SMART SOLDER MONITORING STRAP

Mr.Anbarsu.P[1], Ms.Swathika.K[2], Ms.Revathi.S[3],Mr.Jeeva.S[4],Mr.Hariprasad.A.P[5]

[2-4] *UG Students* [1]*Assistant Professor*
[12345]*Department of Electrical and Electronics Engineering*
[12345]*Sri Eshwar College of Engineering, Coimbatore - 641202*

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Abstract - The Indian army is the land-based branch and it is the largest component of Indian Army. It would be great for our country's safety if we try to provide them better advanced technology equipment. In this project we have explained how to monitor the soldiers health and track their position from a remote location. The measured parameters will be sent to the control room with the help of Wi-Fi module to know the condition of the soldier. If the soldier is injured the modified pulse rate will be measured and will inform the military base station through Wi-Fi module and from GPS we can locate the wounded soldiers. From this information we will stratergise the longer term war plan with the particular number of unharmed soldiers and also we will provide the needed medication for the harmed one with the location provided by the GPS. The proposed system consists of wearable equipment's, sensors and transmission modules which are mounted in the strap for communication between soldier and base station. Hence, it's possible to implement a cost-efficient mechanism to guard the precious human life on the battlefield.

*Key Words***:** GPS, IoT, Wi-Fi module, LM35 Temperature Sensor, Pulse Sensor.

1.INTRODUCTION

The nation's security is maintained by army of every nation where India is not an exception to it. The most important and vital role is of soldiers is to protect their mother nation with all they have. There are many concerns regarding the security of the soldier. Soldiers entering the enemy lines often lose their lives thanks to lack of connectivity, it's very vital for the military base station to known the situation also as health status of all soldiers. India has already lost numerous soldiers in war-fields as there was no proper health backup and connectivity between the soldiers on the war-fields and therefore the officials at the army base stations.

All must be really concerned about the security of the soldiers, so we've decided to create a project which can efficiently keep a check on the health status of the soldier, and his precise location to equip him with necessary medical treatments as soon as possible. Soldier's tracking is done using GPS to provide wireless communication system.

For monitoring the health parameters of soldier we are using bio medical sensors like temperature sensor and heart beat sensor.

An oxygen level sensor is employed to watch atmospheric oxygen so if there are any climatic changes the soldiers are going to be equipped accordingly.

2. PROBLEM STATEMENT

The objective of the system is to provide the real-time continuous monitoring of soldier's health parameters and location tracking using IOT and GPS module.

In emergency situation it helps the solider by continually monitoring the deflection in heart rate of the soldier and intimates it to the base unit. Depending on the data provided by the system the control room takes the necessary action to save the life of the soldier.

3. PROPOSED SYSTEM

The Proposed System contains a micro-controller which is used to control the sensors connected to. The sensors which are connected to it tracks the soldiers location via GPS modem and also measures the soldiers pulse rate, temperature and transmits it to the micro-controller. This micro-controller collects the data from the sensors and transmits the data to the Wi-Fi modem. The Wi-Fi modem transmits the data from the

micro-controller to web through IOT. The transferred data is received in the control room and the status of the soldier is monitored from a remote location.
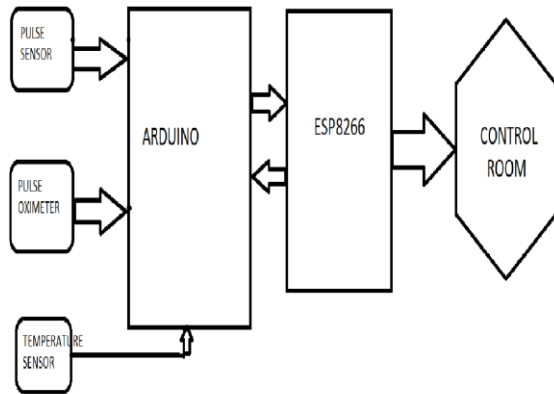

Fig.1 Block diagram of Proposed System

Fig.1 represents the block diagram of the system that is proposed, which contains the following blocks.

a) Arduino

Micro-controllers are one among the main components in any embedded system. A micro-controller is a micro computer on a single integrated circuit containing a processor core. Micro-controllers work in response to the program written inside its program memory. The major use of these single chip devices are in automatic responding devices. The main function of this section is to collect the data from the sensors connected it (i.e) Pulse sensor, Temperature sensor, Pulse Oximetry sensor and also from the GPS module. Then it sends this data to the ESP8266.

Fig.2 Arduino UNO board

b) Esp8266

ESP8266 are often used as an external Wi-Fi module, using the AT Command set Firmware by connecting it to any micro-controller using the serial UART, or directly function a Wi-Fi enabled micro-controller, by programming a replacement firmware using the provided SDK. Here, Esp8266 is interconnected with Arduino, which collects the data from sensor and transmits it to Esp8266. The Esp8266 collects the data and connects to the Wi-Fi giving path to view the data. It transfers the data through web, which is received in the control room.
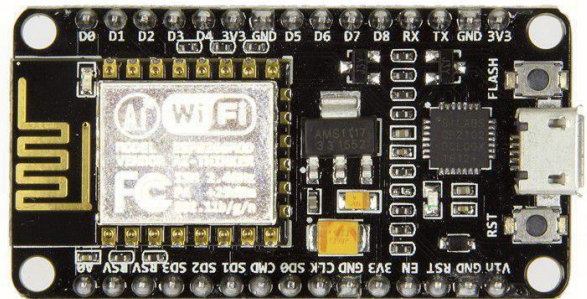

Fig.3 NodeMCU ESP8266

Sensors

Various biomedical sensors are used to determine the health parameters of the soldiers in order to detect the well being of them in the battle field.

a) Pulse sensor

Fig.4 Pulse Sensor

Soldier's heart rate is detected at every instant using this Pulse sensor. This sensor works by placing the sensitive part of the pulse sensor embedded in the wrist. The heart signal is given by SEN-11574 pulse sensor. The LED flash detects the beat of heart and transmits the signal to the receiving channel. It consumes only 4mA current at 5V. It is reliable and fast.

b) Temperature sensor

Body temperature is one of the vital parameters in the health aspects. Here we selected LM35 for detecting temperature in our Smart Solider Military Strap. The Temperature reduction or increase is detected and it is converted to electrical signal proportional to the temperature and this signal is transmitted to take corrective action. LM35 ranges from -55 to +150C and Voltage ranges from 4 – 30V. This sensor measures the particular surrounding temperature.

Fig.5 LM35 Temperature Sensor

c) Pulse Oximetry sensor

The O2 content plays an important role in the health parameters. The MAX30100 is an combination circuit of both Oxygen level detector and heart rate monitor. This sensor is integrated with LEDs, a photo detector and low level noise analog signal processing. This sensor has the capability to work in 1.8 V to 3.3V. The sensor is powered by software and remains connected at all the times.
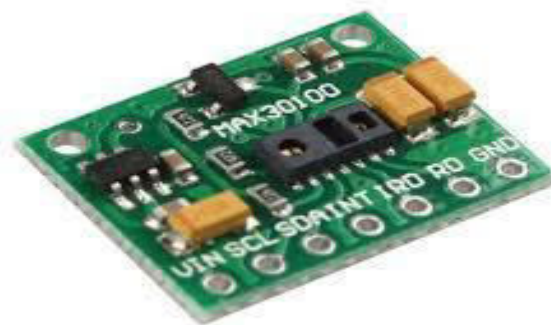

Fig.6 Pulse Oximetry Sensor

d) GPS Module

GPS – Global Positioning System. It is a Satellite based navigation system. The GPS provides latitude and longitude of the exact location where ever the solider is present. GPS works based on the triangulation and trilateration. The total time of which satellites message took to arrive is used for calculating the distance where the solider is located. The exact time and location of every instance is been received and can foresee if any loss or missing of the soldier.

Fig.7 GPS Module

4. Working and Output

The embedded programming which interfaces the sensors and the microcontroller is dumped into the arduino and esp8266. This program takes care of measuring the various parameters from the sensors and it accumulates the data from the sensor and transmits it to the Wi-Fi module. Arduino IDE is used as a virtual development environment software which helps in embedding the software and hardware. Various open source libraries such as 'TinyGPS++' are been used in this project which helps in tracking the soldiers current location. The exact latitude and longitude data is transferred, which for further simplification is embedded with google maps to provide better user interface and experience.

Fig.8 Screenshot of Output Screen – 1

The Output Screen consists of the following parameters,

 a) **Name**
 b) **Photo**
 c) **Latitude and Longitude**
 d) **Date**
 e) **Time**
 f) **BPM**
 g) **Temperature**
 h) **Sp02**

The Name and Photo of the soldiers are hard-coded to the arduino and given to each soldiers. The latitude and longitude are found using the GPS module which is then converted into digital value for viewing the exact location. The analog value from the pulse sensor is converted into digital value for the best studying purpose. Using Pulse Oximetry sensor and Temperature sensor the Sp02 content and the temperature is identified.

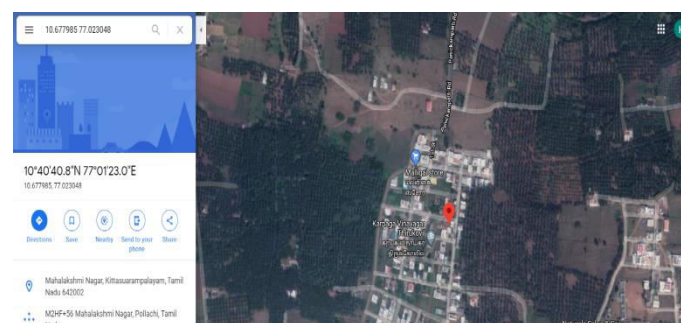**Fig.9 Screenshot of Output Screen – 2**

Fig.10 Location on Google Map

5. CONCLUSIONS

The "SMART SOLDIER MONITORING STRAP" is one of the reliable and safe securing system which is of advanced embedded technology. The Soldier is the god of all humans, a good protector is essentially needed to be served with all best feature, thus our strap will be a best solution for

such soldiers. We have integrated various biomedical sensors to monitor health parameters and GPS module to predict the exact location and time. All these features are integrated into a strap with ESP module and arduino. This strap is useful as it gives health status so if any soldier is injured we can foresee and save them. It also gives location so that no soldiers go missing.. Thus our smart soldier monitoring strap will be helpful for ensuring complete security to the welfare of the soldiers

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