Embedded And IOT based on Security for Soldiers

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Abstract

In the present era, the threat of enemies plays an important role in security policies of any state. In this perspective, military soldiers play an important and vital role. There are several considerations concerning the security of those troopers. So, for the security purpose of troopers, several equipment or devices are attached with them to take the look on their health status and their ammunitions. Health related sensors like pulse rate sensor, body temperature measuring sensor, weather updsates, emergency buttons data transmission and processing capabilities, can thus help to make low-cost wearable solutions for health monitoring. GPS is used for basically point the latitude and longitude to find exact location of soldier. WIFI module can be used for effective range 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. So, by using these equipment's we are trying to implement the basic life guarding system for soldiers at a low cost and high reliability.

Key words: GPS, Wi-fi, pulse rate sensor.

1. Introduction

Our objective was to establish a cost- effective and consistent project that would aid the base unit in terms of soldier health and security during wartime special operations. Furthermore, soldiers can submit requests for assistance to the base Station. First obtaining the physical parameters like body temperature, heart rate, and oxygen level of the soldier's body. Then Tracking the location of the soldier through GPS. After that obtaining the environmental factors of soldier like atmospheric temperature and atmospheric pressure. Data obtained in these cases is processed through the blynk server and displaying the information in the blynk app. If any abnormalities found in the data obtained from the soldier the soldier, Alerting the soldier and authority in emergency. During the conflict, this project has an associated implementation of tracking the soldier and navigating between soldiers, such as getting their speed, distance, and health state, which allows military decision makers to put up war strategies. As a result, they can take immediate action by directing help to soldiers who have requested it. Soldiers' health constraints are monitored using a variety of biological sensors, and their location and placement are restricted using a GPS module.

1.1 Objective

The soldier health and position tracking system enable the military to monitor a soldier's current GPS location as well as their overall health, including their body temperature and heart rate. The System also includes other features, so if a soldier needs assistance, he can do so manually or by sending a distress signal to the military.

2. Existing System

In the existing system they have used Arduino board and for transferring the data to the authorities and communication between the soldiers near to them and the authorities or base station they have

used Zigbee module, the existing system they measured the parameters like body temperature, heart rate and atmospheric temperature of the soldier. While using the Arduino and Raspberry Pi we must use Analog to Digital converters externally.

3. Proposed System

In Our Proposed System We are using ESP32 & NodeMCU microcontrollers for processing. Here transferring of data and communication between the soldiers and authorities is done through the inbuilt Wi-Fi module present on the ESP-32 microcontroller and NodeMCU. The communication between the nearest soldiers is done through the inbuilt Wi-Fi and Bluetooth module present on ESP-32. ESP-32 microcontroller has Inbuilt Analog to Digital converters. So that we don't need to add the Analog to Digital converters externally. In our proposed system We are monitoring the parameters like body temperature, atmospheric temperature, atmospheric pressure, heart rate, oxygen level of blood and the location of the soldier.

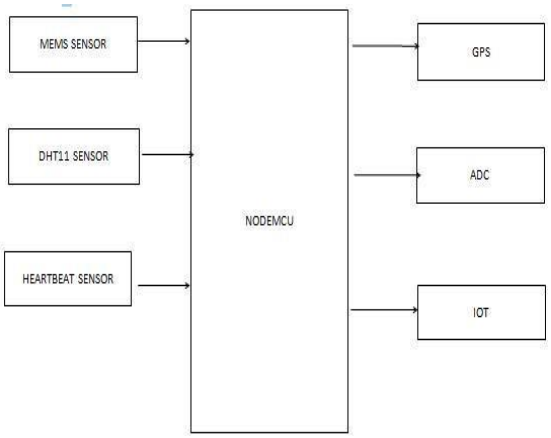

Fig. 1: Block diagram of proposed system.

3.1 Hardware Required

- Nodemcu
- Mems's sensor
- Dhtll-sensor
- Heartbeat sensor
- Gps
- Adc

3.2 Software Required

- arduino ide
- iot

3.3 Hardware Description

3.3.1 NodeMCU

Fig. 2: NodeMCU.

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.

3.3.1.1 Specifications & Features

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs:
- SPIs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna
- Small Sized module to fit smartly inside your IoT project

3.3.2 Mems Sensor

Micro-electro-mechanical Systems (MEMS) Technology is one of the most advanced technologies that have been applied in the making of most of the modern devices like video projectors, bi-analysis chips and also car crash airbag sensors. This concept was first explained by Professor R. Howe in the year 1989. Since then, many prototypes have been released and revised and has thus become an integral part of the latest mechanical products available in the market today.

Fig. 3: Mems Sensor.

3.3.3 DHT 11-Sensor

DHT11 humidity and temperature sensor is available as a sensor and as a module. The difference between this sensor and module is the pull-up resistor and a power-on LED. DHT11 is a relative humidity sensor. To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor. This sensor is used here to monitor the humidity variation of the environment where the crops are cultivated. This is a digital sensor and measures the humidity value in percentage format.

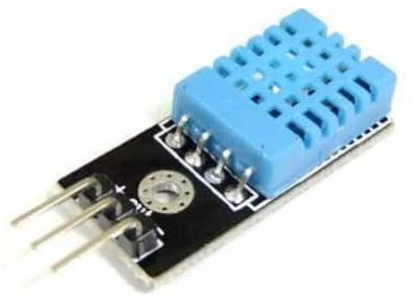

Fig. 4: DHT 11 sensor.

3.3.3.1 Applications

This sensor is used in various applications such as measuring humidity and temperature values in heating, ventilation and air conditioning systems. Weather stations also use these sensors to predict weather conditions. The humidity sensor is used as a preventive measure in homes where people are affected by humidity. Offices, cars, museums, greenhouses and industries use this sensor for measuring humidity values and as a safety measure.

3.3.4 Heartbeat Sensor

Heartbeat sensor is an electronic device that is used to measure the heart rate i.e. speed of the heartbeat. Heart Rate can be monitored in two ways: one way is to manually check the pulse either at wrists or finger then the data are uploaded to the cloud.

Fig. 5: 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.

3.3.5 Global Positioning System (GPS)

The Global Positioning System (GPS) is a satellite-based navigation system made up of at least 24 satellites. GPS works in any weather conditions, anywhere in the world, 24 hours a day, with no subscription fees or setup charges.

Fig. 6: Global Positioning System.

3.3.5.1 How GPS works

GPS satellites circle the Earth twice a day in a precise orbit. Each satellite transmits a unique signal and orbital parameters that allow GPS devices to decode and compute the precise location of the satellite. GPS receivers use this information and trilateration to calculate a user's exact location. Essentially, the GPS receiver measures the distance to each satellite by the amount of time it takes to receive a transmitted signal. With distance measurements from a few more satellites, the receiver can determine a user's position and display it.To calculate your 2-D position (latitude and longitude) and track movement, a GPS receiver must be locked on to the signal of at least 3 satellites. With 4 or more satellites in view, the receiver can determine your 3-D position (latitude, longitude and altitude). Generally, a GPS receiver will track 8 or more satellites, but that depends on the time of day and where you are on the earth.

3.3.6 ADC (MAX3008)

In electronics an analog-to-digital converter (ADC, A/D, or A-to-D) is a system that converts and analog signal, such as a sound picked up by a microphone or light entering a digital camera,

into a digital signal. An ADC may also provide an isolated measurement such as an electronic camera that converts an analog input voltage or current to a digital number representing the magnitude of the voltage or current. Typically, the digital output is a two's compliment binary number that is proportional to the input, but there are other possibilities.

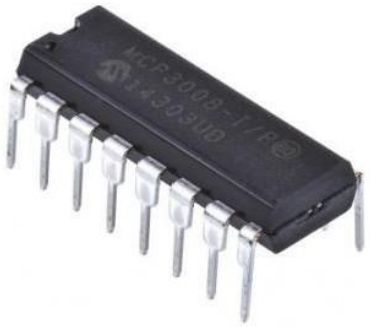

Fig. 7: MAX3008.

3.4 Software Description

3.4.1 Arduino Software (IDE)

Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personalcomputers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

3.5 IoT (Internet of Things)

The Internet of things (IoT) describes physical objects (or groups of such objects) with sensors, processing ability, software, and other technologies that connect and exchange data with other devices and systems over the internet or other communications networks. Internet of things has been considered a misnomer because devices do not need to be connected to the public internet, they only need to be connected to a network and be individually addressable. An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the

devices -- for instance, to set them up, give them instructions or access the data.

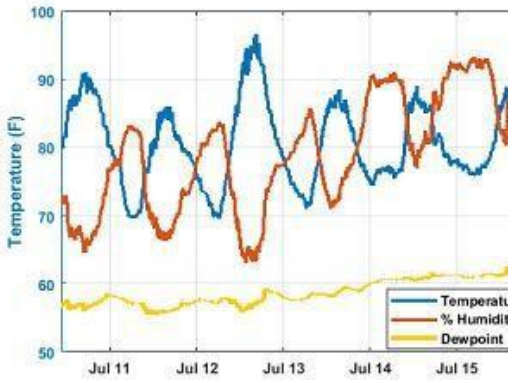

Fig. 8: Values of Temperature and humidity in IoT.

4. Conclusion

The design turned out to be far more successful than we had anticipated when we began our project. In the design and implementation of the project, we attempted to follow ethical guidelines. We won't claim that our circuit was 100 percent efficient because there was some variation that we were able to reduce to some level. The good news is that we discovered that this project has a lot of room for improvement. Our system is designed to accommodate only one soldier. It is possible to establish contact among soldiers. The defence system of our country gains strength from this system. As a result, we may conclude that these tactics are quite beneficial in ensuring troop security

Future Scope

It makes reference to actual, tangible military-grade items that are equipped with software, sensors, and other contemporary technologies. To complete a range of activities more efficiently and precisely, these devices interact with one another in order togather and transport data through the Internet.

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