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GPS BASED SOLDIER TRACKING AND HEALTH MONITORING SYSTEM

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ABSTRACT: The purpose of this investigation is to test the components of the Soldier Tracking and Health Monitoring System (STHMS) against the statement of requirements as found in the Request for Proposal. Secondary aims of this investigation included gathering data that will allow potential users of the system to understand its capabilities and limitations, as well as allow efficient planning of both time and resources necessary to ensure efficient and productive use of the system for training and experimentation purposes. Data collection focused on the following functional requirements criteria: System Requirements, Soldier Requirements, Combat Identification, Umpire Requirements, Data Collection Requirements, Monitoring Requirements, and Performance Feedback Requirements. Those requirements that were not met were a function of economies realized through extensive discussions with the manufacturer and the Scientific Authority. The investigation provides a detailed description of system components, comparisons of measured vs. reported soldier position data, an evaluation of performance feedback mechanisms and the results of extensive directed discussions following the participant's use of the system in a controlled environment.

I. LITERATURE SURVEY

A. Introduction

Now-a-days 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. In today's world enemy warfare is a important factor in the nation's security. The national security mainly depends on army (ground), navy (sea), force (air). The important and vital role is played by the army soldiers. 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 its 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. Also the soldier can ask for directions to the army base unit in case he feels that he is lost. By using the location sent by the GPS, the base station can guide the soldier to safe area. The system is composed of two parts, which are portable remote soldier unit and the monitoring centre. The portable remote soldier unit consists of Advanced RISC Machines (ARM) with the embedded operating system, GPS and a GSM, temperature sensor and heart beat sensor. To design a soldier tracking system using GSM and GPS to provide wireless system for monitoring the parameters of soldier are as – Body temperature & Blood pressure. To find the health status of soldier biomedical sensors are used, a body temp sensor to measure body temperature as well as pulse rate sensor to measure the blood pressure. These parameters are then signal conditioned and will be stored in the memory. One of the fundamental challenges in military operations lays in that the Soldier not able to communicate with control room administrator. In addition, each organization needs to enforce certain administrative and operational work when they interact over the network owned and operated by other organizations. 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. Current problems faced by the military are as follows:

1. Soldier wants to know about their location but he can't do that.
2. Soldiers do not get help during panic situation
3. Soldiers are not traceable

In this project work, our main focus is to improve the communication of soldier with control room people and control plane operations. The above problems are solved as follows:

1. By using GPS, it is possible to give proper information about location in critical condition.
2. It becomes possible to help the soldier in panic condition by communicating with them by means of GSM.
3. It becomes possible to track those using GPS.

B. Overview of the target for the final system

The proposed work of this project is to develop a system that can be supplemented with real-time wireless monitoring systems which are designed and implemented through GPS network and are able to record and transmit bio-signals of soldiers. The aim of this project is to provide a medical monitoring for the soldier at any time and any place and to design a soldier tracking system using GSM and GPS to provide wireless system for monitoring the parameters of soldier such as Body temperature & heartbeat.

1. Wrist Watch for Mountaineers: The idea for our project was taken from the wrist watch used by mountaineers. The watch displays position, direction, surrounding temperature, and it also acts as altimeter. Soldiers carry walkie-talkies, which are bulky. So we are developing an alternative system using headphones which will guide the soldier.
2. Radio Collars with GPS Tracking: Recently in the US and

Australia some of the Indian students were forced to have a Radio Collar strapped to their ankles, so that their movements can be tracked by the officials. We use a similar technology which will display the soldier's current location on a map at the base station.

3. Tracking of Tigers: Recently India announced plans to use a new tiger tracking system in order to crack down on "lazy" wildlife guards. The new tracking system involves fitting tigers with radio collars. A GPRS (general packet radio service) device, along with the M-STrIPES software, will be used to track the movement of the tigers.

C. Summary of the system functionality

The system will track the position of the soldier as well give its health status. GPS is used to log the longitude and latitude of the soldier and GSM is used to send the health parameters of the soldier to the Base unit.

II. BLOCK DIAGRAM

The Block Diagram shows the complete working of the soldier monitoring system. It has two main parts, a soldier unit and base unit. Soldier unit consists of a Microcontroller, Pulse rate sensor, Temperature sensor, GPS receiver And GSM modem.

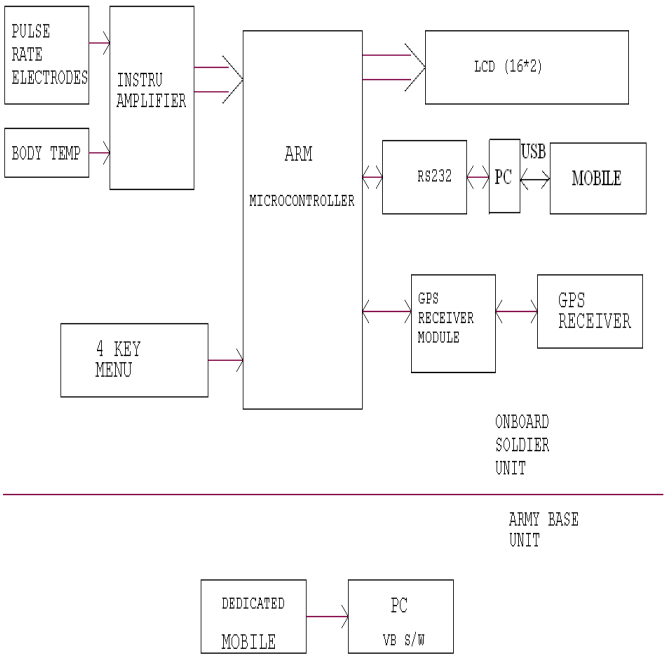

Fig 1.

B. SOLDIER UNIT:

This unit is placed on the soldier. It has mainly following parts:

- Microcontroller
- Power supply
- Biomedical sensors
- Key Pad
- GPS+GSM Unit

Fig. 1.1 Soldier Unit Fig. 1.2 Base Unit

Fig 2: Soldier and Base Unit

B. MICROCONTROLLER:

Microcontrollers are one of the major components in any embedded system. A microcontroller is a small computer on a single integrated circuit containing a processor core, memory and programmable input/output peripherals. Microcontrollers work according to the program written inside its program memory. The major use of these single chip computers are in automatic responding devices. The function of this section is to collect the information about heart beat of the soldier, atmospheric temperature and location of the soldier in each minute. Then it sends this information to the base unit.

Microcontroller Selection:

There are a number of microcontrollers available in the market like 8051, PIC, AVR, but the circuit requires the microcontroller to have 2 UART and also its size and cost plays an important role. The controller must have an inbuilt ADC and DAC to reduce the size of the kit. It satisfies the requirement which has 2 UART, has a 32 bit processor, inbuilt ADC, DAC and it is cost effective as compared to other controllers which have 2 UART. It also has 32Kb of RAM and 512 Kb of ROM which is sufficient for the project.

C. POWER SUPPLY:

The most important section in every electronic circuit is the power supply. For the proper working of all components an unaltered power supply is needed. The supply must be capable of providing the necessary power for each component. At the same time the protection from over voltage must be there. The basic step in the designing of any system is to design the power supply required for that system. The designing of power supply requires the total current that the system sinks from the supply and the voltage rating required for the different components.

In this project work following power supplies is used:

- 5V constant power supply for GPS, GSM Module and LCD section.
- Constant voltage regulator LM7805.
- Variable voltage regulator LM317 for ARM microcontroller LM317.

D. SOLDIER HEALTH INDICATION:
Here to find the health status of soldier, a body temperature sensor as well as pulse rate sensor is used. These sensors will measure the body temperature and the pulse rate of soldier and it will be stored in microcontroller memory.

E. SENSOR SURVEY:
There are a number of temperature sensors like thermistor, thermocouple, RTD, but all these sensors require signal conditioning and are difficult to calibrate in this particular application. The signal conditioning for these sensors increases the size of the kit, hence LM35 is used in this project which is a low cost temperature sensor and it does not require signal conditioning, calibration is also done by software.

F. LM35 SENSOR:
The LM35 are precision integrated circuit temperature sensor whose output voltage is linearly proportional to output current. 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 to readout. It can be used as single power supplier or with I supplies. The LM35 series is available packaged in hermetic to 46 transistor packages while the LM35C, LM35W also available in the plastic To-92 transistor package. The function of LM35 in this project is to monitor the atmospheric temperature.

G. HEART BEAT SENSOR:
Heart beat sensor is designed to give digital output of heart beat when a finger is placed inside it. This digital output can be connected to ARM 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.

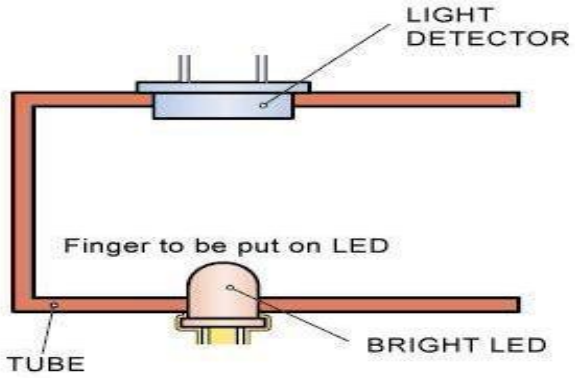

Fig 3: Heart beat cavity measurement system

ICLM358is used for Heart Beat Sensor. Its dual low power operational amplifier consists of a super bright red LED and light detector. One will act as amplifiers 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 reached at the detector. With each heart pulse detector signal varies this variation is converted to electrical pulse.

H. KEY- KEY PAD:
Here we are giving 4 key-key pad as a facility to the soldier where he can send short messages to the base camp.

I. GPS+GSM UNIT:
The GPS is used to log the Longitude and the Latitude of soldier which is stored in the µC memory. The GSM unit sends a SMS to the army base camp containing the health parameters and the location of soldier.

J. MAX 232:
MAX232 is used for level conversion to 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 logic circuits. The MAX232 is a dual driver/receiver. The MAX232 converts the information given by the RF reader and is given to the ARM microcontroller.

K. BASE UNIT:
The base unit is equipped with software called Visual Basic 6.0. This creates a database 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 a soldier it indicates a message.

L. GSM MODEM:
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 ARM microcontroller. In this project we use the GSM modem at base station to communicate with soldier. Upon receiving the SMS the text message in mobile shows the soldiers GPS coordinates also the health status is displayed.

III. APPLICATIONS

Vehicle tracking.

- Can be used for senior citizens.
- Can be used for mining vehicles.
- Can be used for oil tankers etc.

IV. ADVANTAGES

- Efficient way for evacuation of bank.
- Less time delays
- Quick response time.
- Fully automate system
- Robust system

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