

Soldier Health and Position Tracking System

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Abstract: In present era, the threat of enemies plays an important role in security policies of any state. In this prospective, the military soldiers plays an important and vital role. There are several considerations concerning the security of those troopers. So for the security purpose of troopers, a number of equipment or devices are attached with them to take the look on their health status and their ammunitions. Health relating sensors like pulse rate sensor, body temperature measuring sensor, transmission and processing capabilities, can thus help to make low-cost wearable solutions for health monitoring. GPS used for basically point the latitude and longitude to find exact location of soldier. GSM module can be used for effective srange of high-speed transmission that will be required to relay information on situational awareness, tactical instructions, and covert surveillance related data during special operations reconnaissance and other missions. The Soldier Health and Position Tracking System allows military base unit to track the current GPS position of soldier and also checks the health parameter including body temperature. The system is very helpful for getting health status information of soldier and providing them instant help.

Keywords- Soldier health, Safety, system etc.

I. INTRODUCTION

As we know, enemy warfare has an important impact regarding to security issue of any state. The national security in the main relies on army (ground), navy (sea), air-force (air). The vital and important role is done by the military soldier's. There are several considerations concerning the security of those troopers. The soldiers of future guarantees to be more advance technologically in

every crucial situation like warfare or any secret mission. In entire world, numerous analysis platforms presently being arranged, like the United States' Future Force warrior (FFW) and also the United Kingdom's Future infantry Soldier Technology (FIST) and they have a plan of making totally modern fight methodology. Helmet attached screens, accomplished of presenting maps and video from alternative group associates, varieties of physiological sensors' to observance health parameters. For this we are introducing a "SOLDIER HEALTH MONITORING AND POSITION TRACKING SYSTEM".

A.BASIC IDEA: This project base unit acquires location of soldier with the help of GPS. The responsibility of base station operators is to help the soldiers in choosing right path, if there is a threat of missing of soldiers. The base unit will contact this standing of the soldier that is exhibited on the computer.



Fig.I.A. Military Base Unit



Fig.I.A.i. Soldier Unit

B.PLAN: Our plan was to introduce the cost effective and consistent project which can assist the base unit, regarding the health and security of the soldiers, during war, special operations.

C.DESIGN: In order to design our project, we used two units namely soldier and base unit. Soldier unit contains a microcontroller (PIC18F25K20), heart beat sensor (Easy Pulse TCRT1000) is used to calculate the pulse rate of soldier, temperature calculation sensor (LM35) used to calculate the body hotness of the soldier, GPS receiver (SKM53) is used for tracking purpose, a Keypad is used for secret code input, GSM Module (SIM800L) is used to send all the input data to base station and LCD is used to display this data. A Power bank is used to power the circuit. Base unit includes a Cell Phone working as GSM connected with PC, which shows data consisting messages as threads on Mobarobo android pc suit and save messages as well in .xls format. By With the use of this system, the soldier can send feedback to his concerning base station. The project is mainly divided into four sections as

1. Input section
2. Output section
3. Circuit section
4. Sensor section

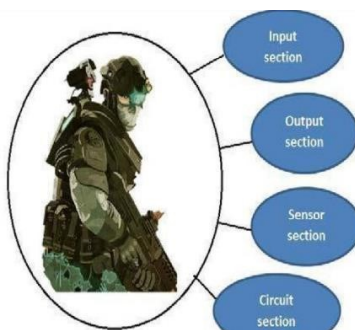


Fig.I.C. Different Sections of Project

D.REPORT OVERVIEW : Further the report includes different portions related to the working of different components used in our project, their working, functionalities in the circuit, techniques, problems faced in making the project and the solution of their problems, software used for

different purposes (like programming, PCB designing, simulation), recommendations, future improvements, prices, etc.

II. REVIEW OF LITERATURE

A.GENERAL OVERVIEW: This system enables GPS Tracking of these soldiers and also enables the telemedicine. It is possible by M-Health. The M-Health can be well-defined as medical sensors and communication technologies for health care. In a Real Time Tracking and Health Monitoring System, smart sensors are attached with the soldiers and other components like LCD, Batteries, GSM and PCB are enclosed in a box, which will be in the bag of soldier. A GPS Tracking system is also enclosed in the box, which provides the tracking of the position of soldier. At any instant, any soldier is in position of entering the enemy area, it's terribly important for the military base station to understand the situation and the health standing of all troopers as well. In our project we have planned towards a concept of tracing the soldier.

B.LITERATURE REVIEW:

1.Wrist Watch for Climbers: The small amount of idea for the project was reserved from the wrist watch that climbers use. Using this watch they can only get their location and surrounding temperature.

2.Walkie-Talkies: Warriors carry walkie-talkies that are massive in weight. Therefore, we are making the substitute system by the use of sensors, GPS. These walkie-talkies are basically Radio devices and work on a particular frequency. We are removing the needs of oral communication, control room can get automatic health conditions of soldier and soldier can also send message using code without any voice. Walkie-talkies needed large batteries which make it bulky.

3.Radio Collars with GPS Tracking : Recently in countries like US and Australia, a number of the foreign students were forced to own a Radio Collar strapped to their ankles, in order that their activities are caterpillar- tracked by the officers.

C.HISTORY: During, wars and military search operations, soldiers gets injured and sometime becomes losses. To find soldiers and provide health monitoring, army base station and need GPS device for locating soldiers, WBASNs to sense health related parameters of soldiers and a wireless transceiver to transmit the data wirelessly. Hong Beng Lim, Di Ma, Bang Wang, Zbigniew Kalbarczyk, Ravishankar k. Lyer, Kenneth L.

Watkin has discussed on recent advantage in growing technology, and on various wearable, portable, light weighted and small sized sensor that have been developed for monitoring of the human physiological parameters. The body sensor network (BSN) consists of many biomedical and physiological sensors such as blood pressure sensors, Electrocardiogram (ECG) sensor, electrical dermal activity (EDA) sensor which can be placed on human body for health monitoring in real time [1]. Shruti Nikam, Supriya Patil, Prajka Power, V.S. Bendre [3] had presented an idea for the safety of soldiers. The Bio sensor which consists of various types of small physiological sensors, transmission modules have great processing capabilities and can facilitate the low-cost wearable solutions for health monitoring. Also as stated by Dinesh Kumar Jaiswar, Sanjana S Repal in their survey, P.S. Kurhe, S.S Agrawal had introduced a system that gives ability to track the soldiers at any moment additionally, the soldiers will be able to communicate with control room using GPS coordinate in their distress. The location tracking has great importance since World War II, when military forces realized its usefulness for navigation, positioning, targeting and fleet management. This system is reliable, energy efficient for remote soldier health monitoring and their location tracking. The parameters of soldiers are measured continuously and wirelessly transmitted using GSM.

III. WORK DONE

A. HARDWARE DESCRIPTION: In this chapter overview of components used in the project is explained briefly. And we briefly discussed general characteristics of these components. Following are the main components and their general description.

- Microcontroller (PIC18F25K20)
- GPS (NEO6M)
- GSM module (SIM800L)
- Heart beat Sensor (TCRT1000)
- Temperature sensor (LM35)
- LM7805 (5V regulator)
- Switches
- Resistors
- LCD
- Battery

B. GLOBAL POSITIONING SYSTEM (GPS)

1. Introduction of GPS: The Global Positioning System (GPS) is radio location using navigation satellites. These systems provide round the clock

information on the three-dimensional position, velocity and time for users with the appropriate equipment and are at or near the earth's surface (and sometimes outside it). The first system GPS, widely available to civil users, has become NAVSTAR. Applications include portable guidance on the location, trajectory tracking of ships, as well as the system of driving wireless communication devices, which are designed for the car, the driver provides a personalized and promotional information, receive messages. GPS technology is used in a large number of applications, including maritime, environmental, navigational applications for tracking and monitoring.

2. SKM 53

a. General Description: The SkyNav SKM53 Series with embedded antenna GPS maintains highly accurate direction finding in the many severe uses and solid fix even when Global Positioning visibility environment is severe. It is centered on the highly accurate structures of the Media Tek 3329 single-chip architecture. It has the tracking sensitivity of -165dBm ranges positioning coverage into place like urban gaps and dark undergrowth environment where the Global Positioning System was not possible before. Receiver like Portable navigation system, GPS mouse, personal locator, camera used for speed detection and vehicle locator.



Fig.III.B.2.a. SKM53 Top View

C. GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS (GSM):

GSM (Global System for Mobile communications) originally from special mobile Group, is the most general standard for mobile telephony systems in the world. Everywhere it achieved international nomadic preparations between mobile phone operatives, allowing subscribers to use their phones in everywhere in the world. Global System for Mobile Communication differs from its prototype in that both signaling and speech channels are digital technologies. So GSM is 2nd generation (2G) mobile phone system. It was everywhere in the implementation of the GSM standard feature for both customers, who may take advantage from the skill to travel and change carriers without changing

H.LCD MODULE: Liquid crystal display (LCD) is the device, which shows output in graphical form. Its figure, features and electrical characteristics are given in Fig.h.

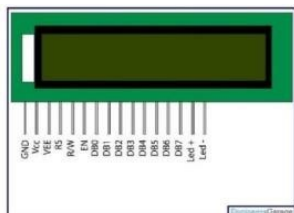


Fig.h.LCD Module

I.POWER SUPPLY: The power supply is the most important part of every electronic device or circuit. The protection from over voltage should be used, which is resistor.

J.COMMUNICATION BETWEEN SOLDIER AND BASE STATION:

For communication system, we used GSM module (SIM800L) in our project. GSM networks operate in a number of different carrier frequency bands. Most 2G GSM networks operating in the 900 MHz or 1800 MHz bands. Where already been assigned to these bands, it was used 850 MHz and 1900 MHz bands instead.

K.WORKING: The circuit diagram of a Real Time Tracking and Health Monitoring System for Soldier. The heart of this circuit is a Programmable interface controller PIC 18F25K20. Other important components used in this circuit are LM35, Easy Pulse v1.1, GSM module, GPS modem, keypad, LCD and some discrete components. PIC 18F25K20 controls and co- ordinate the working of the circuit.Two 22pF capacitors are connected to it for avoiding the damping of the clock signal. Quartz crystal is connected to pin 13 and 14 of the microcontroller. PIC works according to the program written on to it. The program is written in C language. The function of the PIC18F25K20 in our project is to collect information from body temperature sensor LM35, easy pulse v1.1, GPS modem and sent this information to the base station using GSM module. This voltage is given to an analog to digital converter(ADC) of the microcontroller which converts the analog 22 value in its input to a digital value ranging from 0 to 255. It is connected to the port1 (port A) of PIC, i.e. to the 3rd pin.This information is transmitted to PIC and then to base station with using GSM. Heart beat sensor used in this project is Easy Pulse v1.1. A complete heart rate measuring system consists of HRM-2511E named sensor which is factory-made by “Kyoto Electronic Co.”, China, and works

in communication mode. In transmission mode brightness is radiated towards the skin and sensor is sited on the other side of the skin to compute the light fallen on light sensor. In the sensor casing, an IR LED and a light detector are located on two opposite sides and are in front of each other. A graph for this change against time is mentioned to be a photoplethysmographic or PPG signal.The PPG signal contains a huge DC component that is recognized to overall blood volume of the inspected skin, and AC component is identical to heart beat. An AC component that brings vigorous info as well as the pulse rate is too much lesser in scale than the DC component. This AC component is amplified and filtered and the AC signal is converted to a strong pulse train. This output pulse train from Sensor is sent to microcontroller on 2nd pin of microcontroller. Where microcontroller calculates heartbeat display in on the LCD and send to GSM to transmit in SMS.

L.WORKING METHODOLOGY: In this chapter the circuit and hardware and software design of the project is explained with different sections. All the hardware is enclosed in small bag that soldier can easily carry with him.The project has a weight less than 1kg so it can be easily carried by a soldier. We designed a better software design to get the better performance and focus on the problem of processing capability of microcontroller.

M.HARDWARE DESIGN: The physical diagram in Fig. k shows the working of our project

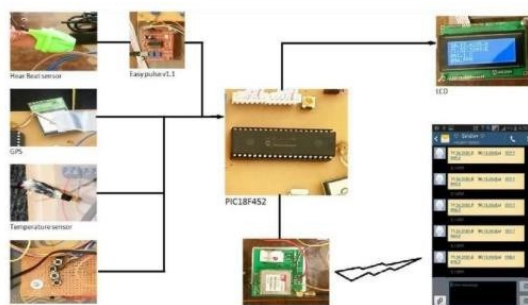


Fig.M.Project hardware and their working

Our project is mainly divided into three parts.

- On finger
- On arm
- In the bag

Sr. No.	Components	Quantity	Unit Price	Total
1	Microcontroler	1	500	500
2	GSM Module	1	5000	5000
3	GPS	1	4000	4000
4	Heart Beat Sensor	1	3000	3000
5	Temperature Sensor	1	35	35
6	LCD	1	550	550
7	Batteries	16	160	2560
8	LED	1	5	5
9	Connectors	4	6	24
10	Push Buttons	6	4	24
11	Voltage Regulator	1	15	15
12	Resistors	10	3	30
13	Wires		190	190
14	Standard PCB	1	35	35
15	PCB Etching	1	900	900
16	Bolts	14	4	60
17	Plastic Sheet	1	100	100
18	Plastic Box	1	460	500
19	Serial Wires	5	60	300
20	Crystal Oscillator	1	30	30
21	Variable Resistor	1	15	15
22	Other		1000	1000
	Grand Total			18,872

VI. FUTURE SCOPE

A.FUTURE ENHANCEMENTS: The good thing, we noted that there is a lot of possibility to make enhancements in this project. Our system is for one soldier. The communication between soldier to soldier can be established. The betterment of base station unit can also be done by making proper GUI at base station PC and officials at base station can also send feedback or any order to soldiers via base unit.

B.FINAL CONSIDERATIONS : By the use of this system, we can condense casualties of battle. It assists to give critical information's and cautions to soldiers so that they can survive for long and aim of war or secret operation can be obtained. This system gives strength to the defense system ocountry. So, we can accomplish that these types of strategies are very supportive for certifying security of the soldiers.

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