E-Jacket for Soldiers

Prof. Mrs. M.A.Kango[1],Bhakti Salunkhe[2],Amruta Surekar[3]
Professor, Dept. of E&TC, P.E.S.'s Modern College of Engineering, Shivajinagar, Pune05[1]
UG Student, Dept. of E&TC, P.E.S.'s Modern College of Engineering, Shivajinagar,Pune05[2]
UG Student, Dept. of E&TC, P.E.S.'s Modern College of Engineering, Shivajinagar,Pune05[3]

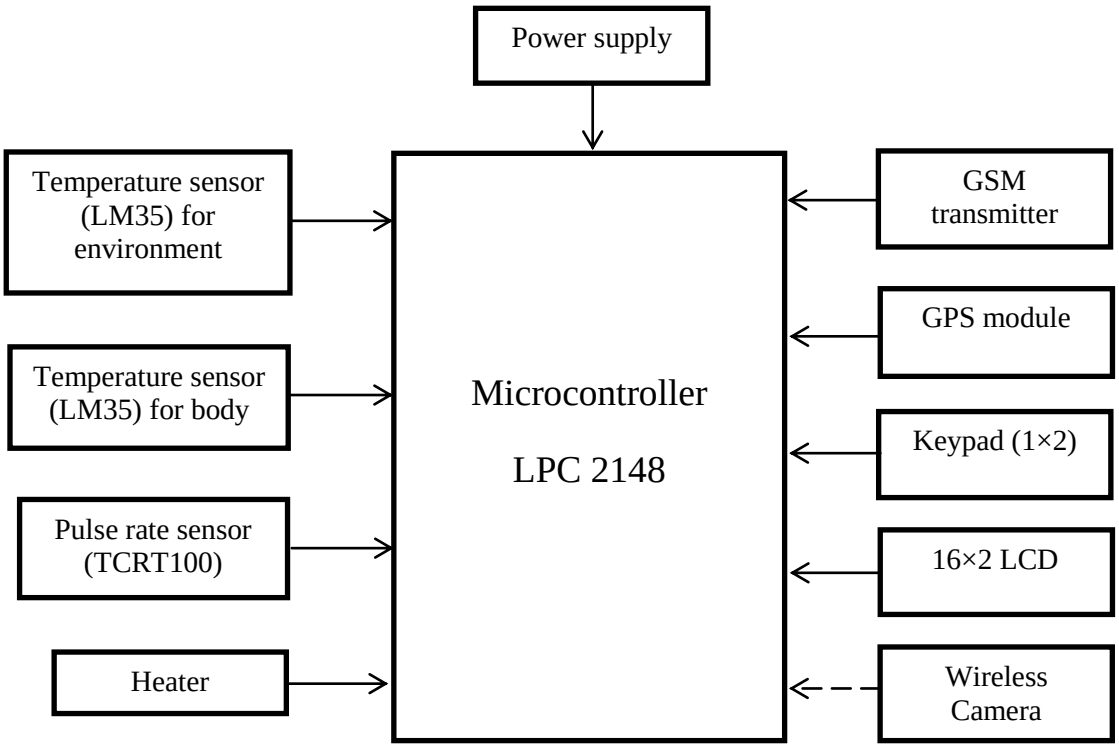
Abstract: In today's world enemy warfare is an important factor in any nation's security. The national security mainly depends on army (ground), navy (sea), air-force (air). The important and vital role is played by the army soldier's. There are many concerns regarding the safety of these soldiers. As soon as any soldier enters the enemy lines it is very vital for the army base station to know the location as well as the health status of all soldiers. In our project we have 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. We are also using wireless camera unit to get the live images of the location. By using the location sent by the GPS modem, the base station can understand the position of soldier. When base station gets location of soldier from GPS, it is necessary for the base station to guide the soldier on correct path if he is lost in the battlefield. The base station can access the current status of the soldier which is displayed on the mobile phone. And hence can take immediate action by sending help for the soldier or sending backup for threat ahead. Using various biomedical sensor health parameters of soldier's are observed, the position and orientation of soldier is trapped using GPS.

Keywords: Safety, Tracking, Microcontroller LPC2148, GPS, GSM, Biomedical Sensors.

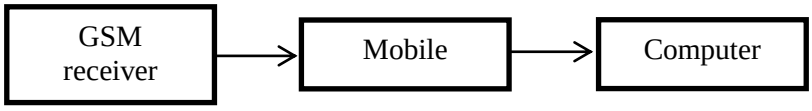
I. Introduction:

The era in which we are living is technological, where every field is trying to develop itself using technology and military forces are no exception for it. To protect the boarders of any nation the soldiers of future will be one of the most technologically advance forces in the world. All over the world a lot of research is going on to develop the technologies in which soldiers safety and nations security is on priority. On the war field soldier has to face many challenges like loss in war, low ammunition, health issues, crossing borders etc. So in these situations to get help soldier has to communicate with base station or there should be some facility to guide him. For this purpose we are trying to track location of soldier using GPS, to get pictures of field using wireless camera also trying to get his health parameters with the help of biomedical sensors. This information will be send to base station using GSM. As soon as base station will receive all information about soldier, they will be able to guide soldier about the direction, strategy and situation. Also base station will be able to provide necessary help to soldier. In addition to this we are providing keys through which soldier will be able to inform the base station about his needs. All this information will be received on computer at the base station.

II. Proposed system:



Soldier unit



Base station unit

The block diagram of GPS based soldier tracking and health indication system is shown in fig. it consist of two units- soldier unit and base station unit. As it requires high speed communication it is intended to use ARM processor which is based on a 32 bit ARM7 TDMI-S™ CPU with real-time emulation and embedded trace support, that combines the microcontroller with 512 Kb of embedded high speed Flash memory. Biosensors such as Body temperature and pulse rate are integrated to ARM processor to monitor the health status. Vibration sensor is also there to check if any bullet hits the jacket. 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. Using keypad we can send messages to other unit. GSM transmitter sends the information to the army base station containing the health parameter and the location of soldier.

At Army Base station unit it gets the details of soldier unit through GSM receiver, the soldier location and health Status isdisplayed on mobile phone as well as on computer.

- **System specifications:**
    - Operating voltage: 3 to 5 volts
    - Operating current: 500mA
    - Temperature range: −55° to +150°C
    - Shock survival: 10,000 g
    - Self-heating: 0.08°C in still air
    - Frequency ranges: 890-915KHz

III. Modules description:

1) ARM (LPC2138):

The microprocessor that has been used for this project is a 32 bit ARM7, CPU with real-Time emulation and embedded trace support that combines the microcontroller with 512 Kb of embedded high speed Flash memory. It has two 8 channel ADC ,single 10 bit DAC, two 32 bit timer/counter ,multiple serial interfaces including two UART ,two fast I2C, Capture, compare and PWM module.

2) Liquid Crystal Display(16x2):

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications.A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters, animations and so on.Here it is used to display all details of soldier such as positional values of the soldier andhealth parameters.

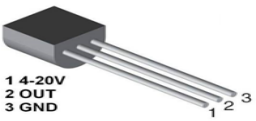
3) GPS module:

SR-87 series GPS modules incorporates high sensitivity, high performance design. The module tracks up to 20 satellites at a time while offering fast time-to-first-fix and 1Hz navigationupdate. SR-87 design utilizes the latest surface mount technology and high level circuit integration to achieve superior performance while minimizing dimension and power consumption The module communicates with application system via RS232 (TTL level) with NMEA-0183 protocol.

4) GSM module:

GSM Module transfers long-distance data extensively and reliably. It Supports instructions of AT commands.SIM300 can be integrated with a wide range of applications. SIM300 is a Tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS1900 MHz. SIM300 provides GPRS multi-slot class 10 capabilities and support the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. With a tiny configuration of 40mm x 33mm x 2.85 mm, SIM300 can fit almost all the space requirement in our application. Therefore, the MCU can connect with GSM modules very expediently through serial interfaces.

5) Biosensors: Here we are using temperature and pulse rate sensor for getting health parameters of soldier.



LM35 is a low cost temperature sensor, its output voltage is linearly proportional to temperature and it does not require signal conditioning. Here it is used to measure body temperature as well as environment temperature.

Pulse rate sensor (TCRT1000) is works on the principle of light modulation by blood flow through finger at each pulse. It gives digital output of heart beat when finger is placed on it.

6) Keypad:

Keypad is used by soldier for sending predefined messages to the base station if he wants to deliver some important message or needs anything. Here push button switches are used.

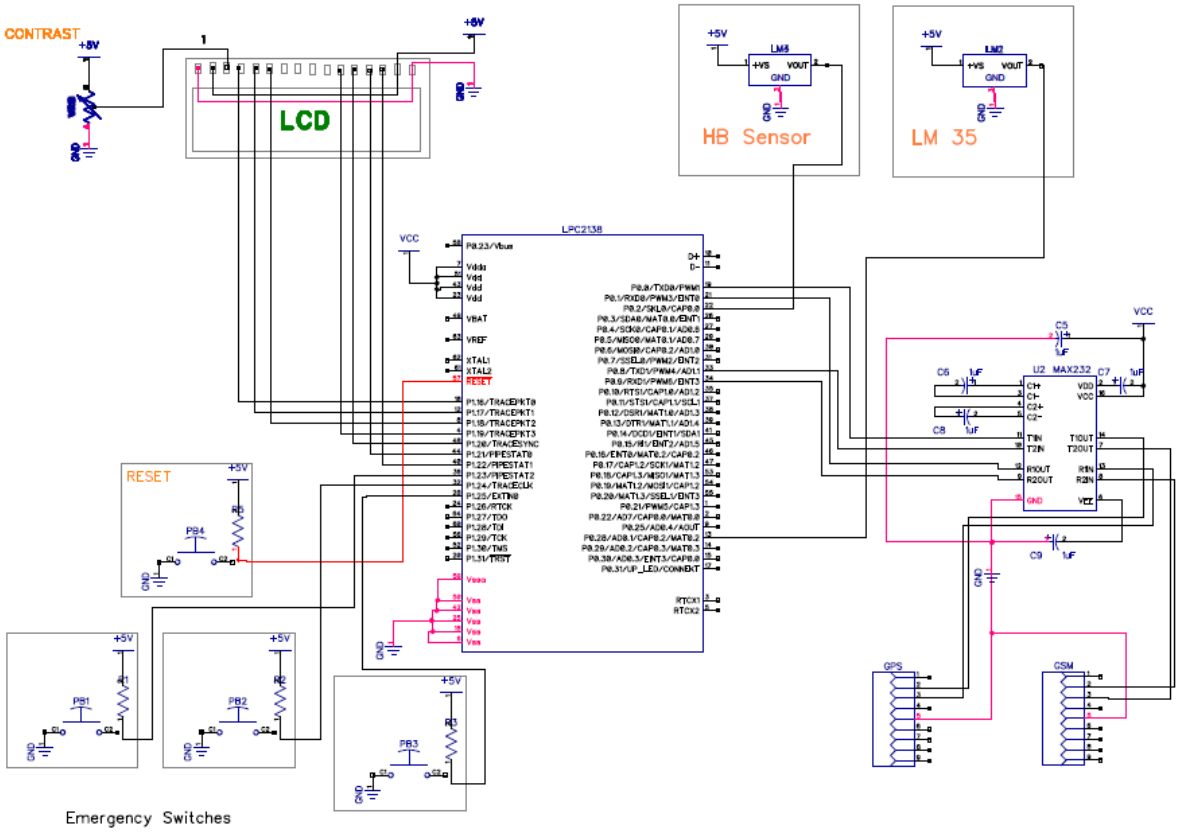
7) Wireless Camera:

Here wireless camera is placed on the jacket and it is used to capture the live images of battle field. These images are then sending to the base station.

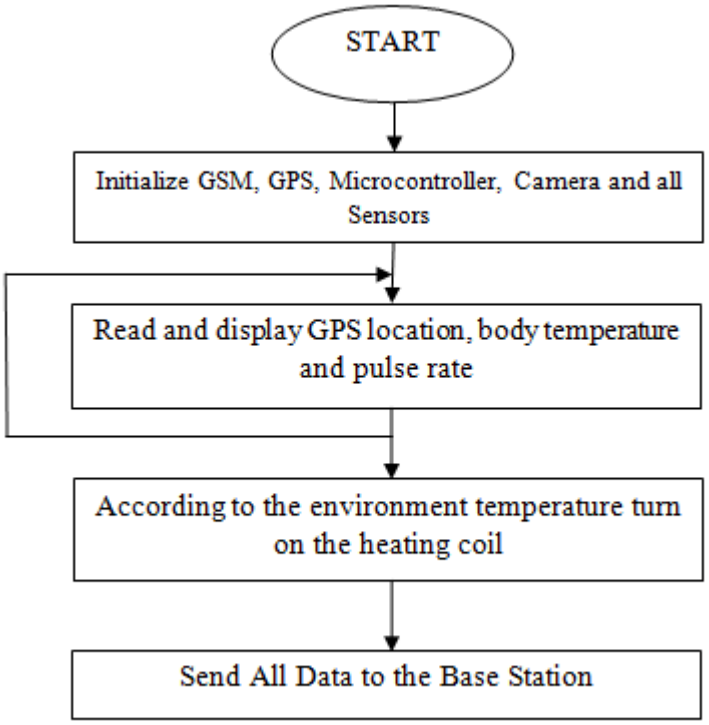
8) Heating coil:

Sometimes soldier needs to work in very low temperature, which can be below freezing point. In places like this his drinking water gets very cold. Sometimes it freezes. So to melt this water and to make it drinkable here we are using heating coil.

IV. Circuit Diagram



V. Flowchart:



VI. Calculation:

- Distance : Dlan=lan2-lan1
  Dlat=lat2-lat1
  C=2*atan2(sqrt(a),sqrt(1-a)
  a=(sin(dlat/2))^2+cos(lat1)*cos(lat2)*sin(dlan/2)^2
  D=R*C

Where, D=distance, R=radius of circle, C=speed of light, lan=longitude, lat=latitude

- speed :Distance/time

VII. Experimental results:

- **Advantages:**
  - No need to go on field.
  - Provides high level safety to human life.
  - Cost effective.
  - Fast and efficient.
  - Minimized search and rescue efforts.
  - There are a number of ways in which the soldier can communicate with the base station.eg- Bluetooth, Zigbee modules etc.

- **Application:**
  - E jacket is used on war field.
  - For soldiers who are on special secret mission.
  - Geographic surveying.

- **Conclusion:**

  We have proposed E-jacket for soldiers in which various sensors are used for sensing body and environment temperature, pulse rate and vibrations. Location of soldier is also being tracked using GPS and through GSM it is send to the base unit with time and date.Features of wireless camera and heating coil are also added.Due to use of LPC2148 processor power consumed by the system is less. Different circuits used are small in size and carries less weight they are not much bulky so can be carried anywhere. So it will be helpful for finding soldier and saving his life.

- **Future scope:**
  - We can add vibration sensor for getting information about firing on the battle field.
  - For avoiding the misuse of jacket, voice recognition system can be used.
  - All modules can be checked continuously and if any fault occurs in any module this can be informed to the base station.

VIII. References:

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