

# Soldier Monitoring and Health Indication System

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**Abstract:** Nowadays Defense services are rapidly growing towards new innovation with advance implementation. Soldier's health is more important because they are the defenders who protect our country. Every year some Soldiers have lost or injured. There are many concerns regarding the safety of these soldiers. This project gives an idea of tracking the location of soldier as well as health status of them during the war, which enables the army personnel to plan the war strategies. It is necessary for the base station to guide the soldier on correct path if he lost in the battlefield. The GPS receiver is used to log the longitude and latitude of soldier, which is stored in microcontroller memory. GPS Receiver receives and compares the signal from orbiting GPS satellite to determine geographic position. At Army Base station unit it gets the location of soldier through GSM.

**Keywords:** GPS, GSM, Heart rate sensor, Temperature Sensor, Vibration sensor, Bomb Detector, Microcontroller

## 1. Introduction

The soldier must be integrated with advanced visual, voice and data communications to receive information from the control station or from the superiority. For that Soldier might need wireless networks such as displaying maps and real time video not only to communicate with control room but also with side by side military personnel. Apart from the nation's security, the soldier must need safety by protecting himself with advanced weapons and also it is necessary for the army base station to monitor the health status of the soldier. For that in this project bio medical sensors and monitoring devices are integrated with the soldiers. The integrated components must be light weight package and must provide desired result without requiring much power. One of the fundamental challenges in military operations lies that the soldier's are not able to communicate with control room station. In addition, the proper navigation between soldiers plays an important role for careful planning and co-ordination. So this project focuses on tracking the location of soldier which is useful for control room station to know the exact location of soldier and accordingly they will guide them. Base station i.e., is control room gets location of soldier using GPS. It is necessary for the base station to guide the soldier on correct path if he lost in the battlefield.

This project "soldier monitoring and health indication system" will be useful for the soldiers, who involve in special operations or mission. Smart Bio medical sensors are attached to the jacket of soldiers. These are implanted with the soldier for complete mobility. This system will provide connectivity to the server at the base station using a wireless connection. A GPS Tracking system is also attached with the jacket, which provides the tracking of the position of each soldier. Here also providing a helmet with video. This may help the control station to know about the situation at the mission field. Each soldier has a GSM enabled phone which enables the communication between both ends.

This project come up with an idea of tracking the soldier as well as to give the health status of the soldier during the war, which enables the army personnel to plan the war strategies.

So by using various equipments this project tries to implement the basic life- guarding system for soldier in low cost and high reliability

## 2. Block Diagram Implementation

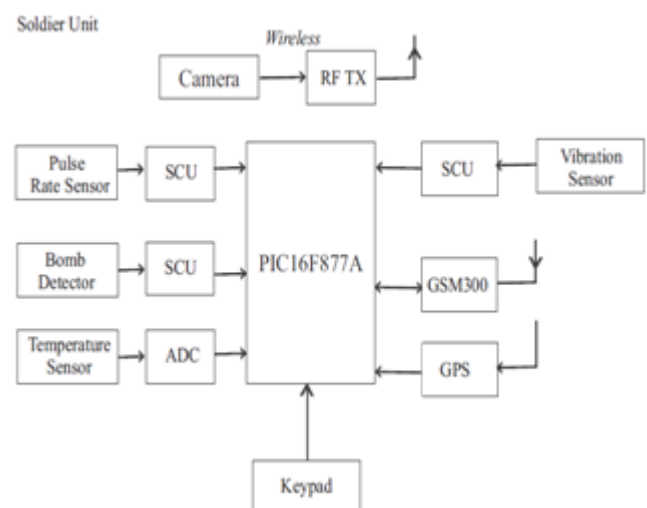


Figure 1: Transmitter Block

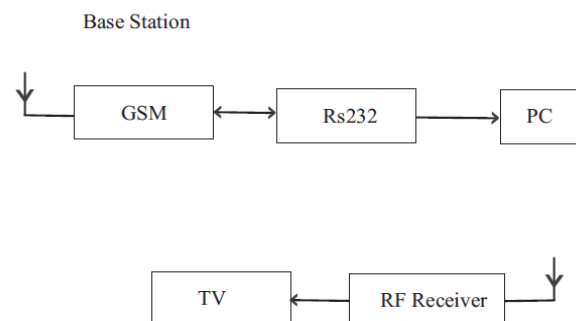


Figure 2: Receiver Block

The figure 1&2 shows the complete working block diagram of the Soldier Health Monitoring and Location Tracking System. It has two main parts, a soldier unit and base unit. Soldier unit consists of a PIC microcontroller, heart rate sensor, temperature sensor, vibration sensor, bomb detector,

GPS receiver, GSM transmitter, a video camera and a key pad. Base unit includes a server, a GSM modem and RF receiver

### 3. Block Diagram Description

#### 1. PIC Microcontroller

The microcontroller that has been used for this project is PIC16F877A. It is used as the brain of this project. The PIC-Programmable Interface Controller is a family of Harvard architecture microcontrollers made by Microchip. The function of this section is to collect the information from heart rate sensor, temperature sensor, vibration sensor, bomb detection unit, and GPS unit which find location of the soldier in each minute. Then it sends this information to the base unit.

#### 2. Pulse Rate Sensor

This project uses polar heart rate transmitter and RMC01 receiver as a heart beat sensor. The use of heart beat sensor in this project is to measure the heart beat of soldier to know about the physical status of the soldier. The Polar heart rate receiver wirelessly receives the heart rate signal from Polar transmitter belt. The complete heart rate measurement system consists of two parts; transmitter, receiver. The transmitter, worn around the chest electrically detects the heart beat and starts transmitting a pulse corresponding to each heart beat. The receiver unit that is placed over the jacket of the soldier receives the signal and generates a corresponding digital pulse that is connected to the PIC micro controller. The normal human heart rate ranges from 60–100 bpm. When the heart rate is not regular the controller sends the heart rate along with information (i.e. whether the heart beat is normal or abnormal) to the server of the base station.

#### 3. Temperature Sensor

Human body temperature varies within a narrow range of values. Body temperature can be measured from different parts of the body, but for this project, temperature will be measured from the ear as it is one of the most accurate types of body temperature measurement. LM 35 has been chosen as the temperature sensor for this project. Temperature measurements taken in the ear are accurate and relate closely to true core body temperature. Hyperthermia at or above about 40 °C (104 °F) is a life-threatening medical emergency that requires immediate treatment. Hypothermia is less than 35°C (95.0°F) gives symptoms as Intense shivering and bluish/grayness of the skin also requires treatment. If temperature sensor meets this condition the PIC micro controller sends the message to the base unit and displays on the PC.

#### 4. Bomb Detector

In this project the paper sensors are used for the detection of bomb which is also called as IED (improvised explosive device). The paper sensors consists inbuilt communication system and these sensors are coated with chemical compounds that are frequently used in IEDs. These system works by detecting the traces of chemical compounds in the atmosphere and also directly detect the type of IED without any additional systems. The sensor sends the acquired data to the processor and memory unit which process the data

and compares with the database and if there is a match enables the buzzer and sends message to the base unit.

#### 5. Vibration Sensor

This unit is used for finding wound of the soldier. If soldier attacked by gun shot or any kind of strain this sensor gives output voltages depends upon the wound. This project uses piezo disk vibration sensor using piezo-electric plate. Piezoelectricity is the ability of crystals and certain ceramic materials to generate a voltage in response to applied mechanical stress. Piezo electric plate converts the mechanical vibration to electrical signal. Lightweight and flexible, piezoelectric film can serve as a highly reliable low-cost alternative to more expensive sensors, in applications it occupies minimum space.

#### 6. GPS

It uses a third generation POT (Patch Antenna on Top) GPS module. This POT GPS receiver providing a solution that high position and speed accuracy performances as well as high sensitivity and tracking capabilities in urban conditions & provides standard NMEA0183 strings in “raw” mode for any microcontroller. The module provides current time, date, latitude, longitude of the soldier to the microcontroller. This is a standalone GPS Module and requires no external components except power supply decoupling capacitors. It is built with internal RTC Back up battery. It can be directly connected to Microcontroller's USART. The module is having option for connecting external active antenna if necessary.

#### 7. GSM

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem can be a dedicated modem device with a serial or USB connection, or it may be a mobile phone that provides GSM modem capabilities. Most of the GSM cellular modems come with an integrated SIM card holder. AT or attention commands are used to interface GSM modem with PIC microcontroller. In this project uses the GSM modem at base station to communicate with soldier.

#### 8. Keypad

Key pad unit is a number of buttons compiled in such a manner so that forms formation of numeral button and some other menus. In this project Keypad is needed to interact soldier unit with base unit system. In case of any emergency if a soldier pressed the keypad it gives alert to main station. for example if a soldier pressed key 1 it gives emergency alert to base station and he pressed key2 means it calls for ambulance such way key pad is used in this project in an emergency situation of the soldier.

#### 9. Video Camera

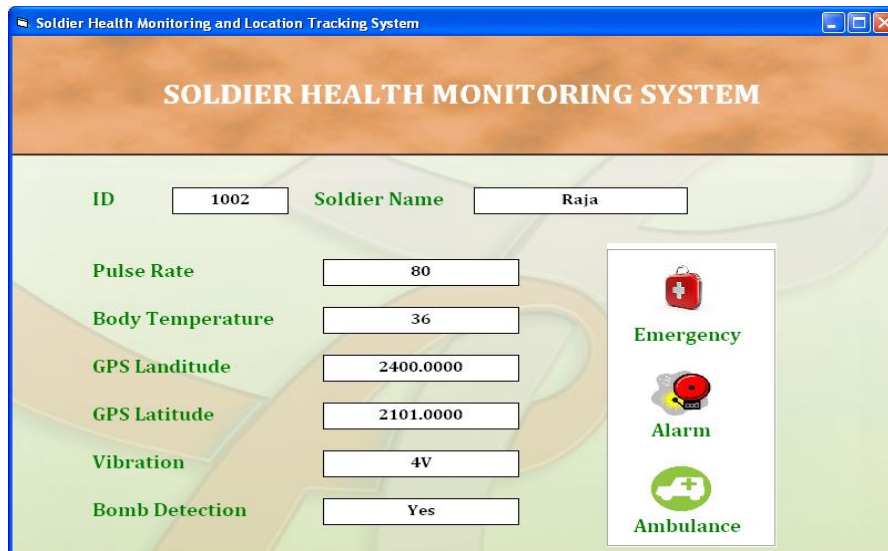
The video camera is a kind of transducer, which produces electrical energy from light energy. I.e., the input to the video camera is light energy and this light energy is converted into electrical signals. The function of video camera in this project is to provide the real time videos to the base station.

### Base Station

The base station is the receiver section of this project. GSM modem is used in base station to receive the data that is sent by army main station. The GSM unit receives the data of soldier heart beat, temperature and the output from the vibration sensor. The vibration sensor tells about whether the soldier is injured by bomb or any other attack by enemy such as injuries in arm, legs can be detected. The GPS used in this project gives the location of the soldier. That can be

received by GSM. The server (PC) is equipped with software called Visual Basic6.0. This creates a data base that contains information about the soldier. Server is used to monitor the status of the soldier. And if there is any abnormality in the status of soldier it displays on a monitor and gives alarm to the army personnel.

### 4. Simulation Results



**Figure 4:** Base Station (PC Using VB Software)

### 5. Conclusion

The project entitled “**SOLDIER HEALTH MONITORING AND LOCATION TRACKING SYSTEM**” 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.

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