Soldier Health and Position Tracking System

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***Abstract*- The soldier Health and Position Tracking System allows military to track the current GPS position of soldier and also checks the health status including body temperature and heartbeats of soldier. The System also consists extra feature with the help of that soldier can ask for help manually or send a distress signal to military if he is in need. The GPS modem sends the latitude and longitude position with link pattern with the help of that military can track the current position of the soldier. The system is very helpful for getting health status information of soldier and providing them instant help.**

***Index terms*- Soldier Health, Hardware, Microcontrollers, Embedded System**

I.INTRODUCTION

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. 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. These are implanted with a personal server for complete mobility. This personal server will provide connectivity to the server at the base station using a wireless connection (GSM).

A GPS Tracking system is also enclosed in the box, which provides the tracking of the position of soldier. Each unit has a GSM module, which enables the communication between both ends. Thereby, it is possible to back up a soldier or assist a soldier and makes the mission accomplished. 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 the soldier throughout the war that allows the military personnel to set up the war ways.

II.WORKING METHODOLOGY

The control room can acquire the required details about the health status like along with position and orientation of soldier from GPS.

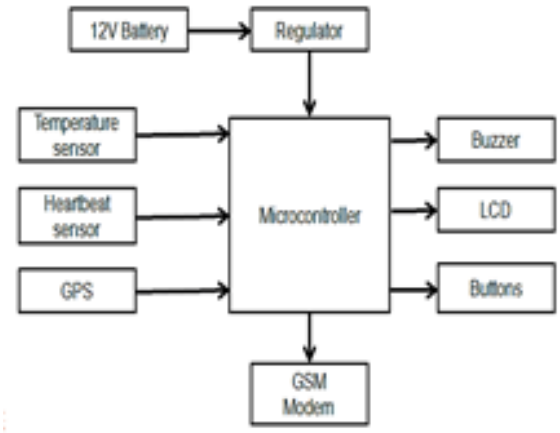

Fig.1. Block Diagram

Even in case of losing their direction, it is the responsibility of the GPS to guide the soldier in correct direction which would be guided by the control room. The control room can access the

current status of the soldier using cloud computing the different tracking parameters of the soldier get transmitted via GSM module in our system we have designed in such a manner that the threshold valve is set to individual sensor so that the control room can get the required information of the soldiers during the emergency condition. This information will be stored on the Cloud and can be extracted on the PC of control room, as and when required. Based on this information, the authorities can take immediate action by deploying a medical, rescue team or any backup force for their help. Using various biomedical sensors, health parameters of a soldier is observed.

The proposed system is consist of two main functions as acquiring the data from the hardware and transfer of the data through cloud computing. LM35 temperature sensor, toxic gas detector sensor, blood pressure, accelerometer oxygen level and GSM for continuously monitoring health status of soldier. GSM is used for transferring of all the data from the above sensors. The base station can access the current status of the soldier which is displayed on the phone with the help of GSM and hence appropriate actions can be found. 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. 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.

III.HARDWARE DETAILS

A. Microcontroller

A microcontroller (MCU for microcontroller unit) is a small computer on a single metal-oxide-semiconductor (MOS) integrated circuit chip. In modern terminology, it is similar to, but less sophisticated than, a system on a chip (SoC); an SoC may include a microcontroller as one of its components. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems. In the context of the internet of things, microcontrollers are an economical and popular means of data collection, sensing and actuating the physical world as edge devices. Microcontrollers may serve performance-critical roles.

Fig.2. Microcontroller

B. GPS Modem

A GPS navigation device, GPS receiver, or simply GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position. Using suitable software, the device may display the position on a map, and it may offer directions. The Global Positioning System (GPS) is a global navigation satellite system (GNSS) made up of a network of a minimum of 24, but currently 30, satellites placed into orbit by the U.S. Department of Defense. The GPS was originally developed for use by the United States military, but in the 1980s, the United States government allowed the system to be used for civilian purposes. Though the GPS satellite data is free and works anywhere in the world, the GPS device and the associated software must be bought or rented.

A GPS device can retrieve from the GPS system location and time information in all weather conditions, anywhere on or near the Earth. A GPS reception requires an unobstructed line of sight to four or more GPS satellites, and is subject to poor

satellite signal conditions. In exceptionally poor signal conditions, for example in urban areas, satellite signals may exhibit multipath propagation where signals bounce off structures, or are weakened by meteorological conditions. Obstructed lines of sight may arise from a tree canopy or inside a structure, such as in a building, garage or tunnel. Today, most standalone GPS receivers are used in automobiles. The GPS capability of smartphones may use assisted GPS (A-GPS) technology, which can use the base station or cell towers to provide a faster Time to First Fix (TTFF), especially when GPS signals are poor or unavailable. However, the mobile network part of the A-GPS technology would not be available when the smartphones is outside the range of the mobile reception network, while the GPS aspect would otherwise continue to be available.

Fig.3. Global Positioning System

C. Battery

It is rechargeable Type. A battery is one or more electrochemical cells, which store chemical energy and make it available as electric current.

Fig.4.Battery

There are two types of batteries, primary (disposable) and secondary (rechargeable), both of which convert chemical energy to electrical energy. Primary batteries can only be used once because they use up their chemicals in an irreversible reaction. Secondary batteries can be recharged because the chemical reactions they use are reversible; they are recharged by running a charging current through the battery, but in the opposite direction of the discharge current. Secondary, also called rechargeable batteries can be charged and discharged many times before wearing out. After wearing out some batteries can be recycled. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy.

D.GSM Modem

The Global System for Mobile Communications (GSM) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile devices such as mobile phones and tablets. It was first deployed in Finland in December 1991. By the mid-2010s, it became a global standard for mobile communications achieving over 90% market share, and operating in over 193 countries and territories.2G networks developed as a replacement for first generation (1G) analog cellular networks. The GSM standard originally described a digital, circuit-switched network optimized for full duplex voice telephony. This expanded over time to include data communications, first by circuit-switched transport, then by packet data transport via General Packet Radio Service (GPRS), and Enhanced Data Rates for GSM Evolution (EDGE). Subsequently, the 3GPP developed third-generation (3G) UMTS standards, followed by fourth-generation (4G) LTE Advanced standards, which do not form part of the ETSI GSM standard.

"GSM" is a trade mark owned by the GSM Association. It may also refer to the (initially) most common voice codec used, GSM networks operate in a number of different carrier frequency ranges (separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G), with most 2G GSM networks operating in the 900 MHz or 1800 MHz

bands. Where these bands were already allocated, the 850 MHz and 1900 MHz bands were used instead (for example in Canada and the United States). In rare cases the 400 and 450 MHz frequency bands are assigned in some countries because they were previously used for first-generation systems. For comparison most 3G networks in Europe operate in the 2100 MHz frequency band. For more information on worldwide GSM frequency usage, see GSM frequency bands.

Fig.5. GSM Module

E. Control Unit

Microcontroller is a computer on a chip. Micro suggests that the device is small, and controller tells you that the device' might be used to control objects, processes, or events. Another term to describe a microcontroller is embedded controller, because the microcontroller and its support circuits are often built into, or embedded in, the devices they control. It is temporary storage unit. Arduino is an open source microcontroller which can be easily programmed, erased and reprogrammed at any instant of time. Arduino uses a hardware known as Arduino development board and software for developing code known as IDE. The micro controller board used in our design is Arduino Uno

Fig.6. Arduino UNO

The Arduino UNO ATmega328 microcontroller is the MCU used in Arduino UNO R3 as a main controller. ATmega328 is an MCU from the AVR family; it is an 8-bit device, which means that its data-bus architecture and internal registers are designed to handle 8 parallel data signals. Most articles explain the software of Ardiuno. A good grasp of the electronic design of your Arduino hardware will help you learn how to embed an Arduino in the design of a final product, including what to keep and what to omit from your original design. Before we can understand the UNO's hardware, we must have a general overview of the system first.

F. LCD Display

A liquid crystal display or LCD draws its definition from its name itself. It is combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. Liquid crystal displays are super-thin technology display screen that are generally used in laptop computer screen, TVs, cell phones and portable video games. LCD's technologies allow displays to be much thinner when compared to cathode ray tube (CRT) technology. we can see that there is a disadvantage of this project that some patch of the given area may be left uncut due to the obstacle present, in future, we may interface the BOT with a wireless technology where we can control the kit manually and keep a check that it does not go out of the desired area.

Fig.7. LCD Display

Liquid crystal display screen works on the principle of blocking light rather than emitting light. LCD's requires backlight as they do not emits light by them. We always use devices which are made up of LCD's displays which are replacing the use of cathode ray tube.

G. Heartbeat Sensor

Heartbeat Sensor is an electronic device that is used to measure the heart rate i.e. speed of the heartbeat. Monitoring body temperature, heart rate and blood

pressure are the basic things that we do in order to keep us healthy. In order to measure the body temperature, we use thermometers and a sphygmomanometer to monitor the Arterial Pressure or Blood Pressure. Heart Rate can be monitored in two ways, one way is to manually check the pulse either at wrists or neck and the other way is to use a Heartbeat Sensor. In this project, we have designed a Heart Rate Monitor System using Arduino and Heartbeat Sensor. You can find the principle of heartbeat sensor, working of the heartbeat sensor and Arduino based Heart Rate Monitoring System using a practical heartbeat Sensor. A new version uses the TCRT1000 reflective optical sensor for photoplethysmography. The use of TCRT100 simplifies the build process of the sensor part of the project as both the infrared light emitter diode and the detector are arranged side by side in a leaded package, thus blocking the surrounding ambient light, which could otherwise affect the sensor performance. I have also designed a printed circuit board for it, which carries both sensor and signal conditioning unit. Its output is a digital pulse which is synchronous with the heartbeat. The output pulse can be fed to either an ADC channel or a digital input pin of a microcontroller for further processing and retrieving the heart rate in beats per minute (BPM).

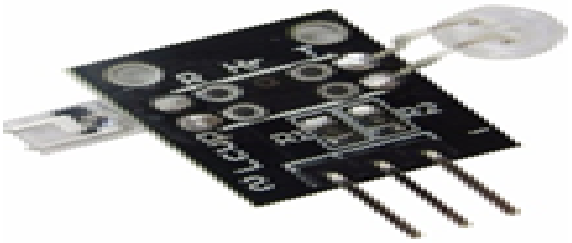

Fig.8. Heartbeat Sensor

V.RESULTS AND DISCUSSION

This project is more suitable for a common man as it is having much more advantages i.e, no fuel cost, no pollution and no fuel residue, less wear and tear because of less number of moving components and this can be operated by using solar energy. Especially no skill is required to operate the grass cutter machine. This system is having facility of charging the batteries while the machine is under motion. In this paper, the work done on lawn mower will meet the challenge of environmental production and low cost of operation. This lawn mower has been developed for the use of residences and establishments that have lawns where tractor driven mowers could not be used.

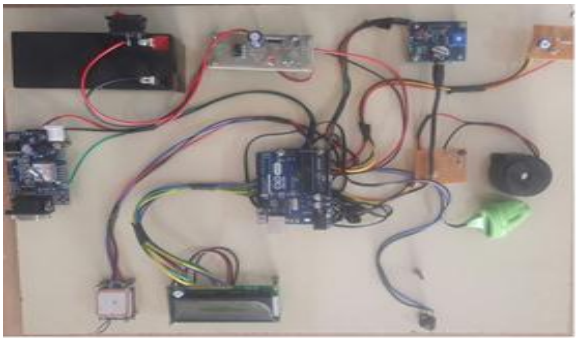

Fig.9. Hardware Module

VI.CONCLUSION

From the above implementation we have concluded that the communication hurdles between the soldiers and authorities at the base unit is overcome using GSM, the precise location and health parameters are known using GPS and wireless body area sensor network (WBASNs) respectively and with the GSM modem all information is send to the base station so that field commander will take necessary action. The design was way more effective than we originally thought off at the start of our project. We tried following ethics in designing and implementation of the project. We won't claim that our circuit had 100% efficiency, as it did show some variance that we minimized to some extent. The good thing, we noted that there is a lot of possibility to make enhancements in this project. This system gives strength to the defense system of our country. So, we can accomplish that these types of strategies are very supportive for certifying security of the soldiers.

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