Soldier Health Care Monitoring & Tracking System Using IOT

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Abstract: Embedded is a combination of software and hardware, when a technology is used to do a particular task it is called embedded system. Embedded system is widely used automobiles, industrial automation, home appliances, mobile and aeronautics. Embedded technology uses PC or a controller to do the specified task and the programming is done using assembly language programming or embedded C. Wireless Sensor Network technologies have become a latest research area in health care industries due to rapid maturity in improving the quality of life of a patient. Wireless Sensor Networks when work in medical field provide continuous monitoring of vital health parameters which over a long period of time provide doctors much needed help to make accurate diagnosis and giving better treatment using Internet of things.
Keywords: Gps, Heat Sensor, Iot, Micro Controller, Relay.

I. Introduction

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 monitoring heart rate, core body temperature etc. These devices will improve situational awareness, not only for the host, but also for collocated military personnel who will exchange information using wireless networks.

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. One of the fundamental challenges in military operations lies that the soldiers are not able to communicate with control room station. In addition, the proper navigation between soldier's organizations plays important role for careful planning and co-ordination. So in this paper we focus on tracking the location of soldier from GPS, which is useful for control room station to know the exact location of soldier and accordingly they will guide them. Also Highspeed, short-range, soldier-to-soldier wireless communications to relay information on situational awareness.GPS navigation, Bio-medical sensors, Wireless communication.

II. Proposed System

It consists of two unit's viz., "Soldier unit" and "Server unit". The wireless technology (IoT) is used in our project for the communication. We are using a ARM programmable IC (LPC 2148).GPS is interfaced with the Soldier Unit (moving unit) which sends the current location of the soldier in the battle field, to the server unit, via IoT module. The receiver in the server unit receives the signal and tracks the location. Heart beat sensor and temperature sensor are attached with the soldier unit, to check if the soldier is alive or dead, and sends the information to the server unit. In any emergency situation soldier can contact the server by giving a request through keypad interfaced with the unit. To prevent inactive the body part for examples finger, heart, leg& hand due to heavy snow. Thermoelectric cooling uses the peltier effect to create a heat flux between the junctions of two different types of materials which is wearied by soldier for worm up. LCD display shows the status. The server unit monitors via Cloud (PC or Mobile phone). LCD display shows the status.
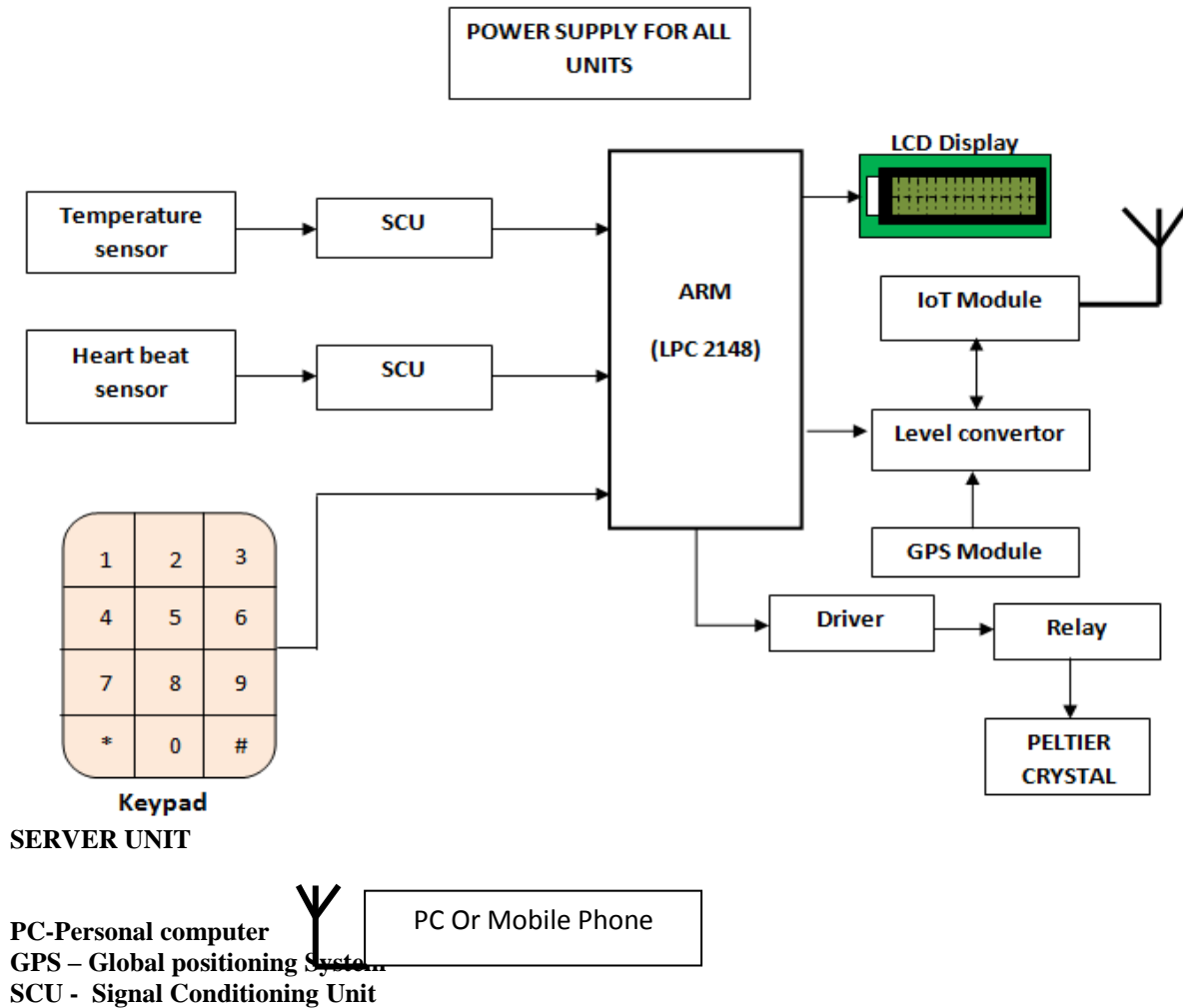
III. Block Diagram

3.1. Soldier Unit

SERVER UNIT

PC-Personal computer
GPS – Global positioning System
SCU - Signal Conditioning Unit

Fig. 1.block diagram of the solider and server unit

IV. Components Description

4.1. BATTERY CELLS

Battery Cells are the most basic individual component of a battery. They consist of a container in which the electrolyte and the lead plates can interact. Each lead-acid cell fluctuates in voltage from about 2.12 Volts when full to about 1.75 volts when empty. Note the small voltage difference between a full and an empty cell (another advantage of lead-acid batteries over rival chemistries).

Lead acid battery

A lead-acid battery is an electrical storage device that uses a reversible chemical reaction to store energy. It uses a combination of lead plates or grids and an electrolyte consisting of a diluted sulphuric acid to convert electrical energy into potential chemical energy and back again. The electrolyte of lead-acid batteries is hazardous to your health and may produce burns and other permanent damage if you come into contact with it.

4.2. HEART BEAT SENSOR:

Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat in fig.2. This digital output can be connected to microcontroller 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.
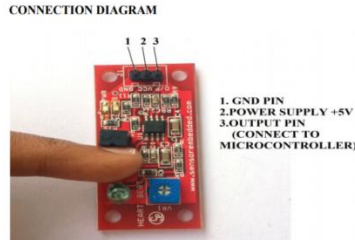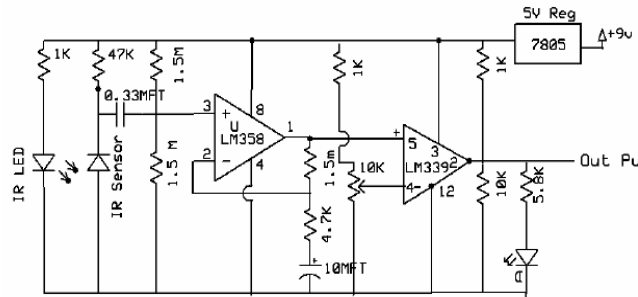
Fig.2. Heart Beat Sensor

Fig.3. Circuit Diagram Of Heart Beat Sensor

This is a non-invasive measurement for changes in finger blood flow during wakefulness and sleep. Pulse wave amplitude (PWA) is the most frequently used parameter obtained by finger plethysmography.fig.3. PWA is directly and positively correlated to finger blood flow. The hypothesis of this study was that finger plethysmography detects pharmacologically induced changes in finger blood flow.

4.3. TEMPERATURE SENSOR (LM35):

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in ^{o}C) in fig.4 and fig.5. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.
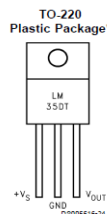
PIN DIAGRAM:

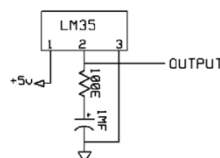**Fig.4.Temperature Sensor**

CIRCUIT DIAGRAM

Fig.5.Circuit Of Temperature Sensor

4.4. MATRIX KEYPAD

Keypads are a part of HMI or Human Machine Interface and play really important role in a small embedded system where human interaction or human input is needed in fig.6. Matrix keypads are well known for their simple architecture and ease of interfacing with any microcontroller.
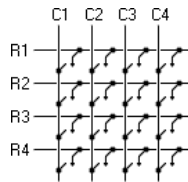
Fig.6.Diagram Of Matrix Keypad

4.5. ARM LPC 2148

ARM is a family of instruction set architectures for computer processors based on a reduced instruction set computing (RISC) architecture developed by British company ARM Holdings.

A RISC-based computer design approach means ARM processors require significantly fewer transistors than typical processors in average computers. This approach reduces costs, heat and power use. These are desirable traits for light, portable, battery-powered devices—including smartphones, laptops, tablet and notepad computers), and other embedded systems. A simpler design facilitates more efficient multi-core CPUs and higher core counts at lower cost, providing higher processing power and improved energy efficiency for servers and supercomputers.

4.6. Global Positioning System (GPS)

A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth. Each satellite continually transmits messages that include the time the message was transmitted, precise orbital information (the ephemeris),the general system health and rough orbits of all GPS satellites (the almanac). The receiver utilizes the messages it receives to determine the transit time of each message and computes the distance to each satellite.

4.7. INTERNET OF THINGS (IOT)

The **Internet of things** (**IoT**) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure.

4.8. ESP8266 ARDUINO CORE

Arduino began developing new MCU boards based on non-AVR processors like the ARM/SAM MCU and used in the Arduino Due, they needed to modify the Arduino IDE so that it would be relatively easy to change the IDE to support alternate tool chains to allow Arduino C/C++ to be compiled down to these new processors. They did this with the introduction of the Board Manager and the SAM Core in fig.7. A "core" is the collection of software components required by the Board Manager and the Arduino IDE to compile an Arduino C/C++ source file down to the target MCU's machine language. Some creative ESP8266 enthusiasts have developed an Arduino core for the ESP8266 WiFi SoC that is available at the GitHub ESP8266 Core webpage.
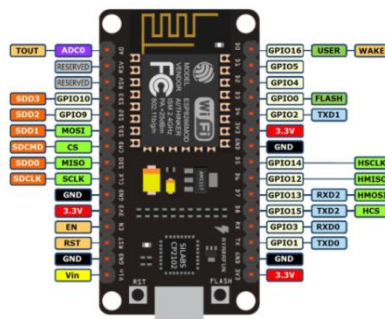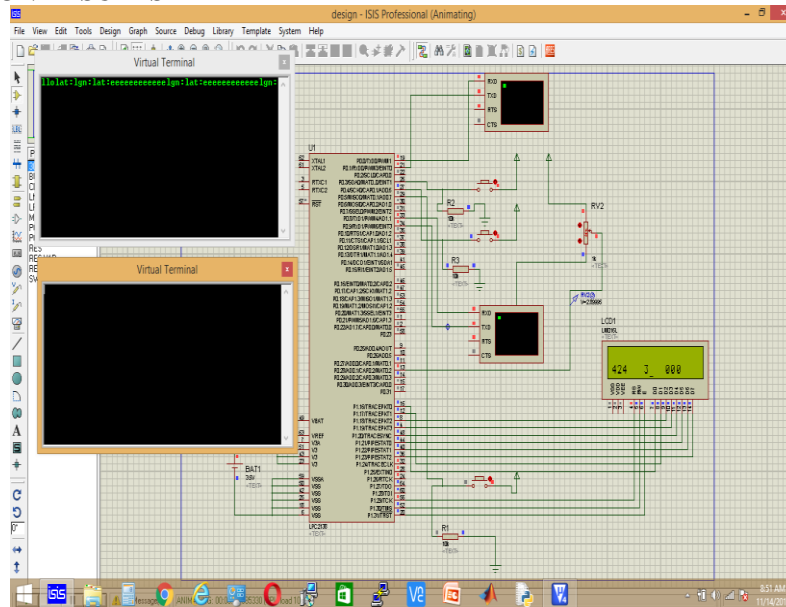

Fig.7.Diagram Of ESP28266 ARDUINO CORE

4.9.SOFTWARE DESCRIPTION
Keil SOFTWARE

Keil provides a broad range of development tools like ANSI C compiler, macro assemblers, debuggers and simulators, linkers, IDE, library managers, real-time operating systems and evaluation boards for Intel 8051, Intel MCS-251, ARM, and XC16x/C16x/ST10 families.

4.10. SIMULATION RESULTS

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, IOT module 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. A GPS Tracking system is also enclosed in the box, which provides the tracking of the position of soldier. Each unit has a IOT module, which enables the communication between both ends.

V. Conclusion

Security and safety for soldiers: GPS tracks position of soldier anywhere on globe and also health system monitors soldier's vital health parameters which provides security and safety for soldiers. Continuous Communication is Possible: Soldiers can communicate anywhere using IoT module which can help soldier to communicate among their squad members whenever in need.Less complex circuit and power consumption. Use of PIC Microcontroller and low power requiring peripherals reduce overall power usage of system.

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