Soldier Health and Position Tracking System using GPS and GSM Modem.

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Abstract-**Nowadays all nations keep its security at high priority. Wars are being fought for land, water and acquiring the position of most powerful nation. A country's arm forces consist of three professional uniformed services: the army, the navy, and the air force. Soldiers being the backbone of any armed force usually lose their lives due to lack of medical help when in emergency, also soldiers who are involved in missions or in special operations get straggled on war fields and lose contact with the authorities. To overcome this concerns we had build this project which, using wireless body area sensor network (WBANS) such as temperature sensor, heartbeat sensor etc. will monitor the health status of the soldier whenever required. Also using GPS we can track the soldier's exact location whenever required. Using oxygen level sensor we can also monitor the environmental condition, so authorities can provide essential aids. The communication is established between the soldiers and authorities via GSM. Any abnormalities in the readings of wireless body area sensor network (WBASNs) is considered as a trigger for GSM to establish the connection between the soldier and base unit and send current location and health status to the receiver. By using all this equipments we had tried to implement the basic guarding system for the soldier in low cost, light weighted, portable and precise device.**

Keywords: Arduino Board, GPS, GSM modem, temperature sensor.

I. INTRODUCTION

The nation's security is monitored and kept by army, navy and air-force. The important and vital role is of soldiers who sacrifice their life for their country. There are many concerns regarding the safety of the soldier. Soldiers entering the enemy lines often lose their lives due to lack of connectivity, it is very vital for the army base station to known the location as well as health status of all soldiers. India has already lost so many soldiers in war-fields as there was no proper health backup and connectivity between the soldiers on the war-fields and the officials at the army base stations. Recently on 29 September 2016, a military confrontation between India and Pakistan began, Indian soldiers conducted a surgical strike against militant launch pads across the line of control in Pakistani-administered Azad Kashmir, and inflicted "significant causalities".

Indian soldiers are mainly known for their courage, in spite of scarce ammunitions and safety measures, they have many triumphs to their credits. All must be really concerned about the safety of the soldiers, so we have decided to build a project which will efficiently keep a check on the health status of the soldier, and his precise location to equip him with necessary medical treatments as soon as possible. Soldier's tracking is done using GPS and GSM is used to provide wireless communication system. For monitoring the health parameters of soldier we are using bio medical sensors such as temperature sensor and heart beat sensor.

An oxygen level sensor is used to monitor atmospheric oxygen so if there are any climatic changes the soldiers will be equipped accordingly.

The infantry soldier of tomorrow promises to be one of the most technologically advanced modern warfare has ever seen. Around the world, various research programs are currently being conducted, such as the United States' Future Force Warrior (FFW) and the United Kingdom's Future Infantry Soldier Technology (FIST), with the aim of creating fully integrated combat systems.Alongside vast improvements in protective and weaponry subsystems, another major aspect of this technology will be the ability to provide information superiority at the operational edge of military networks by equipping the dismounted soldier with advanced visual, voice, and data communications.

Helmet mounted visors, capable of displaying maps and real-time video from other squad members, ranges of physiological sensors display the heartbeat, body temperature, atmosphere pressure, surrounding oxygen level etc. These devices will improve awareness for collateral military personnel as well as who will exchange information using wireless networks along with host. The challenge was to integrate these piecemeal components into a lightweight package that could achieve the desired result without being too bulky and cumbersome or requiring too much power. Communicating with the base (control room) station become the fundamental challenges in military operations also the proper navigation between soldier's organizations plays important role forcareful planning and co-ordination.

So this paper focus on tracking the location of soldier from GPS, which isuseful for control room station to know the exact location of soldier and accordingly they will guide them. Also High-speed,short-range, soldier-to-soldier wireless communications to relay information on situational awareness, such asBio-medical sensors, GPS navigation, Wireless communication.

Proposed system:

After cosidering the above technologies the tracking of soldieran navigation between soldier to soldier such as knowing their speed,distance,height as well as health status of them during the wa,which enables the army personal to plan the war stratergies.Base staton gets location of soldier from GPS. The base station can access the current statusof the soldier which is displayed on the phone with the help of GSM and hence appropriate actions can be found.

Special Issue - 2018

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NCESC - 2018 Conference Proceedings

II. SYSTEM ANALYSIS

System analysis is the act, process of profession of studying an activity typically by mathematically means in order to define its goals or purposes and discover operation and procedures for accomplishing them most efficiently.

III. HARDWARE REQUIREMENTS

The hardware requirements for the system are as follows
a. Pulse Sensor:

Fig: Pulse sensor

The sensor used in this project is pulse sensor-SEN-11574. Heart rate data can be really useful for determining the health status of a person. The pulse sensor amped is a plug and play heart rate sensor for arduino. It essentially combines a simple optical heart rate sensor with amplification and noise cancellation circuitry making it fast and easy to get reliable pulse readings. It sips power with just 4 mA current draw at 5V. To use it simply clip the pulse sensor to earlobe or fingertip.

b. Temperature Sensor

Fig: Type T

Type T (copper constantan) thermocouples are suited for measurements in the range 200 to 350 degree Celsius. Often used as a differential measurement, since only copper wire touches the probes. This series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the centigrade temperature. The LM35 device has an advantage over linear temperature sensor calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient centigrade scaling. To find the health status of soldier base station should know the body temperature and pulse rate of the soldier. So we are using LM35 body biosensor as it is a low cost temperature sensor and it does not require signal conditioning. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified. As the temperature increase above the specified value the GSM module will immediately alert the Base station and thus will not wait for heart beats to go out of the normal range.

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: 1. 5V constant power supply for GPS, GSM Module and LCD section. 2. Constant voltage regulator LM7805. 3. Variable voltage regulator LM317 for ARM microcontroller LM317.

d. Arduino Board

Special Issue - 2018

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
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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.

The ATmega328 is a single –chip microcontroller created by ATmega in the mega AVR family. The Atmel 8-bit RISC-based microcontroller combines 32kB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2kB SRAM, 23 general purpose I/P lines, 32 general purpose working registers, three flexible timer/counter with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, 6-channel 10-bit A/D converter programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz .

e. *GPS Modem*

The Global Positioning System (GPS) is a space-based global navigation satellite system that provides reliable location and time information in all weather and at all times and anywhere on or near the Earth when and where there is an unobstructed line of sight to four or more GPS satellites.

f. *GSM Modem*
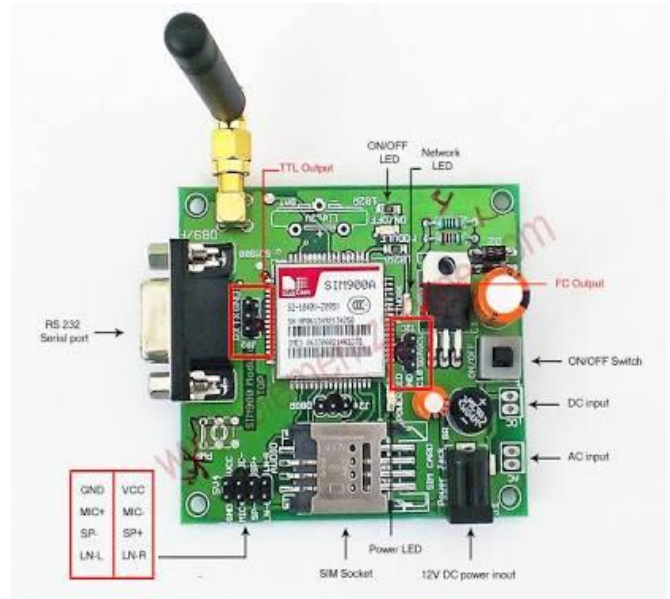
GSM modem

GSM, which stands for Global System for Mobile communications, reigns as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area.

GSM module is a breakout board and minimum system of SIM900 Quad-band/SIM900A Dual-band GSM/GPRS module. It can communicate with controllers via AT commands (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands). This module supports software power on and reset. It has a quad-band 850/900/1800/1900 MHz and a dual-band 900/1900 MHz. It has control via AT commands, a very low power consumption of 1.5mA (sleep mode).

F. *GPS Receiver Module:*

Special Issue - 2018

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NCESC - 2018 Conference Proceedings

The GP-20U7 is a compact GPS receiver with a built-in high performances all-in-one GPS chipset. The GP-20U7 accurately provides position, velocity, and time readings as well possessing high sensitivity and tracking capabilities. Thanks to the low power consumption this receiving GP-20U7 is deal for portable applications such as tablet PCs, smart phones, and other devices requiring positioning capability.
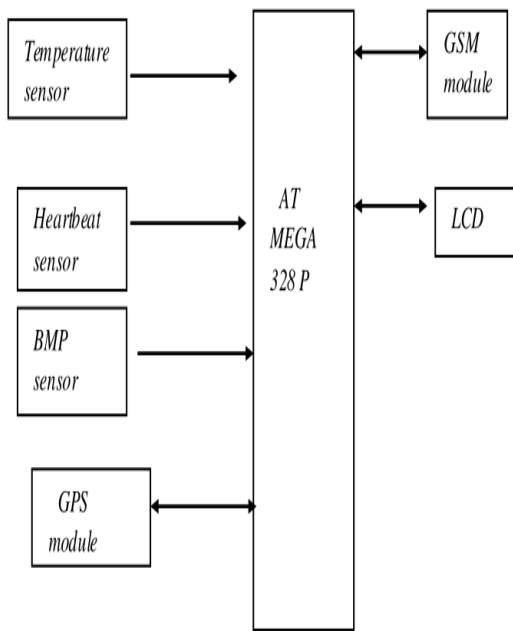
System Block Diagram

METHOD OF NAVIGATION USING GPS

A robust accurate positioning system with seamless indoor and outdoor coverage is highly tool for increasing safety in emergency response and military operation. GPS-based positioning methods mainly used to field rescue. The position and orientation of the rescuer and the trapped is acquired using GPS chip. Using the GPS data of both the units the relative distance, height and orientation between them are calculated from the geometric relationships based on a series of formulas in Geographic Information Science (GIS). Using this technology, we are doing the navigation between two soldier .the data will be send wirelessly by RF Transceiver. This device can do accurate coordination via wireless communication, helping soldier for situational awareness. GPS module have serial interface. Receiverinformation are broadcast via this interface in a special data format. This format standardized by the National Marine Electronics Association (NMEA).

PHYSIOLOGICAL SIGNALS AND BIOSENSORS

With recent advances in technology, various wearable sensors have been developed for the monitoring of human physiological parameters. The various sensing technologies are available, which can be integrated as a part of health monitoring system, along with their corresponding measured

physiological signal. The measurement of these vital bio-signal and their subsequent processing for feature extraction, lead to collection of real time gather edparameter which can give an overall estimation of health condition at any real time There are a number of medical parameters of soldier that can be monitored, like ECG, EEG, Brain Mapping, etc. But these require complex circuitry and advanced medical facilities and hence they cannot be carried around by the soldier. The entire system would become bulky for the soldier.

Flow chart
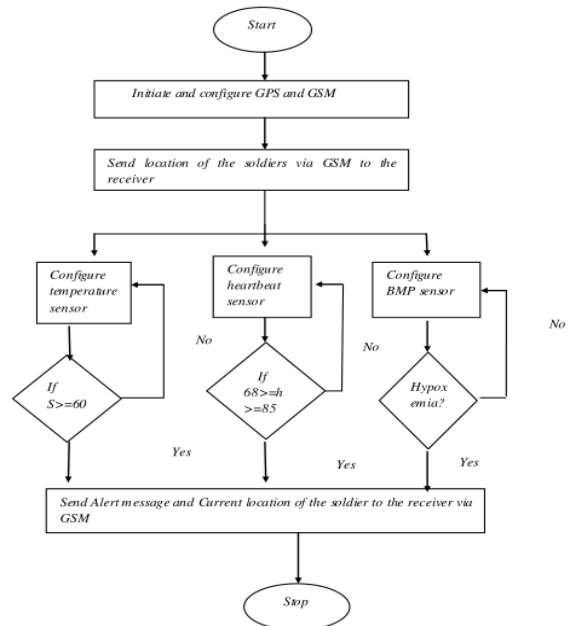
IV. SOFTWARE REQUIREMENTS

- Compiler
- MC Programming Language: C

VI. RESULT AND CONCLUSION

The result is as shown below. A message is send on the registered number confirming about GSM and GPS configuration. Later as the normal body parameters deviates an alert message is send to base station along with the precise location of the soldier.

Following conclusion can be retrieved from above implementation are:

- Soldiers Security and safety: GPS tracks position of soldier anywhere on globe and also health system monitors soldier's vital health parameters and environmental situation which provide security and safety for soldiers.
- Less complex circuit and less power consumption: Use of PIC processor and low power requiring peripherals reduce overall power usage of system.

Special Issue - 2018

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NCESC - 2018 Conference Proceedings

- Modules used are smaller in size and also lightweight so that they can be carried around.
- So in this way concept of tracking and navigation system is very useful for soldiers when they are on military field during war. And also for base station so that they can get real-time view of soldier.
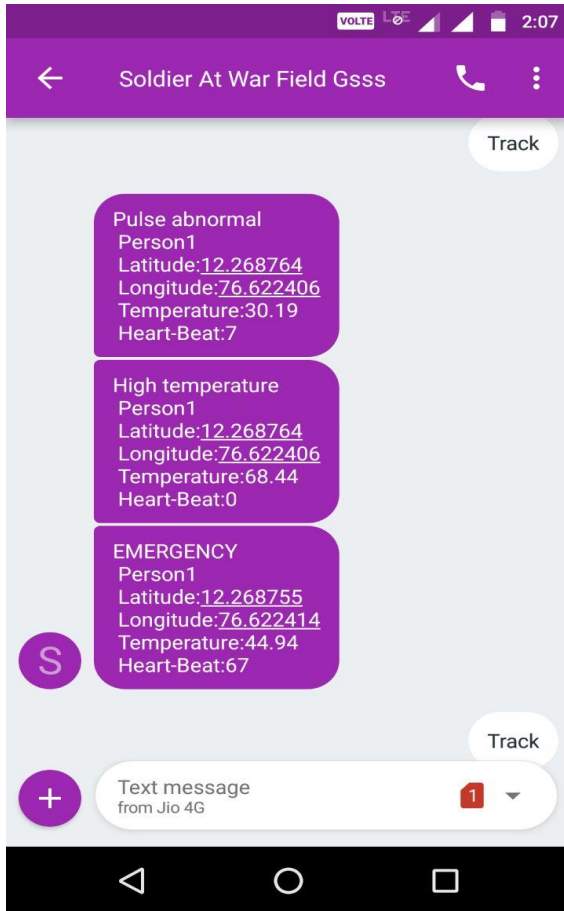
Message Received in control unit
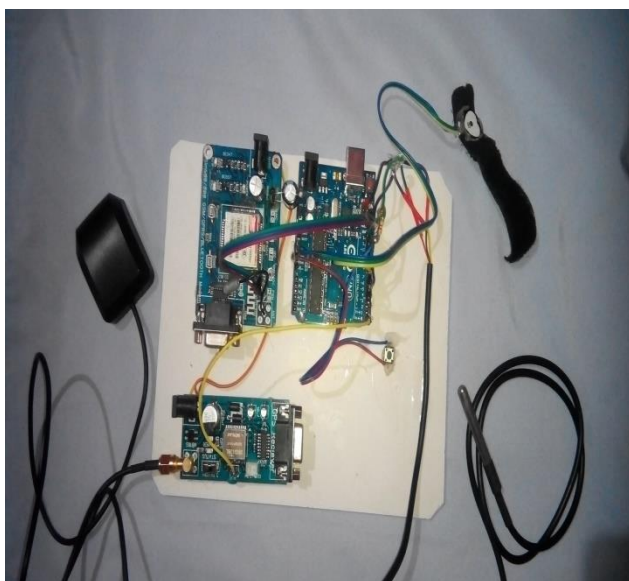
Circuit implemented

Soldier unit

VII. FUTURE ENHANCEMENT

We can dial an emergency call if the soldier health parameters crosses threshold value or soldier co-ordinates goes out of a certain / pre-decided track.

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