring of linear resonant actuator (LRA) which creates a force when driven.

Our proposed system is composed of two parts:-

1]. Soldier's Unit

1. It consists of body area sensor networks such as temperature sensor and heart beat sensor. These are used to sense the health parameters of soldiers.
2. Temperature sensor will sense the body temperature of soldier and give that data to microcontroller. The heart beat sensor will sense the pulse rate or heart beats of soldiers in beats per minute (BPM) and give it to the microcontroller to process.
3. The output of the temperature sensor which is analog signal will be converted into digital signals using analog to digital converter and then compared with the normal condition signals. And if any difference occurs between sensed signals and defined normal signals, then it will be observed as an emergency.
4. A GPS modem is used to trace the location of soldiers at any time from anywhere. The GPS are space based satellite navigation systems that provide location and time information in all weather conditions.
5. The data coming from GPS receiver will pass to microcontroller through ATMEGA16 which converts RS-232 voltage level data to TTL voltage level data and vice versa. This is done by IC MAX232.
6. During panic condition the soldiers can use panic switch if he needs any help. Then through Zigbee information is transmitted to control room.

2]. Control Room's Unit

The army base station unit consists of a PC which is connected to Zigbee. The data coming from Zigbee module will be displayed on PC screen with the help of graphical user interface (GUI) coded using C# language in Visual studio software.

METHODOLOGY

In this paper, our aim is to track the location of soldiers in the battle field, military search operations and to provide real time health monitoring to soldiers. So, in order to implement, we will use the GPS receiver to track the location of the soldiers through satellite. IC LM35 which is a temperature sensor senses the body temperature of the soldiers. An IC LM358 will be use to sense the heart beat of the soldiers. We will use Atmega16 microcontroller to process all the received data through sensors and GPS receiver in real time. Wireless transmitting and receiving of data is done by Zigbee. The data received from GPS modem is a RS-232 level data, therefore, we have to use IC MAX232, which convert the RS-232 voltage level data to 5V TTL/CMOS level. An alphanumeric LCD display is used to display the data sensed from sensors and coming from GPS modem. Ultrasonic radar is used so that soldier will get an alert indicating that someone is there at back through Vibration.

To implement this hardware design, we will require software like Atmel Studio 7, Cad soft Eagle and Visual studio. To write program using language embedded c in Atmega 16 microcontroller for LM 35 temperature sensor, ICLM358 heart beat sensor, GPS modem and Zigbee module and for GUI we will be using C# language.

CONCLUSION

Security and safety for soldiers: - GPS tracks the position and monitors health parameters of soldiers which provides security and safety for soldiers. Continuous Communication is Possible:- Soldiers can communicate with base station whenever in need. If soldier needs any help from base station then there is Panic button for emergency.

So tracking and navigation system is very useful for soldiers when they are on military field during war and also for base station, so that they can get real-time view of soldier's on field displayed on PC.

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