ISSN:2581-4419 VOLUME-1

GPS AND GSM BASED SOLDIER TRACKING AND HEALTH MONITORING SYSTEMS

SHUBHAM GAJANAN SHINDE [1] MANINDER SINGH RANDEV [2] VIGHNESH WALUNJ [3]
SUNNY SHIDRUK[4]

[1-4] B.E. Students
Department of EXTC Engineering,
K.C. College of Engineering & Management studies & Research,
Kopri, Thane (E)-400 603, India.

Abstract- In today's era enemy warfare is an important factor in any nation's security. The national security mainly depends on army (ground), navy (sea), air-force (air). The important and vital role is played by the soldiers. There are many concerns regarding the safety of these soldiers. The defense department of country must be effective for the security of that country. This system will be useful for soldiers, who involve in missions or in special operations. This system enables GPS (Global positioning systems) tracking of these soldiers. It is possible by M-Health. The M-health can be defined as mobile computing, medical sensors and communication technologies for health care. In this system, smart sensors are attached to the body of soldiers. This is implemented with a personal server for complete mobility. This personal server will provide the connectivity to the server at the base station using a wireless connection. Each soldier also has a GSM (Global system for Mobile communication) module which enables the communication with the base station in case of injuries. As soon as any other soldier enters the enemy lines it is very difficult for the army base station to know about the location as well as the health status of all soldiers. In our paper we have come up with an idea of tracking soldier as well as to give status of the soldier during thewar.

I. INTRODUCTION

Soldier is always facing death. He never shirks responsibility. He fights in most difficult terrains, on hills and mountain, in plains and forest. The defense of the country is his primary mission. The role of soldier in safeguarding the frontiers of his modest land is unique. He lives and dies for the NATION. It is our responsibility to help our soldier. That's why we are introducing this paper which will be very useful for providing health status of the soldiers and provide medical help to them at critical situation in battlefield.

In our system we are basically focusing on Soldier's health in terms of his heartbeats and his body temperature. If soldier gets injured and becomes unconscious by gunshot or due to any other reason, then his heart beats start increasing or decreasing gradually. In this type of situation where the information about current heart brat rate becomes the indispensable part of soldier, this paperemerges out as best to acknowledge the doctors at server site with the correct and fast information. If heart beat either increases above critical level or decreases below the critical level, a message is automatically sent to server with the help of GSMmodem.

GPS tracker will give the current location of the soldier which will be useful for locating soldier's location and providing medical help as early as possible. In case if soldier is injured then by using the GSM modem attached to the device an SMS will be sent to hospitals in the vicinity or to the base station to providehelp.

The goal of this paper is to develop a low cost, low

power, reliable, non-intrusive and non-invasive signs of health status. To track the location of the soldier i.e. longitudes and latitudes.

The methodology adopted for this paper is to use non-invasive sensors to measure heart rate and body temperature. Signal conditioning circuits are designed to filter and amplify signals to provide desired output. All the components used in the circuit are low powered and cheap. The acquired data is real time and is sent through ADC and into Micro controller. [2]

I. OVERVIEW OF THESYSTEMS

Here the Over view of the systems is shown and explained briefly.

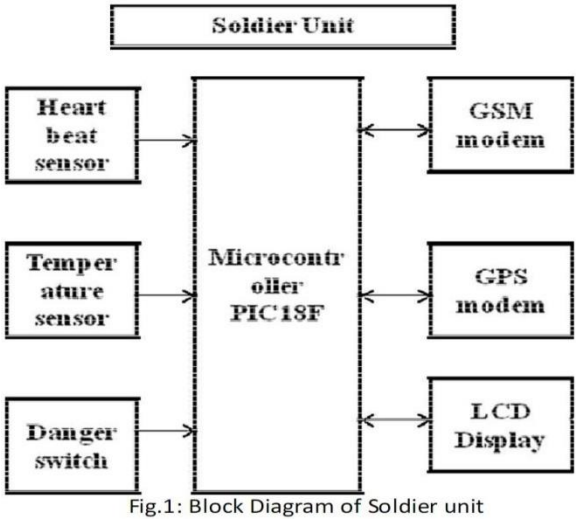

Fig.1: Block Diagram of Soldier unit

Fig.1 shows the block diagram of soldier unit which includes following blocks.

A. Heart beatsensor

- The Heart Beat sensor provides a simple way to study the heart'sfunction.
- This sensor monitors the flow of blood through thefinger.
- As the heart forces blood through the blood vessels in the finger, the amount of blood in the finger changes withtime.
- The sensor shines a light lobe (small High bright LED) through the finger and measures the light transmitted to theLDR.
- The signal obtained from the LDR is amplified by the amplifier and will be filtered and provided to theADC.

B. Temperaturesensor

- The Temperature can be detected with the help of a temperature sensorLM35.
- The LM series are precision integrated circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade)temperature.

Station which when pressed immediately will alert Base station and thus will not wait for heart beats to go out of the normal range.

II. MATHEMATICAL MODELING AND SYSTEMSDESIGN

A. Heart beat sensor

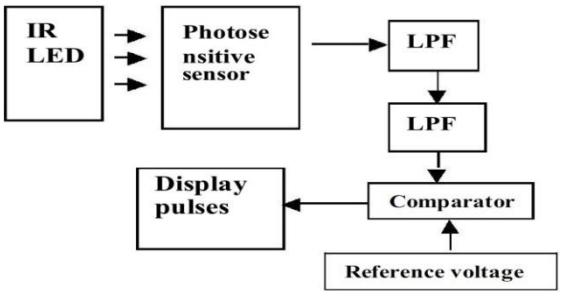

Fig.2: Block diagram of heart beat sensor.

B Microcontroller(PIC18F)

- It continuously monitors the signals from the sensors and if any abnormality like the heartbeat increased or decreased or the body temperature rises or falls thenthe

  information obtained from these sensors and the location information obtained from the GPS modem is sent as the message to a central location with the help of a GSM modem.

- The serial port of the micro controller is connected to the GSM and GPSmodem.

D. GSMModem

- The GSM MODEM is used to provide the information of the soldier like the heartbeat rate and the body temperature to a remote location.
- It is similar to a mobile which requires a SIM card for its operation but the advantage of GSM modem over mobile is that it has an serial connectivity that can be directly connected to the Micro controller for sending the AT(Attention) commands for sending SMS

E. GPS modem

- The location of the soldier can be tracked with the help of a GPSMODEM
- The GPS modem receives the signals from the satellite and calculates the Latitude and Longitude of the location of soldier and sends it to the controller in the form of the serialdata.

F. LCDUnit

The LCD displays the heartbeat rate and the temperature, current date, time and location of soldier.

G. Dangerswitch

Danger switch that helps in alerting the Base Deference voltage

Fig.2 is the block diagram of heart beat sensor which includes IR LED, photosensitive sensor and display and operation of above block diagram is explained below.

Operation:

The systems consist of an infrared (IR) LED, a photo transistor sensor, both high and low-pass filters, as well as an amplifier, comparator and output LED. An oscilloscope is included to display the signal.

Initially, the IR-LED is used to illuminate a person finger with infrared light. The light intensity is modulated by blood pressure changes within the finger before striking the photo transistor. The sensor then converts the changing light intensity into a proportional voltage containing two components a large DC off-set corresponding to the average light intensity as well as a small varying signal caused by changing bloodpressure.

The voltage signal is then passed through a high pass filter to remove the DC component and then light is amplified. Low-pass filtering is then applied to remove any high frequency noise before displaying the signal on an oscilloscope. Finally, the signal is compared to a reference voltage using a voltage comparator, and an output LED is illuminated if the voltage signal is greater than the desired threshold, indicating a heartbeat.

The rectangular pulses which we get from this procedure are applied to the counter pin of the micro controller. Counter of the Micro controller counts the number of pulses for duration 5 sec. multiplies it by 12 and displays as a heartbeat rate per minute because in order to obtain the results in bpm (beats per minute).

H. Selection ofLED

Since the detection of heart beats includes detection of light changes through the finger, this process involves means of capturing the light variations with great accuracy. Hence the source of light must be such that light passes through the finger efficiently. Making detection easier. Hence we are using the IR LED, also known as IR transmitter.

I. LM35Sensor

- The LM35 are Precision integrated circuit temperature sensor whose output voltageis linearly proportional to 0 C.
- LM35 temperature sensor connected to pin 6 VIN provides continuous temperature in analogform.
- When low to high pulse is applied to micro controller PIC18F which has inbuilt ADC converts the analog value into digitalform.
- When it successfully converts the value, it sends the interrupt to the micro controller. Micro controller thus now executes ISR (An interrupt service routine (ISR) is a software routine that hardware invokes in response to an interrupt. Is Rs examine an interrupt and determine how to handle it. ISRs handle the interrupt, and then return a logical interrupt value.) where it reads the converted value in ADC by sending High to low pulse to pin 2 RD.
- 1°C rise in temperature increases voltage by 10mV.
- The LM35 thus has an advantage their linear temperature sensor calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient centigrade scaling low cost is assured by trimming calibration at water level.
- The LM35s low Output impedance, linear output precise inherent calibration make interfacing toreadout.
- The function of LM35 in this paperis to monitor the bodytemperature.

J. MAX232-Levelconvertor

- MAX232 is used for level conversion to convert TTL voltage level to CMOS voltage level.
- The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logiccircuits.
- The MAX232 is a dual driver/receiver. The MAX232 converts the information given by the GSM and GPS modem and is given to the microcontroller.

K. GPS modem

- The GPS unit contains a GPS module along with a GPS receiverantenna.
- The module functions according to its built and the antenna receives the information from the GPS satellite in NMEA(National Marine Electronics Association) format. This data is then sent to the micro controller wherein it is decoded to the required format and sent further.
- The GPS module continuously transmits serial data (RS232 protocol) in the form of sentences according to NMEAstandards.
  - The general NMEA (National Marine Electronics Association) format consists of an ASCII string commencing with a $ character.

  - The $GPRMC message format is as shown below: $GPRMC, HHMMSS.SSS, A, DDMM, MMMM, N, DDDMM.MMMM, W, 0.13, 309.62, DDMMYY$GPRMC, 16122.487, A, 3723.2475, N, 12158.3416, W, 0.13,309.62,120598

Message component	Description
HHMMSS.SS	UTC time in hrs., min, and sec of the GPS position
A	Status (A=valid, V=invalid)
DDMM.MMM	Latitude in degrees, minutes and decimal minutes
N	Latitude location (N=north latitude ,S=south latitude)
DDMM.MMM	Longitude in degrees, minutes and decimal minutes
W	Longitude (E=east longitude, W=west longitude)
DDMMYY	UTC date, month and year

Table I : Content of GPRMS line

Table I includes message component and displays on LCD display.

Extraction of GPS Data ATE0-

Echo off ATE1–

Echoon

ATD – call to dial a number Syntax: ATD 8149980725

ATDL – redial last telephone number ATA – answer an incoming call

ATH – disconnect existing connection AT+CMGD – to delete SMS

Syntax: AT+CMGD=1 –reads 1st SMS in SIM card

AT+CMGS – to send SMS Syntax: AT+CMGS = 8149980725 press enter

Type text and press ctrl+z.

III. FLOWCHART

The flow chart of GPS and GSM are being explained and shown in Fig.4 and Fig.5

A. Flow chart of GPS

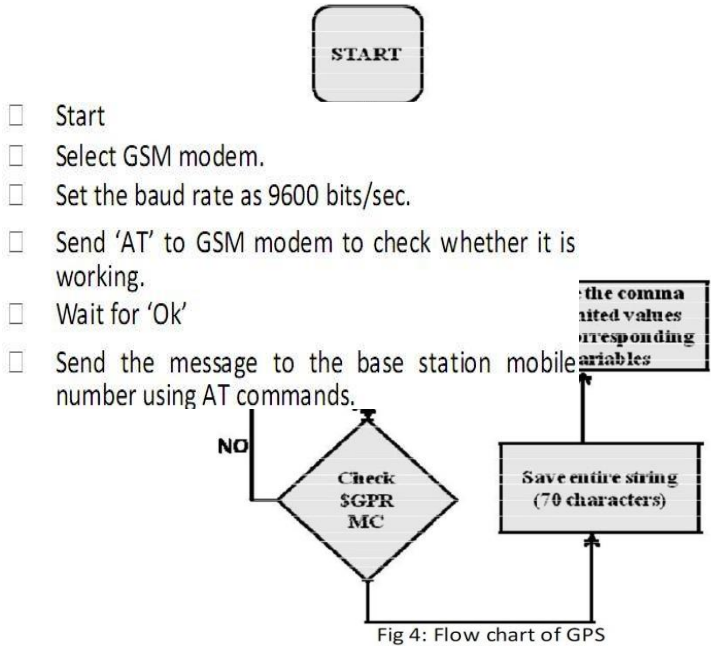

Fig 4: Flow chart of GPS

Fig.4 shows flow chart of GPS module which include the algorithm of GPS system.

- Start
- Select the GPS modem
- Set the baud rate as 4800 bits/sec
- Check whether you have received the $GPRMC message
- From the comma delimited GPRMC sentenced, latitude, longitude, date, time, speed values are extracted by finding the respective comma positions.

Fig.5 shows flow chart of GSM module which include the algorithm of GSMsystem.

B. Flow chart of GSM

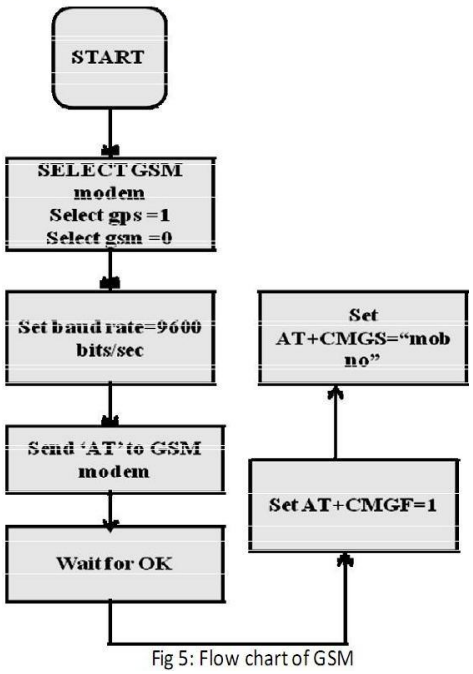

Fig 5: Flow chart of GSM

IV. RESULT

We have achieved the heart beat pulses shown in ig.6 and also the heart beat counter and temperature measurement using LM35 sensor shown in Fig.8.

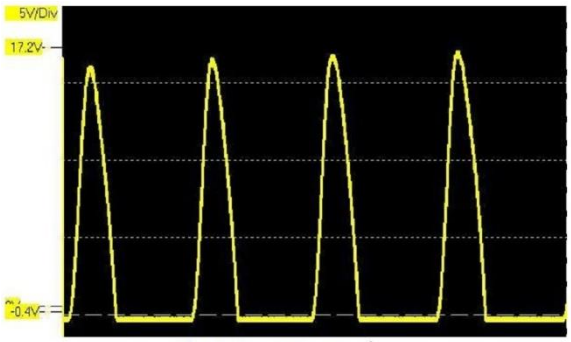

Fig.6 Heart Beat pulses

Fig.6 are the Pulses of Heart beat sensor obtained from the circuit diagram given in Fig.3.

CONCLUSION

Above system when completed would help in determining health status of soldier with measures of heart beats and body temperature. It would also help in tracking his position by using GPS modem and with GSM modem it can send all information to base station so that further necessary action could be taken.

REFERENCES

[1] S.Gamache, "LocationTracking Applications", IEEE 15-10-0519-00, JULY2010.

[2] M.V.N.R. P.Kumar, G.R. Vijay, P.V.Adhikrao and B.S. Vijaykumar," Health Monitoring and Tracking of Soldier Using GPS", International Journal of Research in Advent Technology, Vol.2, No.4, April 2014 E-ISSN: 2321-9637, page no.291- 294.S.Nikam, S.Patil, P.Powar and V.S.Bendre, "Gps based soldier tracking and indication system", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 2, Issue 3, March 2013,page no.1082-1088.

[3] S.Nikam, S.Patil, P.Powar and V.S.Bendre, "Gps based soldier tracking and indication system", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 2, Issue 3, March 2013,page no.1082-1088.