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IoT Based Trooper Monitoring System

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ABSTRACT

In military operations, one of the challenges is that the soldiers are not able to communicate with the control room or army base station. Once a troop become injured or need some help during the panic situations in the battlefield then it becomes more difficult to monitor them and bring back to the base station. It is necessary for the army base station to guide the soldiers in such cases. Our project is a wireless embedded system by which the health status of the troopers who get injured can be monitored by the army control unit. This system facilitates continuous investigation of the trooper for emergency looked over by attendees. The doctors and caregivers monitor the trooper in real time through the data received through the internet. This system consists of temperature sensor, ECG sensor and camera interface. The data value measured by the sensors and the image captured by the camera are transmitted wirelessly using the internet. Also, a soldier can ask for help from the control room when they need help in critical situation.

Keywords: ECG, IoT, Cloud computing and Thingspeak.

1. INTRODUCTION

Health is one of the global challenges for humanity especially for the troopers who are responsible for the nation's security system. Apart from the nation's security, the soldier must need safety by protecting himself and also it is necessary for the army base station to monitor the health status of the soldier.

The soldier must be integrated with advanced visual and data communications to transmit information to the control station. For that soldier might need bio medical sensors for monitoring the health status and wireless networks to communicate with control room. The system must be light weight and must provide desired result without requiring much power.

IoT based trooper monitoring system will be useful for the soldiers, who involve in special operations or mission. This project implements the life- guarding system for soldier in low cost and high reliability. Smart

Bio medical sensors are attached to the jacket of soldiers. Here camera unit is also interfaced to help the control station to know about the situation at the mission field. This system will provide connectivity to the server at the base station using a wireless internet connection.

2. EXISTING WORK

In the existing system the parameters like temperature, pressure, and heart beat rate are measured. The mode of transmission is us using bluetooth module and Zigbee module. Since Bluetooth and Zigbee modules are used the transmission of the data is limited within certain bounds. GSM module is used to send the intimation message to the base station. PS is used to track the location of the soldier. There is no facility to store the data's of the trooper.

3. PROPOSED WORK

In the proposed system ECG wave of the trooper is monitored by using the ECG leads. The term IoT plays very important role in proposed system. The internet of things (IoT) is the interconnection of uniquely identifiable embedded computing gadgets within the current net infrastructure. The health parameters and the intimation message can be sent to the destination by means of internet. Camera is interfaced to the microprocessor which enables the system to capture the image. When the trooper caught in critical situations the image is captured by pressing the switch integrated in the system. The captured image is sent through the mail. In this set of services we offer a unique set of services in the form of cloud storage. The cloud storage is used to store medical histories of the troopers with a particular database pertaining to each trooper. These records can be used to correlate the current data received from the sensors for diagnosis.

4. BLOCK DIAGRAM

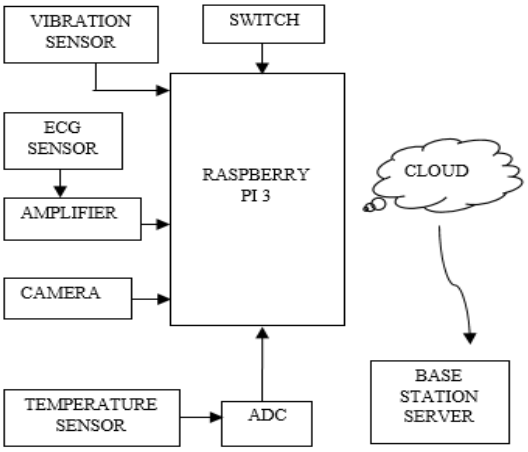

Fig.1. Block diagram

Figure: 1 represents block diagram and flow of execution of the project. The analog values of the health parameters obtained by the sensors are converted into digital values by MCP3008 ADC and given to the raspberry pi. After processing the values the parameters are stored in the cloud for the easy access by the base station army officer.

A. RASPBERRY PI 3

Fig.2. Raspberry pi

The Raspberry Pi 3 is the third generation Raspberry Pi. There are two giant upgrades in the Pi 3. The primary is a next generation Quad core Broadcom BCM2837 64-bit ARMv8 processor, making the processor speed boom from 900 MHz on the Pi 2 to up to 1.2GHz at the Pi 3.The second giant improve is the addition of a BCM43143 Wi-Fi chip built-in on your Raspberry Pi. There's also Bluetooth Low Energy (BLE) on board making the Pi an excellent IOT solution.

Lastly, there's an upgraded switched power source that goes up to 2.5 Amps instead of just 2 Amps - allowing your Pi to power even more powerful devices over USB ports. It has features like 802.11n Wireless LAN, Bluetooth 4.1, 4 USB ports,40 GPIO pins, Full HDMI port, Ethernet port, Camera interface (CSI),Display interface (DSI).

B. ECG SENSOR

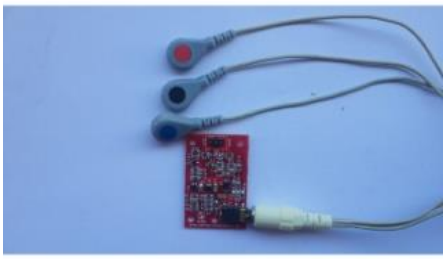

Fig.3. ECG sensor

ECG sensors measure the bio-potential generated by electrical signals that control the expansion and contraction of heart chambers accurately. An ECG electrode is a tool attached to the skin on certain parts of an affected person's body usually the arms, legs, and chest in the course of an electrocardiogram process. It detects electric impulses produced on every occasion the heart beats. The quantity and location of electrodes on the body can vary, however the characteristic remains the same. The energy that an electrode detects is transmitted through this twine to a device, which translates the strength into wavy lines recorded on a bit of paper. The ECG facts, in a fantastic detail, are used to diagnose a totally wide range of heart situations. An ECG electrode is generally composed of small steel plate surrounded by using an adhesive pad, which is covered with a carrying out gel that transmits the electric sign.

C. TEMPERATURE SENSOR

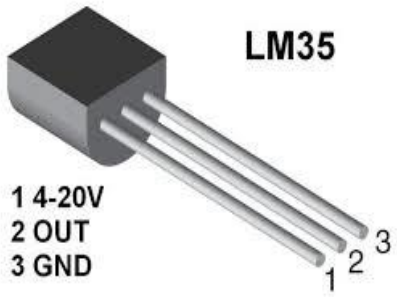

Fig.4. Temperature sensor

The LM35 series are precision incorporated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 for this reason has a bonus over linear temperature sensors calibrated in ° Kelvin, because the user is not required to subtract a large regular voltage from its output to reap handy Centigrade scaling. The LM35 does now not require any external calibration or trimming to offer normal accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −fifty five to +150°C temperature range.

D. VIBRATION SENSOR

Fig.5. Vibration sensor

Vibration sensor is a device that measures the vibration, or acceleration of motion of a structure. The force due to vibration or an alternate in movement (acceleration) reasons the mass to "squeeze" the piezoelectric material which produces an electrical rate this is proportional to the force exerted upon it. Since the charge is proportional to the force, and the mass is a constant, then the charge is also proportional to the acceleration. When the trooper gets injured, it is sensed by the vibration sensor and it is intimated to the base station via internet.

E. MCP3008 ADC

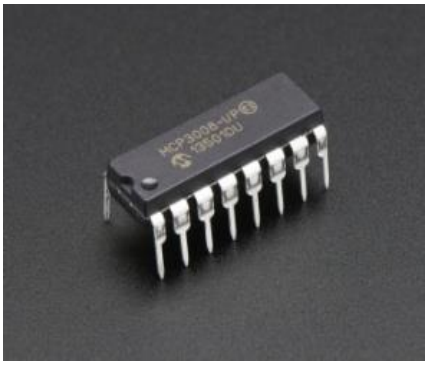

Fig.6. MPC3008

The MCP3008 is a low price eight channel 10 bit analog to digital converter. The precision of this ADC is just like that of an Arduino Uno, and with eight channels we are able to study pretty some analog signals from the Pi. This chip is a great option to read simple analog signals, like from a temperature or light sensor.

F. PANIC BUTTON

A panic button or a switch will be providing in this system, so that a soldier can request for his help in panic situation by pressing it. As a soldier will press the panic button, the health parameters, the image captured by the camera and the SMS is sent to the base station through internet.

G. CAMERA

The camera is interfaced with the raspberry pi in order to capture the image when the soldier caught in panic situation by the enemies. The camera is connected to the raspberry pi through CSI (Camera Serial Interface). When the soldier press the switch the image is sent through the mail to the base station server. The image is also sent when the vibration in the vibration sensor exceeds the threshold value.

H. CLOUD COMPUTING

Cloud computing is based on sharing of sources to reap coherence and economies of scale, similar to a network. Cloud computing is the broader concept of converged infrastructure and shared services. Cloud computing, or in simpler shorthand simply the cloud, additionally makes a specialty of maximizing the effectiveness of the shared sources. Cloud assets are commonly not handiest shared through more than one users however are also dynamically reallocated in step with call for. This can work for allocating sources to customers. Cloud computing incorporates of kinds. They're personal cloud and public cloud.

I. BASE STATION

The base station is the receiver section of this project. In base station internet is used to receive the data that is sent by army main station. Firstly sms is received to the base station through way-to-sms app via internet. Then the data of soldier such as vibration, temperature and the output from the ECG sensor are stored in the cloud. The vibration sensor tells about whether the soldier is injured or attacked by enemy. Data base is created which contains information about the soldier is displayed on Thingspeak webpage. Image captured by the camera is sent to the mail of base station unit.

5. RESULTS AND DESCRIPTIONS

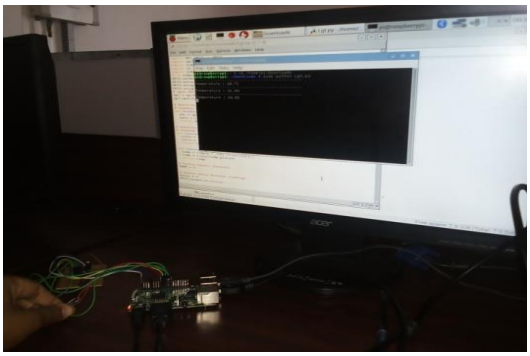

Fig.7. Experimental setup

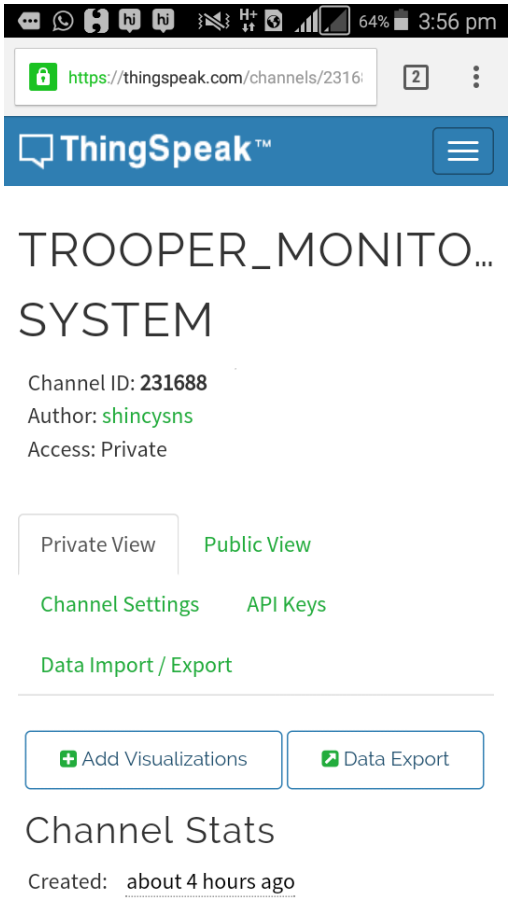

Fig.8. Thingspeak webpage

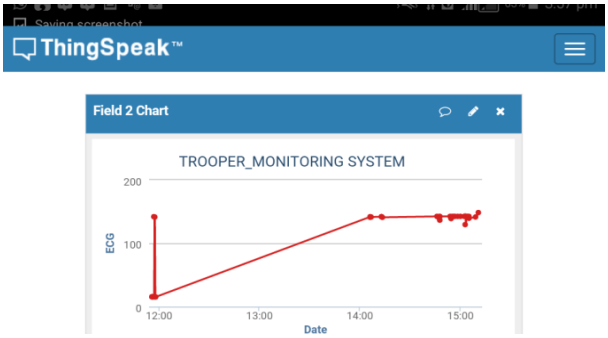

Fig.9. ECG waveform

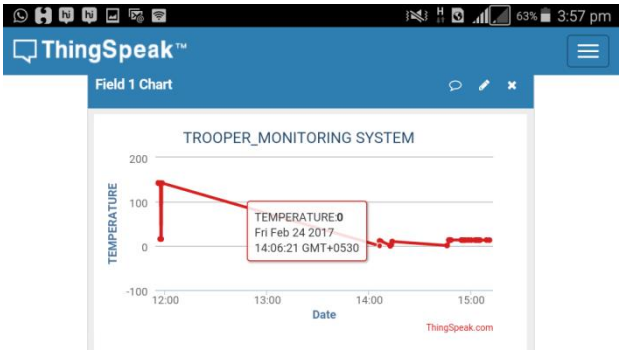

Fig.10. Temperature waveform

Figure: 7 shows the experimental connection of the hardware components. The health parameters like temperature and ECG are sent to the cloud and accessed by the base station server. Base station webpage is created in Thingspeak website. Figure: 8 shows the thingspeak webpage created for the trooper monitoring.Figure:9 shows the graph of variations of ECG.Figure:10 shows the graph of variations of temperature.

6. CONCLUSION

The project entitled "IoT Based Trooper Monitoring System" is an effective and safety system which is made by integrating the advancements in wireless and embedded technology. It helps for the troopers in their special missions. This system can be used in critical conditions. It has real-time capability. The health parameters are monitored in real time. And also the image captured by the camera is sent to the base station when the troopers caught into panic situations.

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