Soldier Health Parameter Monitoring and Location Tracking System using NodeMCU

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Abstract: At In today's world enemy warfare is an important factor in any nation's security. The national security mainly depends on the army (ground), navy (sea), air-force (air). The important and vital role is played by 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 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. By using the location sent by the GPS modem, the base station can understand the position of the soldier. As the climatic conditions are changing rapidly, the winters are getting much colder, especially in northern region and the western region of India. Since we developed a smart army jacket using control media devices such as GSM, GPS, and sensors in the jacket. The smart army jacket aims for providing reliable health monitoring as well as position tracking of soldier. Some of climatically conditions are led to Unfortunate deaths of soldiers. This jacket can automatically sense the temperature inside, outside using temperature sensors. We are using coils for heating purpose and the temperature of the coil will depends on the outer temperature. GPS, GSM are the models used for communication purpose. Hence for monitoring the health and the heart rate of the soldier health monitoring equipment sensors are been establish in the jacket as well.

Keywords: Soldier Health, Location Tracking, GSM modem, Embedded System, Sensors.

I. INTRODUCTION

Many other jackets existing in the market can provide both cooling and hot service with the jacket. The different climatic conditions such as very cold and very hot temperatures could be dangerous to health. Since in very cold temperatures, the most serious concern is the risk of hypothermia or dangerous overcooling of the body. Henceforth we have developed a smart army jacket as an important resource for the army soldiers as soldiers play a very important role to protect our country in extreme cold conditions. The smart army jacket is proposed in such a way that it could monitor the health; internal temperature as well as emergency notification in the form of short message service for the soldier the jacket will be developed in three phases.

In the first stage, the fiber of the jacket is been developed as according to the military standards keeping in note the weight, the color, the finishing, stitching, concerning 20 meters (65 feet) inside and a bigger vary outdoors. In current world situations, defending our nation from external and internal threats is the most important factor and depends on the army force. Every year many army personnel suffer from different injuries during the battle and no help can be provided at the needed time. The army suffers a lot due to the unavailability of information of injuries to its personnel who may increase the death/ permanent disability toll. With the help of many advanced technologies coming into implementation, we can provide safety to the army personnel.

It is necessary to develop a system in order to get the location and vital health status of the soldiers which can be tracked in real time. Soldier's location can be tracked using GPS and Wi-Fi module, which is used to provide wireless communication system between soldier and base station. Health status of the soldier is monitored using bio medical sensors such as temperature sensor and heart beat sensors.

II. LITERATURE REVIEW

[1] Soldier Security and Health Monitoring ThangaDharsni, Hanifa Zakir, Pradeep Naik, Mallikarjuna, Raghu.2018, the proposed framework can be mounted on the warrior's body to track their wellbeing status and current area utilizing GPS. These data will be transmitted to the control room through distributed computing. The proposed frame work involves small wearable physiological equipment's, sensors, transmission modules. Consequently, with the utilization of the proposed hardware, it is conceivable to execute a minimal effort component to ensure the important human life on the war zone GSM is used which is irrelevant and excessive use of sensors unnecessarily.

[2] Health Monitoring and Tracking System for Soldiers Using Internet of Things (IoT) Niket Patil 2017, the paper reports an Internet of Thing (IoT) based health monitoring and tracking system for soldiers. The proposed system can be mounted on the soldier's body to track their health status and current location using GPS. This information will be transmitted to the control room through IoT. The proposed system comprises of tiny wearable physiological equipment's, sensors, transmission modules Only hardware approach and no use of software systems. Didn't utilized cloud processing as well.

[3] Wearable Systems for Monitoring the Health Condition of Soldiers: Review and Application PatrikKutilek, Petr Volf, SlavkaViteckova, Pavel Smrcka 2017, systems for measuring of physical and medical data for the diagnostics of physical and psychological state have significantly spread. This study, however, examines the current technologies and usage of the wearable monitoring systems in military. The article can serve as a guide for choosing suitable and affordable systems of quantitative evaluation of physical and psychological conditions of soldier's Wearable system but with higher cost. High end simulation software required.

[4] Wireless detection system for Health and military applicationYallalinga, Nirmalkumar S. Benni 2017, upon detection of fall/collapse the sensor system transmits the information wirelessly, which will be received by the care-taker's mobile. The sensor is a belt shaped wearable device consisting of accelerometer (tri-axial) and gyroscope. These sensors are used to classify the posture and dynamics of the user. The main aim of the project is to develop efficient algorithms to detect falls and distinguish between falls and non-falls using these sensors. GSM is outdated. Zigbee is used for wireless communication and it has many limitations such as range and obstacles in communication channel
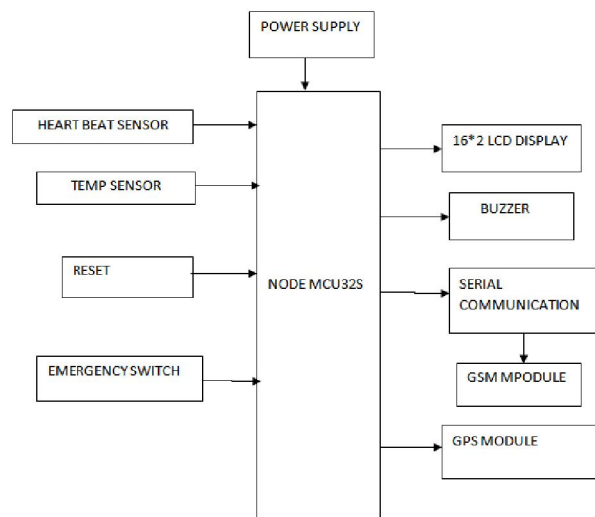
III.PROPOSED SYSTEM

Fig. 1. Block Diagram

The system consists of the highly powerful rechargeable battery power supply. The circuitry of the system into the smart army jacket is been connected through wires and are placed in such a way that the circuitry could be removed and placed again according to the soldiers convenient.as a jacket is been designed as waterproof and inflammable the circuitry inside is placed according the same manner seeing all the worst conditions. Hence the circuitry include the

blocks of at mega 328 microcontroller, LM35 temperature sensor, health monitoring sensor, GPS, GSM systems and copper coils which are connected through wires to the batteries.

A. NodeMCU ESP32s Microcontroller

At the core of this module is the ESP32-D0WDQ6 chip*. The chip embedded is designed to be scalable and adaptive. There are two CPU cores that can be individually controlled, and the CPU clock frequency is adjustable from 80 MHz to 240 MHz. The user may also power off the CPU and make use of the low-power co-processor to constantly monitor the peripherals for changes or crossing of thresholds. ESP32 integrates a rich set of peripherals, ranging from capacitive touch sensors, Hall sensors, SD card interface, Ethernet, high-speed SPI, UART, I2S and I2C.

• 18 Analog-to-Digital Converter (ADC) channels

• 10 Capacitive sensing GPIOs

• 3 UART interfaces

• 3 SPI interfaces

• 2 I2C interfaces

• 16 PWM output channels

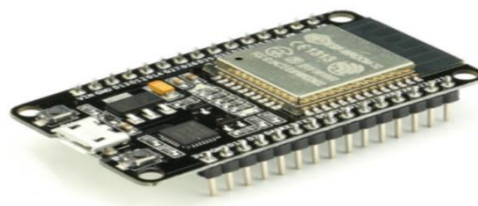• 2 Digital-to-Analog Converters (DAC)

• 2 I2S interface

Fig. 2.: NodeMCU ESP32s

B. GSM Module

GSM (Global System for Mobile Communication) is a standard developed by the European Telecommunication Standards Institute (ETSI) to describe protocols for second-generations (2G) digital cellular networks used by mobile phones. GSM describes a digital, circuit-switched network optimized for full duplex voice telephony and also expanded to include data communications, packet data transport via GPRS (General Packet Radio Services). The longest distance the GSM specification supports in practical is 35 kilometers (22mi).

SIM800 is a complete Quad-band GSM/GPRS solution in a LGA type which can be embedded in the customer applications. SIM800H support Quad-band 850/900/1800/1900MHz, it can transmit Voice, SMS and data information with low power consumption. With tiny size of 15.8*17.8*2.4 mm, it can fit into slim and compact demands of customer design. Featuring and Embedded AT, it allows total cost savings and fast time-to-market for customer applications.

Fig. 3:Pulse rate Sensor

C.LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.
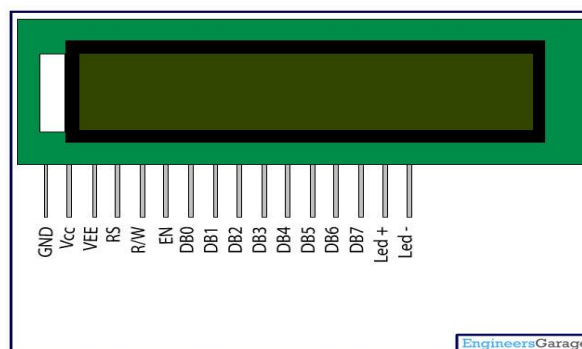

Fig. 4.: LCD Display

D.Pulse Rate Sensor

A person's heartbeat is the sound of the valves in his/her's heart contracting or expanding as they force blood from one region to another. The number of times the heart beats per minute (BPM), is the heart beat rate and the beat of the heart that can be felt in any artery that lies close to the skin is the pulse.

Principle of Heartbeat Sensor

The heartbeat sensor is based on the principle of photo phlethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (a vascular region). In case of applications where heart pulse rate is to be monitored, the timing of the pulses is more important. The flow of blood volume is decided by the rate of heart pulses and since light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses.
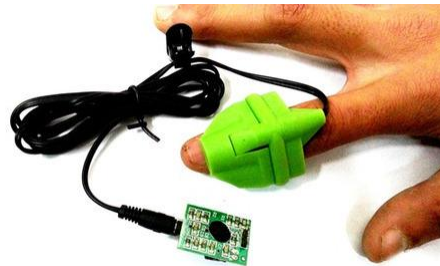

Fig. 5: Pulse Rate Sensor

E. LM35Temp Sensor

12V Outputs 10mV per Degree that can also be read directly on multimeter or read in to microcontroller. For example, at 30-degreecelcius it will output 300mV at linear scale. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°Cover a full -55 to +150°C temperature range.
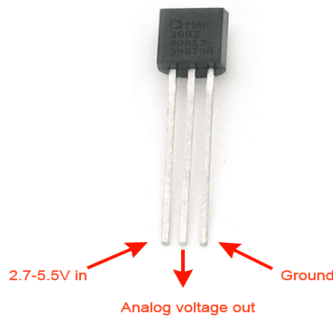

Fig. 6: LM35 Temp Sensor

F. GPS Module

This is New Version (V2) of our famous GPS Receiver with Antenna (5VTTL Serial) , with 4pin 2.54mm pitch Berg strip connector option. It is made with third generation POT (Patch Antenna on Top) GPS module. The on board 3V3 to 5V level convertor enables us to directly interface with normal 5V Microcontrollers. Its low pin count (4Pin) will make it easy to interface and it is bread board friendly with 2.54mm (0.1″) Pitch connector pads. The 4 Pins are 5V, TXD, RXD and GND. Yes, there is no setting required, just plug in to the power (5v), your raw data (NMEA0183) is ready at TX pin!. This is a standalone 5V GPS Module and requires no external components. It is built with internal RTC Back up battery. It can be directly connected to Microcontroller's USART.

Fig. 7: GPS Module

IV. CONCLUSION

The proposed system is an effective security and safety system which is made by integrating the advancements in wireless and embedded technology. It helps for a successful secret mission. This system can be used in critical conditions. 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. Biomedical sensors provide heartbeat, body temperature of every soldier to control room. This technology can be helpful to provide the accurate location of missing soldier in critical condition and overcome the drawback of soldiers missing in action.

ACKNOWLEDGMENT

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