

# Unobtrusive Sensing and Wearable Device for Soldiers using WNS

Mr. M. Senthil Kumar

Assistant Professor

Department of Electronics & Communication Systems  
KG College of Arts and Science, Coimbatore, India

## Abstract

The national security mainly depends on army, navy and air- force. Among them vital role is played by soldiers. There are many concerns regarding the safety of these soldiers during the war. As soon as any soldier enters the enemy territories it is very difficult to get the information about him until they contacts the base station. During these situations, the soldiers are not even known whether dead or alive or even become a refuge to the enemy. Using the trends in the electronics supporting gadgets for the military peoples is designed in this project. Bio-sensory systems like small physiological sensors are used to monitor the health parameters of soldier when they left from the base station to the enemies' territory. The Wireless Sensor Network (WSN) applications are used to for these purposes. Using GSM module and GPS tracking system provide wireless monitoring to the soldier's along the location, longitude and latitude information's are known easily.

**Keywords:** Bio Sensor, Wireless Sensor Network, GSM, GPS

## I. INTRODUCTION

The armed force soldier of tomorrow promises to be one of the most technologically advanced modern warfare.

Around the world, various research programs are currently being conducted, such as the United States' Future Force Warrior (FFW) and the United Kingdom's Future Infantry Soldier Technology (FIST), with the aim of creating fully integrated combat systems. Alongside, vast improvements in protective and weaponry subsystems, another major side 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. The challenge was to integrate these piecemeal elements into a light-weight package that could achieve the desired result without being too bulky and cumbersome or requiring an excessive amount of power. One of the fundamental challenges in military operations lies that the soldiers are not able to communicate with control base station. In addition, the proper navigation between soldier's organizations plays necessary role for careful planning and co-ordination.

Our work concentrates on the pulse rate, body temperature and oxygen level in the soldier's body. These are sensed and the data base is maintained at the military base. These system tracking the location of soldier using a GPS is focused, which is useful for control base station to know the exact location of soldier and accordingly they will guide them with the High speed, short-range, soldier – to - soldier wireless communications to relay information on situational awareness are focused. When the soldiers are at a long range the GSM system is used to get information about the soldier and their situations.

## II. BASIC CONCEPT



Fig. 1: Base station unit

This project is used to tracking the soldier and navigation between soldier to soldier such as knowing their speed, distance, health status and living status. Base station gets location of soldier from GPS. It is necessary for the base station to guide the soldier on correct path if they are lost in the battlefield. The Bio sensors are used to collect the soldier health status and the GPS module is used to access the current status of the soldier which is displayed by the PC. And hence can take immediate action by sending help for the soldier or sending backup for threat ahead. Using various biomedical sensors to observed the health parameters of soldier's. The position and orientation of soldier is trapped using GPS.

At Army Base station unit it gets the details of soldier unit through GPS receiver, the soldier location and health status displayed on PC in the base station by using the WSN technique.



Fig. 2: Soldiers Unit

### III. WORKING PRINCIPLE

In this a soldier tracking system using GSM module, Unobtrusive sensor and GPS to provide wireless system for monitoring the Body temperature & Blood pressure is designed. To find the health status of soldier the biomedical sensors are used to measure the body temperature, pulse rate sensor and blood pressure. These parameters are then signal conditioned and will be stored in the system memory. Thus, without careful planning and coordination, one troop cannot communicate with the troops or leverage the communication infrastructure operated by the country troops in the same region.

The processed data such as values of temperature, heartbeat, and also latitude and longitude are displayed in 16\*4 layer LCD display unit. The system is also installed with sensors. The 3-d axis sensor continuously monitors and reports any anomaly caused due to change in axes, and this anomaly is called as the abnormal condition. During an abnormal condition the values of temperature, heartbeat and position of the soldier will be shown in the computer at the military base station.

The sensors shown in the left side of the block diagram is the Soldier Unit and the hardware shown at the right side is the Base Unit. The Soldier and Base units are interfaced through a PIC microcontroller which operates by an external power supply of 12V.

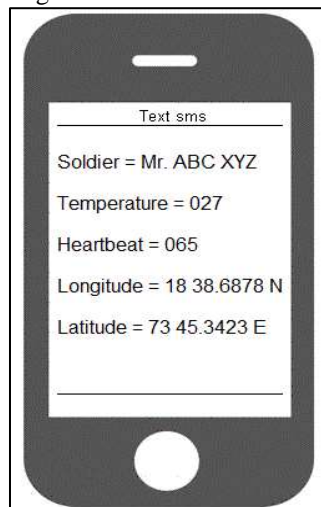


Fig. 3: Text sms

The GPS and GSM transceivers in the both units are used to transmit the data from the Soldier unit to the monitoring system when an abnormal condition occurs.

#### IV. BLOCK DIAGRAM

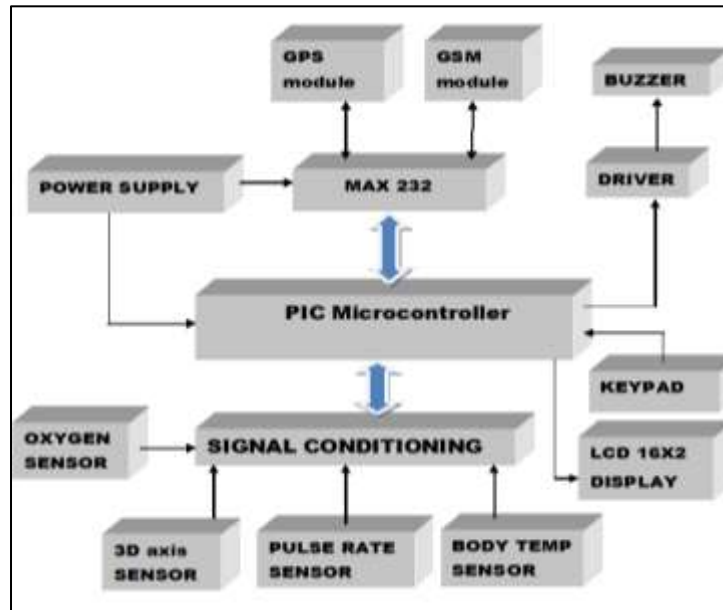


Fig. 4: Block Diagram of the system

#### V. BLOCK DIAGRAM DESCRIPTION

The unobtrusive sensing and wearable device for soldiers using WNS system comprises of the following units and they are listed below:

- PIC microcontroller
- Temperature sensor
- 3D Axis sensor
- Heart Beat sensor
- GSM Module
- GPS
- LCD Display
- MAX 232
- Buzzer

##### A. PIC Microcontroller

The microcontroller can be defined as “system on a chip”. The microcontrollers can be distinguished from microprocessor by various criteria. The microprocessor can be addressed as “computer without any inbuilt memory”. Though microprocessor has several advantages due to the absence of internal memory, all real time applications are making the use of microcontrollers.

The microcontrollers are comprises of the following units,

- Central Processing Unit (CPU).
- Random Access Memory (RAM).
- Read Only Memory (ROM).
- I/O Port.
- Timer /Counters.
- Analog to Digital converter (ADC).
- Serial communication.
- CCP /PWM modules.

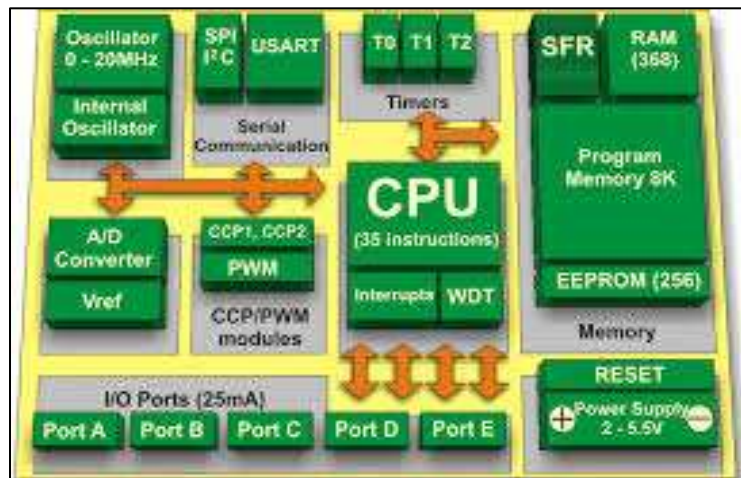


Fig. 5: Basic building blocks of PIC Microcontroller

### **B. Temperature Sensor**

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 is rated to operate over a  $-55^{\circ}$  to  $+150^{\circ}\text{C}$  temperature range. The temperature sensor senses the heat energy and produce equivalent voltage. The equivalent voltage is given to PIC microcontroller.

### **C. 3-D Axis Sensor**

MEMS ACCELEROMETER is used as the 3-d axis sensor. An accelerometer is a device for measuring acceleration and gravity induced reaction forces. Single- and multi-axis models are available to detect magnitude and direction of the acceleration as a vector quantity. Accelerometers can be used to sense inclination, vibration, and shock. They are increasingly present in portable electronic devices.

### **D. Heart Beat Sensor**

Heart beat sensor is designed to give digital output of heart beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heartbeat.

### **E. GSM Modem**

GSM stands for Global System for Mobile Communication and is used to provide communication from one place to another. It is an open, digital cellular technology used for transmitting mobile voice and data service.

### **F. Global Positioning System**

GPS is a technology for determining a location using signals from a network of satellites that orbit Earth. It works pretty much anywhere around the planet, including remote locations. All that's needed is a GPS receiver and a clear enough view of the sky to receive signals from at least three or four GPS satellite.

### **G. LCD Display**

The Graphical LCD's are used to display customized characters and images. The Graphical LCD's used in many applications; they are used in video games, mobile phones, and lifts etc. as display units. This LCD has yellow-green color backlight and has a display format of 128x64 dots. Here it is used to display all details of soldier such as latitude, longitude, distance, height and also their health parameters.

### **H. MAX 232**

MAX232 is an integrated circuit which is used to convert signals from a TIA-232 (RS-232) serial port to signals suitable for use in TTL compatible digital logic circuits.

### **I. Buzzer**

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. In this proposed system buzzer is used as an alarm in various critical stages of soldier.

## VI. SIMULATION RESULTS

Unobtrusive sensing and wearable device for soldiers are simulated using Proteus software. The circuit model of the above system is shown and sensors are connected to measure output result.

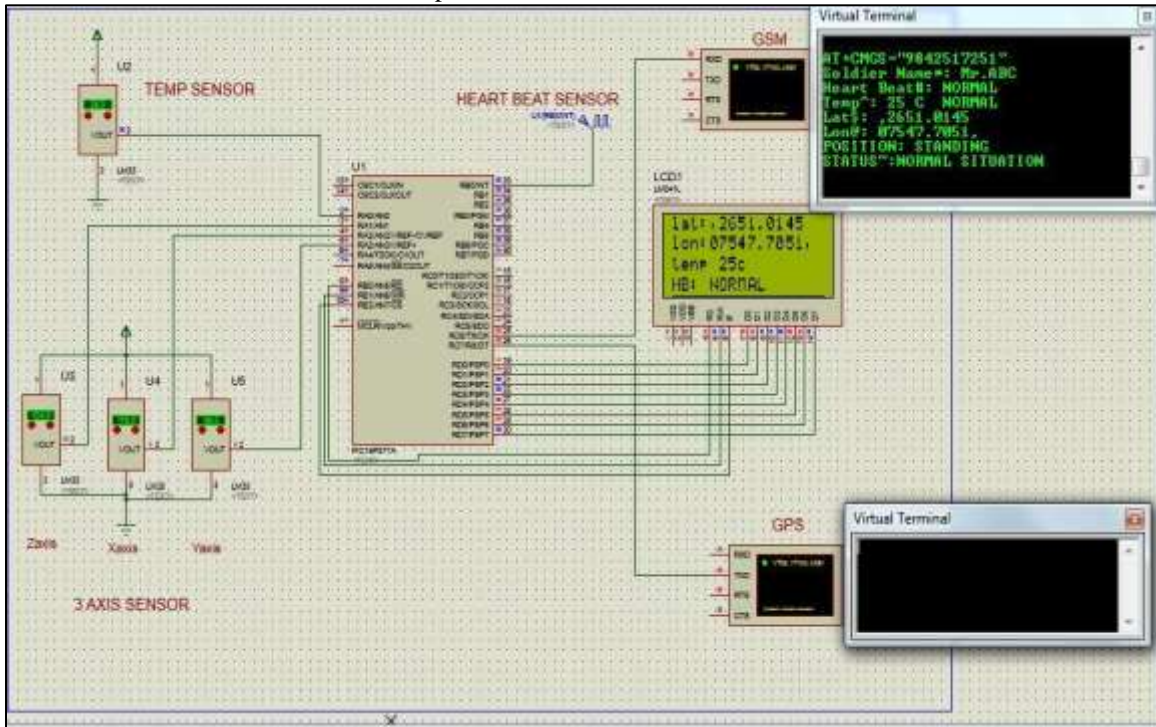


Fig. 6: Normal condition at soldier's unit

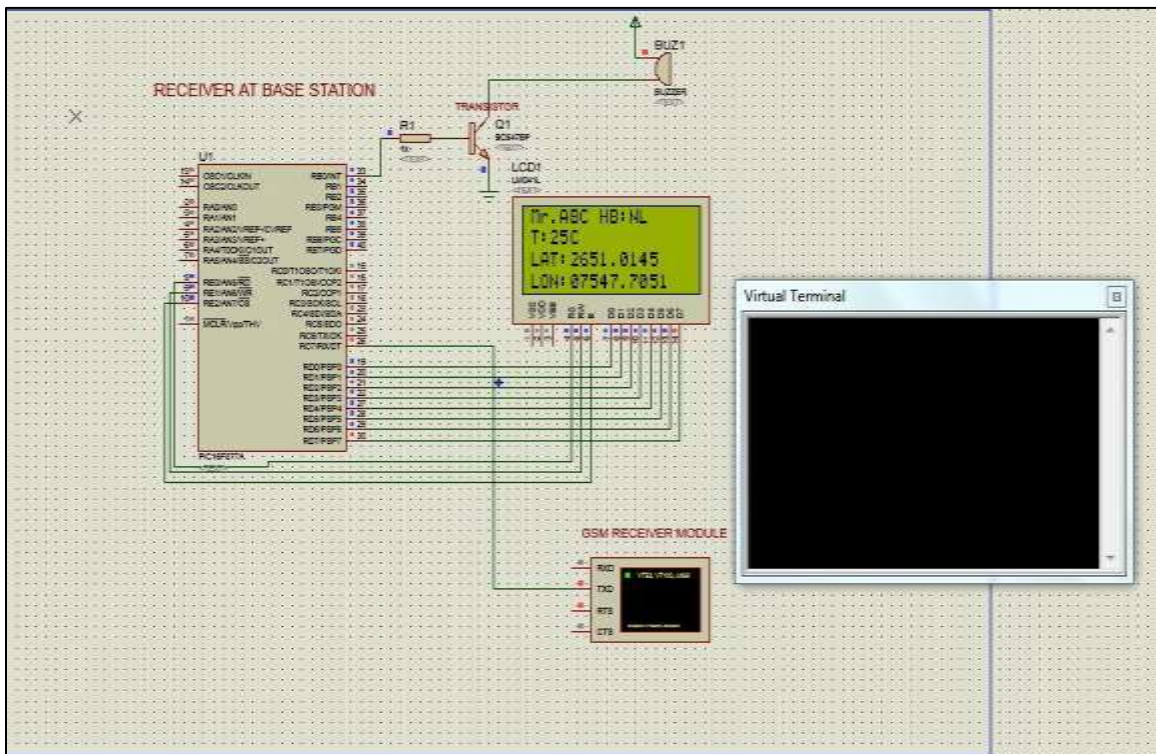


Fig. 7: Normal condition at base station

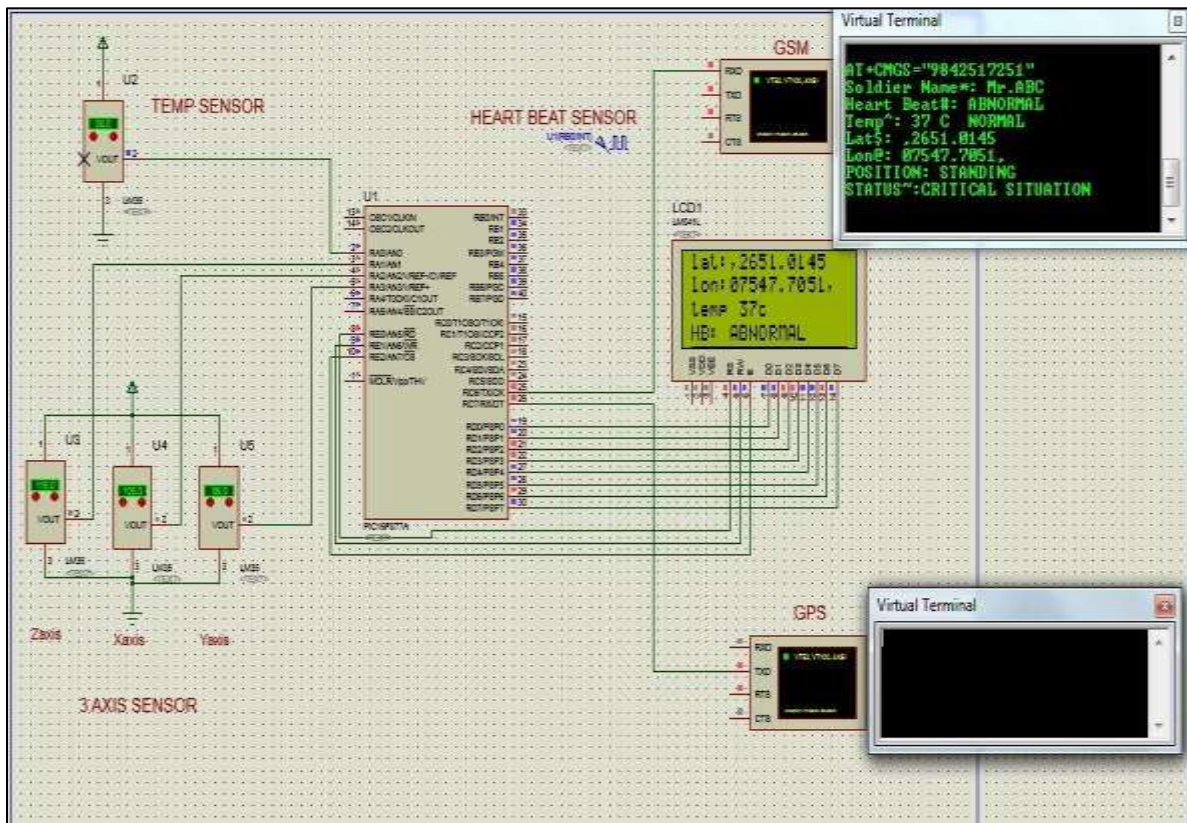


Fig. 8: Heartbeat of the soldier becomes abnormal condition and the message send to the base station.

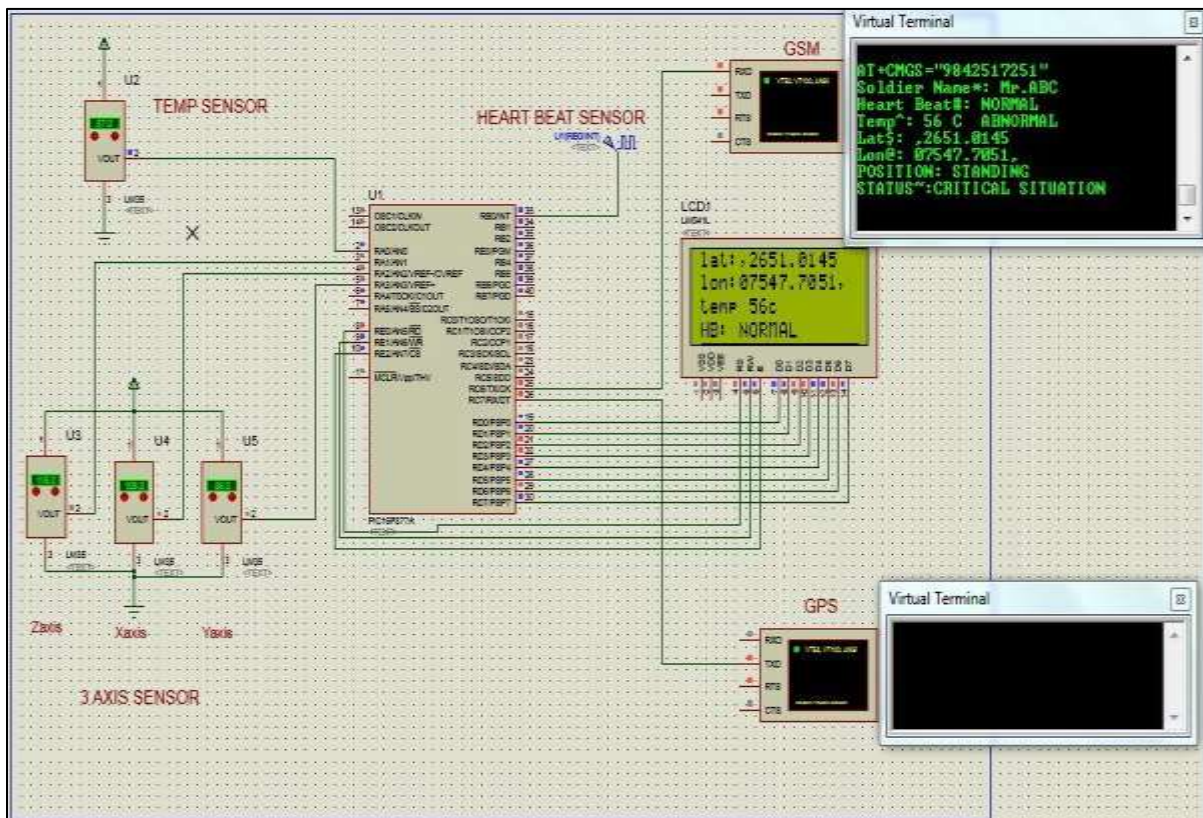


Fig. 9: Most critical and high temperature at the soldier's place and the message was sent to the base unit

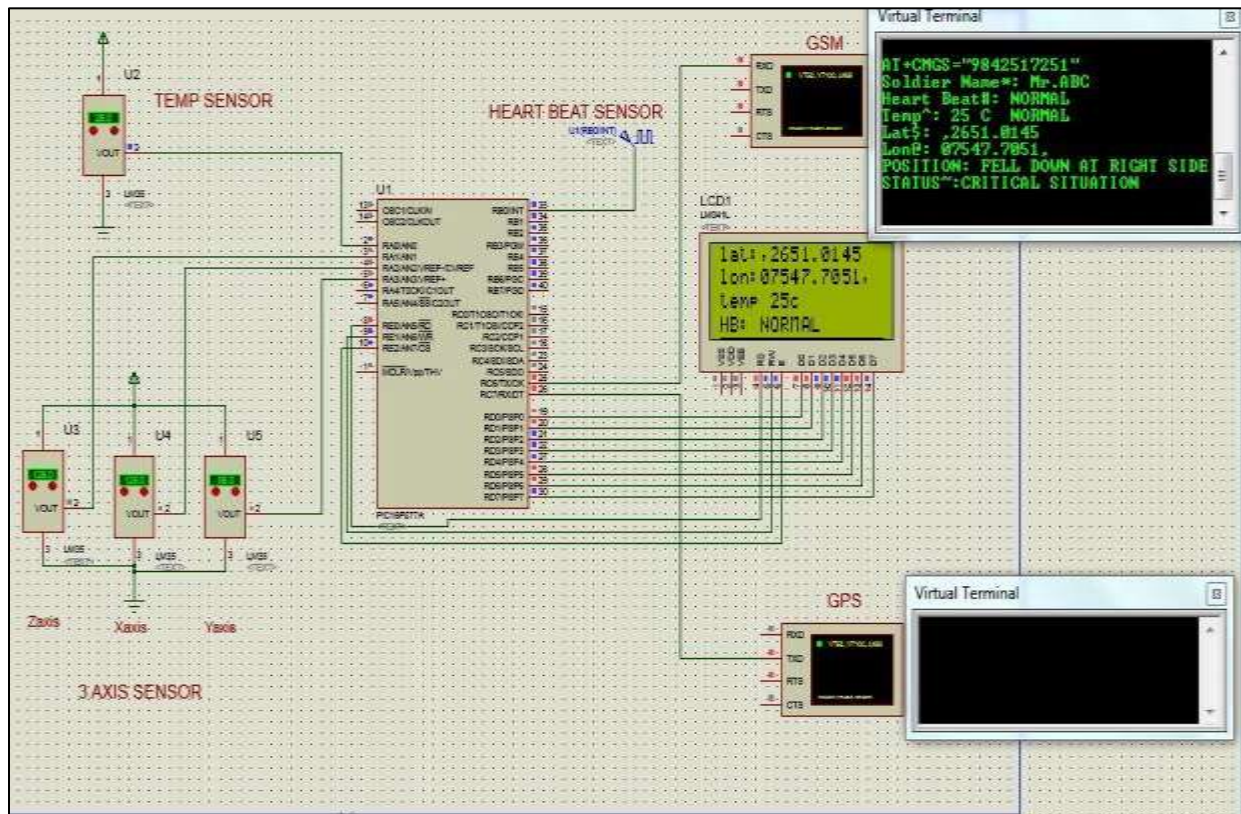


Fig. 10: The soldier fell down at the right side of his position and the message was sent to the base station.

### VII. CONCLUSION

The Following conclusion can be retrieved from above implementation are:

The GPS based tracking and Health monitoring of soldiers by using various Sensors and GSM Module has been designed and tested successfully. This reduces the environment of risk and fatality rate of soldier. It simplifies the effort taken by the Ground/Base unit to track the soldiers when the medical attention is required by the GPS and various sensors.

Using this project, exact position of solders can be tracked easily. Using biosensors such as LM35, Heart beat sensor, Oxygen sensor health status of soldiers are monitored easily and can be useful in emergency situation. The system is useful for soldiers' safety and security

- GPS tracks position of soldier Soldiers vital health parameters monitored, which provides security and safety for soldiers.
- Continuous Communication is Possible: Soldiers can communicate anywhere using RF,DS-SS,FH-SS which can help soldier to communicate among their squad members whenever in need.
- Less complex circuit and power consumption. Use of PIC processor and low power requiring peripherals reduce overall power usage of system.
- Modules used are smaller in size and also lightweight so that they can be carried around.
- So in this way concept of tracking and navigation system is very useful for soldiers when they are on military field during war.
- And also for base station, they can get real-time view of soldier's on field displayed on PC.

### VIII. FUTURE ENHANCEMENT

The project may be further extended by adding an additional feature of transmitting the sensed parameters through GSM or RF transmitter protocols for supporting the concept. In future instead of battery we can use solar cell battery.

In future we have add some more biosensor for monitor the each health status parameters details of soldier with Wi-Fi camera to analysis the weather conditions. This system is used to analysis and monitoring the each movement of the soldiers and them status.



Fig. 11: SCI-FI Squad-die with other additional features

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