

Soldier Tracking and Health Indication System Using ARM7 LPC-2148

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Abstract-The need of creating this project is that, every year many soldiers faced some problems related to their health for example panic situation, high blood pressure, weakness, injury, higher fever etc. that time they need help regarding to their health. This system helps to inform their health status to control room; however control room can take quick action as early as possible.

Similarly, using Global positioning system (GPS) we are able to track soldier's positions and directions where they are located or injured. This is a system which is reliable and energy efficient soldier tracking system.

Keywords- ARM LPC2148, GPS, GSM, Temperature Sensor, Heartbeat Sensor.

1. INTRODUCTION

In today's world, the science and technology is growing rapidly with new inventions, innovations and with advance level of their implementations. Now-a-days we can see that soldiers who are the heroes and defenders of us, they are helpless when actually they need a help. They protect us by putting their own life in danger. Sometimes they have to pass the days without eating but still they stand forward to protect us. Previously and even today the soldiers die due to sudden temperature change which affects the breathing and there are no backups or else if there, then it take too much of time to take the injured soldier to the hospital which may cause his death. And during war it is impossible to take him to the hospital. So we are working on project that can provide safety to the soldiers. In our project, we are trying to provide an embedded wireless system by which the Army base stations can monitor the heart beat count and body temperature of soldiers using wireless body area sensor networks such as temperature sensor, heart beat sensor, etc. Base stations can also know the location of soldiers by tracking them through Global positioning system (GPS) and can guide them to any safe area. Also, the soldier can ask for his location from army control unit in case if he feels that he is lost or to plan any new strategies against enemies. In this project, all the processes are in real time because of the use of ARM 7 microprocessor. By this system during war if the soldier is injured, then it is not necessary to take the soldier or treat the soldier there itself. By this system the headquarters will get the information due to sensors and accordingly the help will send to him. This may not 100 percent saves the life of soldiers but may save their lives up to some extent. The sensed

data and the tracked location of soldiers will be transmitted wirelessly using GPS and GSM module.

In military operations, one of the fundamental challenges is that the soldiers are not able to communicate with control room and sometimes not even with the other fellow soldiers. Once a troop or a soldier become lost during fight in battlefield due to some unfavorable environment or adverse fight conditions, then it becomes more difficult to search them and bring back to the army base station. There are many problems which are faced by soldiers during wars in battlefield, like:

1. Sometimes soldiers want to know their location when they become lost but they are not able to do so.
2. Sometimes soldiers need some help during panic situations but they are not able to ask for help.
3. Sometimes soldiers are not able to get help when they get injured during war.

The soldiers unit consists of an ARM 7 (advanced RISC machine) microprocessor, GPS tracking device, heart beat sensor, temperature sensor, etc. Where, GPS device is use to track the location of the soldiers with the help of satellite communication system. The heart beat sensor also called pulse rate 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 through a module. In this project, our main aim to improve the communication between soldiers and army control room by using advance and highly efficient, powerful systems. This project helps in to solve above mentioned problems as follows:

1. By using GPS device, it is possible to provide proper information about the location of soldiers when it is needed.

2. It will become possible to help the soldiers in panic situations when it is ask, by communicating with them, using such technology.
3. It will become easy to provide medical assistance to soldiers when they get injured.

2. PROPOSED SYSTEM

The purpose of this project is to develop a system that included both real time wires-less monitoring system which are designed and implemented through GPS and GSM systems.

This system helps to send the soldiers health details and location to the control room at any time and any place. This system consists of two units:

- 2.1 Soldier Unit
- 2.2. Control unit

2.1. Soldier Unit:

In this unit two types of sensors are used such as temperature sensor, Heartbeat sensor. Temperature sensor used to measure the heat signal from the human body while the Heartbeat sensor is used to measure the Heartbeat rate of the person. These signals are analog in nature which further converted into the digital signals with the help of ADC which is inbuilt in processor. These measured signals are compared with the actual signals (the actual signals are those signals which was already set by us. For e.g. if we set the temperature in 100°C. If the measured signals are below or above the set signal then indication will given to processor unit and it is considered as an emergency.)

The ARM LPC2148 is the heart of this project which plays an important role in controlling all the devices. The measured parameters are sending to the processor and the output displayed on LCD.

GSM transmitter is used to transmit the signals from the sensors which are controlled by the Microprocessor. It is very helpful to the control unit to escape the soldiers as soon as the emergency signals are received.

GPS system is used to locate the position of the soldiers.

2.2. Control Unit:

By receiving the message on the mobile from the GSM (sim900) which checks the soldier's location or their position based on the GPS parameters and gives health status too. In this way the control unit will help the soldiers as early as possible.

3. BLOCK DIAGRAM OF SYSTEM:

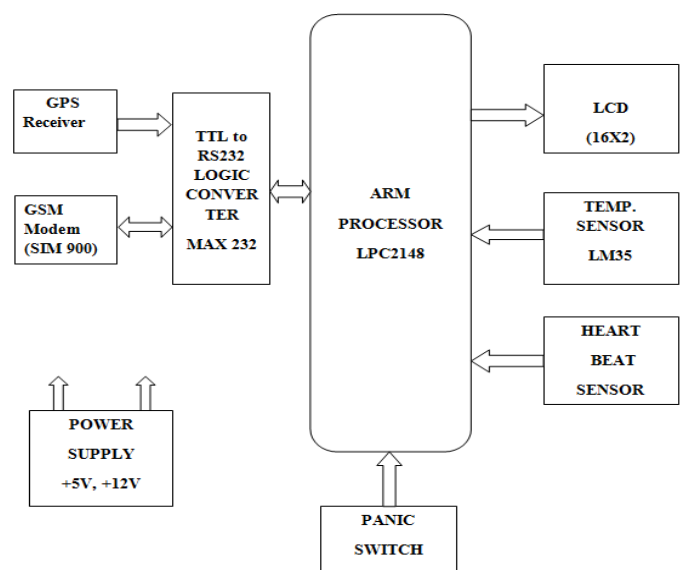


Fig. 1. Block Diagram

3.1. Description of Blocks:

The Microprocessor is the heart of the system. In our project we use the ARM processor. Temperature sensor is used to measure the temperature of the soldiers. As processor operates only on digital data so this analog data is to be converted into the digital form by using the ADC inbuilt in ARM processor.

3.1.1. ARM7- LPC2148:

Over the last few years ARM processor has become the most useful 32-bit architecture in the world, with wide range of IC's available from various IC manufacturers.

In this system ARM7 LPC2148 plays a vital role. It controls all the devices which are connected to it.

LPC2148 is widely used IC from ARM-7 family and it pre-loaded with many inbuilt peripherals

making it more efficient and reliable option for beginners as well as high end application developers. It has 8 to 40kb on chip static RAM 32 to 512kb on chip flash program memory. 128-bit of wide interface or accelerator enables high speed 60 MHz operation. One or two 10-bit A/D converters provide a total of 6/14 analog inputs with conversion time as low as $2.44\mu\text{s}$ per channel. Single 10-bit D/A converter provide variable analog outputs. Low power real time clock with independent power and dedicated 32 KHz clock inputs.

3.1.2. Temperature sensor (LM-35):

LM-35 is a temperature sensor with its output proportional to the temperature (in $^{\circ}\text{C}$). The sensor circuitry is sealed and therefore it is not affected by the oxidation and other processes. With LM-35, temperature can be measured more accurately than with the thermistor.

In this system it is used to monitor temperature of soldier's body and which is connected to the ARM processor and the temperature of the body will display on the LCD.

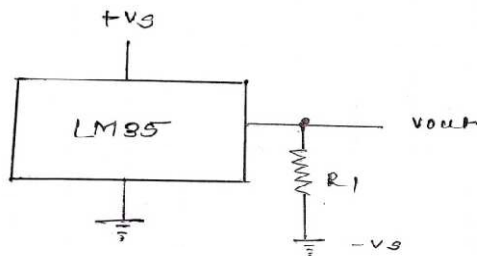


Fig. Temperature sensor

Fig. 2. LM-35 (Temperature sensor)

3.1.3. 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 accordance to each heart beat. This digital output can be connected to Microprocessor directly to measure the beats per minute (BPM) rate. It works on the

principle of light modulation by blood flow through finger at each pulse.

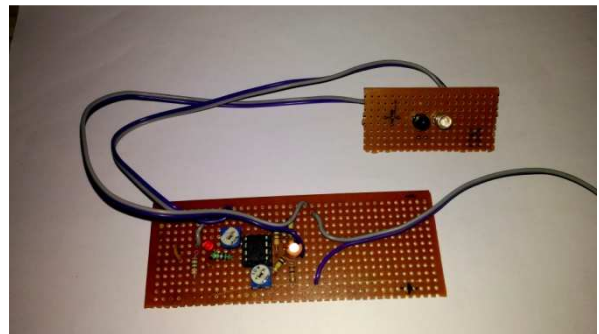


Fig. 3. Heart beat sensor

IC LM358 is used for heart beat sensor. Its dual power operational amplifier consists of super bright red LED and light detector. One will act as amplifier and another will be used as comparator. LED needs to be super bright as the light must pass through finger and detected at other end. When heart pumps a pulse of blood through blood vessels finger becomes slightly more opaque so less light reach at the detector. With each heart pulse detector signal varies this variation is converted to electrical pulse.

3.1.4. Voltage regulator 7805:

We need the regulated 5V output for the most of the IC's used in our system. Now the output of bridge rectifier is unregulated DC. To get 5V regulated DC output from it we have used regulator IC 7805.

3.1.5. MAX 232:

Max 232 is used for level conversion to TTL voltage level to CMOS voltage level. The Max 232 is an integrated circuit that converts signal from an RS-232 serial port to signal suitable for used in TTL compatible digital logical circuit. The Max 232 is a dual driver/ receiver. The Max 232 converts the information given by the GSM modem and is given to the ARM processor.

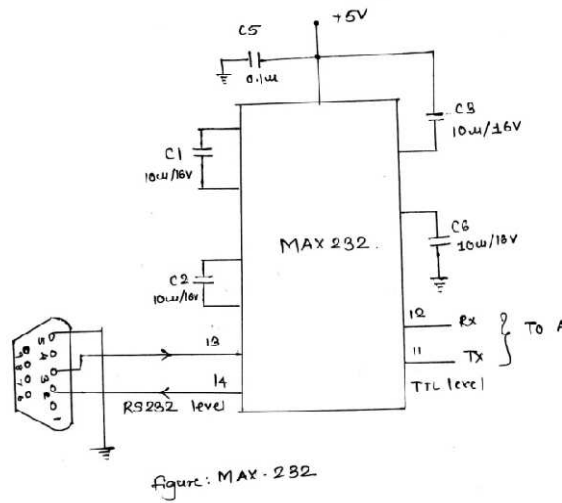


Fig. 4. Max 232

3.1.6. GSM modem:

GSM modem is a modem which accepts a SIM card and operates over a subscription to a mobile operator just like a mobile phone. Its frequency is 850 MHz.

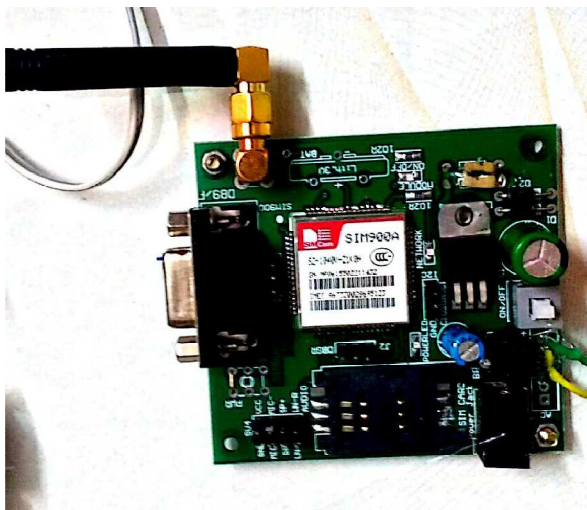


Fig. 5. GSM modem

A GSM modem can be a dedicated modem device with a serial or USB connection. Most of the GSM

cellular modems come with an integrated SIM card holder. AT or attention commands are used to interface GSM modem with ARM processor. In this system we used the GSM modem at base station to communicate with soldier. Upon receiving the SMS the text message in mobile shows the soldiers GPS coordinators also the health status is displayed.

3.1.7. GPS module:

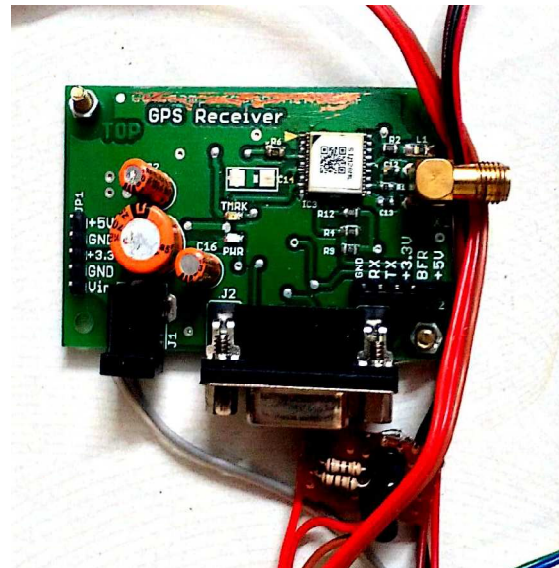


Fig. 6. GPS module

A GPS navigation device is a device that accurately calculates geographical location by receiving information from GPS satellites. Initially it was used by the United States military but now most receivers are in automobiles and smart phones.

In this system it is used to track exact location of soldiers and the output of the GPS module is given to the ARM processor.

3.1.8. LCD (16X2):

The LCD's are used to display characters and numbers. In this system 16X2 LCD is used for display all details of soldiers such as distance and their health parameters.

4. CONCLUSION:

From the above system designed we can concluded that by using GPS and GSM modems we can able to track the soldiers position in the battle field and can be provide help to soldiers in emergency as early as possible. The above system helps soldiers to communicate with control room. And also control room able to know about their health status. The

accuracy of the system is affected by some parameters such as weather, environment around the mobile soldiers unit, GPS receiver. This system has many advantages such as efficient, reliable, fast, a quick response time.

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