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IOT Based Soldier Position Tracking and Health Monitoring System

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Abstract – The Indian army is the land-based branch and it is the largest component of Indian Army. It will be beneficial for our country's safety if we try to provide them better advanced technology equipment. Internet of Things (IOT) is a new and fast growing technology in which everything (smart objects and smart devices) are connected to the internet for effective communication between these connected things. We can check the health based issues and a lost soldier within a fraction of seconds through a app called ThingView. This consisting of wearable physiological equipment and transmission modules which are mounted inside the jacket for communication between soldier and base station or between soldier and soldier. Hence, it is possible to implement a low cost mechanism to protect the valuable human life on the battlefield.

***Key Words*: Arduino Board, GPS, GSM module, Temperature sensor, M-Health.**

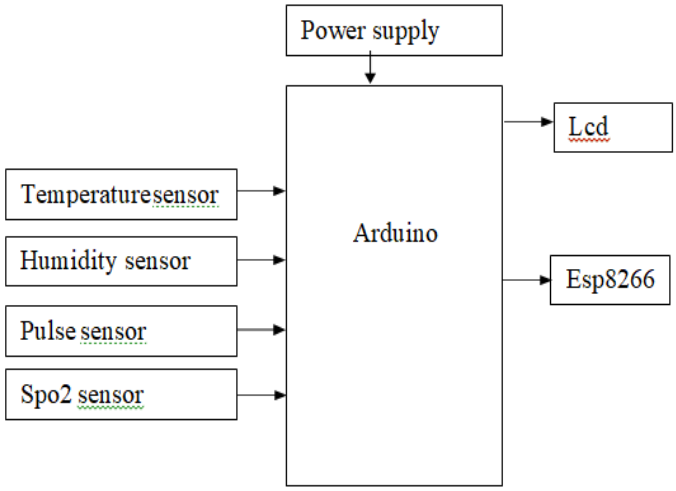

Fig1 : Block Diagram

1. INTRODUCTION

In this project we have explained how to track the location a of the soldier with the help of GPS and also we will be able to monitor health parameters such as pulse rate and body temperature. The measured parameters will be sent to the control room with the help of GSM module to know the condition of the soldier. If the soldier is injured the fluctuations with the pulse rate will be measured and will inform the military base station and through GPS we can locate the wounded soldiers. we can provide the needed medication for the harmed one with the location provided by the GPS. In this project the exact location and the health status parameters of the soldier can be sent to the base station in real time so that the appropriate actions can be taken in case of crisis. This technology helps to minimize the rescue, time and search operation effort of army rescue control unit. This is a wearable technology which is the most important factor of this project.

The soldier must be integrated with advanced healthcare monitoring, real time GPS (Global Positioning System) and data communications to send and receive information to/from the control unit Apart from the nation's security, the soldier must need safety by protecting himself with advanced weapons and also it is necessary for the army control unit to monitor the health status of the soldier.

1.1 INTRODUCTION TO DOMAIN

Each day, our lives become more dependent on 'embedded systems', digital information technology that is embedded in our environment. More than 98% of processors applied today are in embedded systems, and are no longer visible to the customer as 'computers' in the ordinary sense.

Embedded computing systems generally exhibit rich functionality—complex functionality is usually the reason for introducing CPUs into the design. However, they also exhibit many non-functional requirements that make the task especially challenging:

- Real-time deadlines that will cause system failure if not met;
- Multi-rate operation;
- In many cases, low power consumption;
- Low manufacturing cost, which often means limited code size.

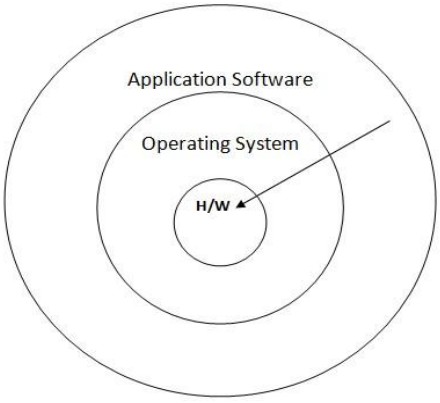

Fig2 :Overview of an Embedded System Architecture

1.2 Hardware components

The required hardware components are: Arduino Uno, 16X2 LCD display, GSM module, temperature sensor(LM35), Esp8266, pulse sensor.

Arduino Uno

The Arduino is a family of microcontroller boards to simplify electronic design, prototyping and experimenting for artists, hackers, hobbyists, but also many professionals. People use it as brains for their robots, to build new digital music instruments, or to build a system that lets your house plants tweet you when they're dry. Arduinos (we use the standard Arduino Uno) are built around an ATmega microcontroller essentially a complete computer with CPU, RAM, Flash memory, and input/output pins, all on a single chip.Unlike, say, a Raspberry Pi, it's designed to attach all kinds of sensors, LEDs, small motors and speakers, servos, etc. directly to these pins, which can read in or output digital or analog voltages between 0 and 5 volts. The Arduino connects to your computer via USB, where you program it in a simple language (C/C++, similar to Java) from inside the free Arduino IDE by uploading your compiled code to the board.

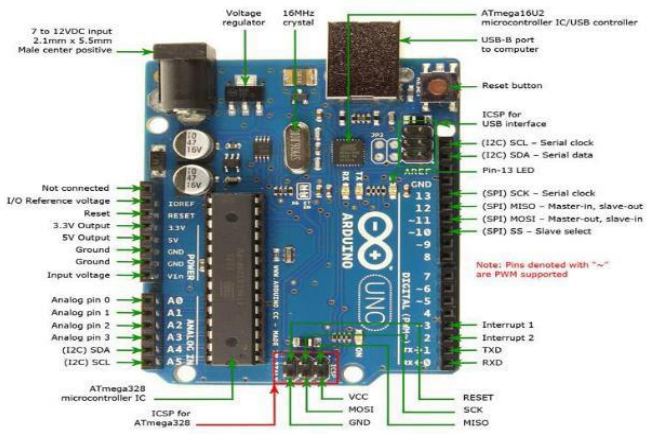

Fig3: Arduino Board

16X2 LCD display

Fig4: 16X2 LCD display

Liquid Crystal Display, which we are using in our project is 16*2 LCD. This display consists of 16 columns and 2 rows. This is programmed using the library <LiquidCrystal.h> LCD stands for Liquid Crystal Display that uses a plane panel display technology, used in screens of computer monitors & TVs, smartphones, tablets, mobile devices.

Temperature sensor:

Temperature is the most often-measured environmental quantity. This might be expected since most physical, electronic, chemical, mechanical, and biological systems are affected by temperature. Certain chemical reactions, biological processes, and even electronic circuits perform best within limited temperature ranges.

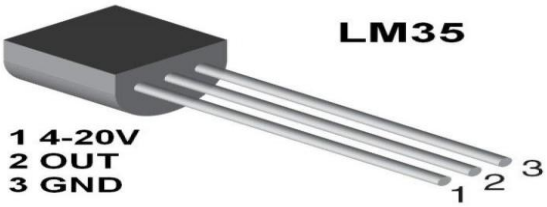

Fig5: Temperature sensor

Esp8266:

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that **can give any microcontroller access to your WiFi network**. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor.

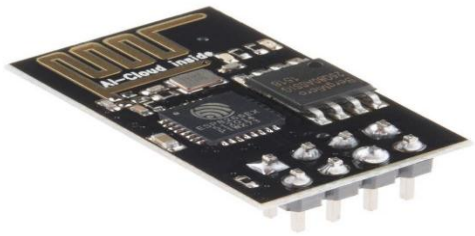

Fig6: Esp8266

GSM MODULE: GSM (Global System for Mobile communications) originally from special mobile Group, is the most general standard for mobile telephony systems in the world. Everywhere it achieved international nomadic preparations between mobile phone operatives, allowing subscribers to use their phones in everywhere in the world. It was everywhere in the implementation of the GSM standard feature for both customers, who may take advantage from the skill to travel and change carriers without changing phones, and network operatives as well.

Fig7: GSM Module

Pulse sensor: Pulse Sensor is a well-designed plug-and-play heart-rate sensor for Arduino. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heartrate data into their projects. The sensor clips onto a fingertip or earlobe and plugs right into Arduino with some jumper cables. It also includes an open-source monitoring app that graphs your pulse in real time.

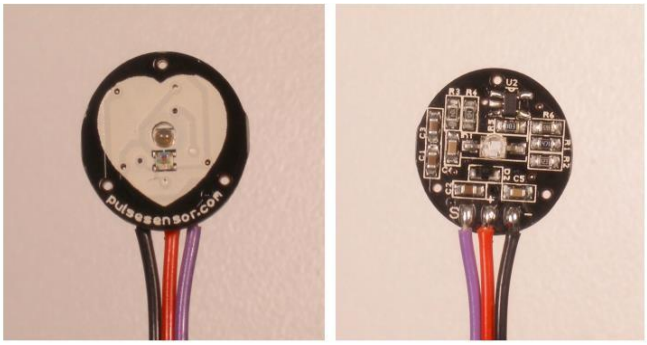

Fig8: Pulse sensor

1.3 Software Requirements

Download arduino software

You'll need to download the Arduino Software package for your operating system from the arduino download page. When you've downloaded and opened the application you should see something like this:

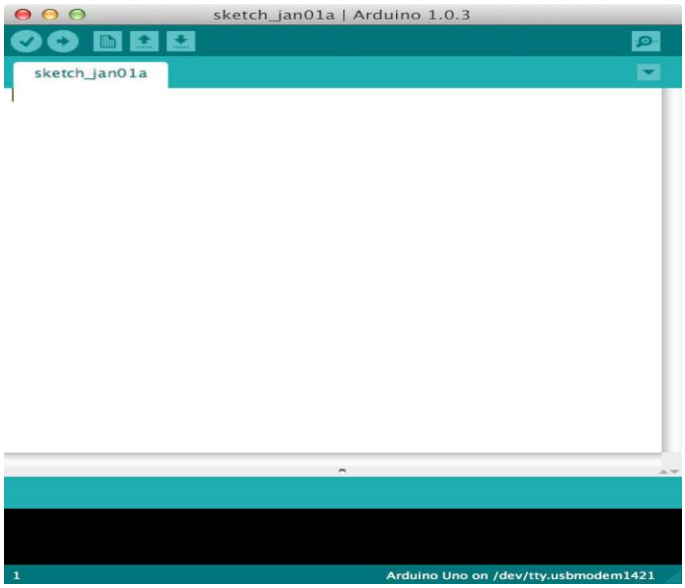

Fig9: This is where you type the code you want to compile and send to the Arduino board.

The Code : The code you write for your Arduino are known as **sketches**. They are written in **C++**.

Every sketch needs two *void type functions*,setup(), and loop(), A void type function doesn't return any value. The setup()method is ran once at the just after the Arduino is powered up and the loop()method is ran continuously afterwards. The setup()is where you want to do any initialization steps, and in loop() you want to run the code you want to run over and over again.

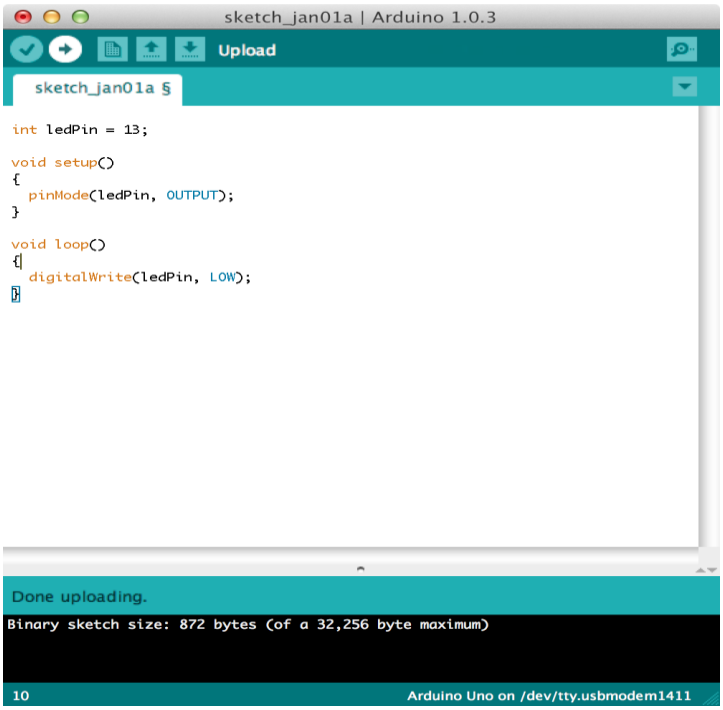

Fig10: Code in software

2. Results and Discussion

The circuit diagram of a Real Time Tracking and Health Monitoring System for Soldier is shown The heart of this circuit is a Programmable interface controller PIC 18F452. Other important components used in this circuit are LM35, Easy Pulse v1.1, GSM module, GPS modem, keypad, LCD and some discrete components. Finally, at base station, the text message containing calculated data is received on base station using GSM. This is then displayed on pc or laptop using android pc suit.

For communication system, we used GSM module (SIM900D) in our project. GSM networks operate in a number of different carrier frequency bands. Most 2G GSM networks operating in the 900 MHz or 1800 MHz bands. Where already been assigned to these bands, it was used 850 MHz and 1900 MHz bands instead. In occasional cases it is set ranges of 400 and 450 MHz in some countries because it was previously used for first-generation system.

2.1About app

Using a ThingView app we can see the parameters like, temperature and pulse rate of the wounded soldier so that immediate action will be taken by the base station. The App display is given below so we add a multiple channel to it. The variation are like in the form of graphs.

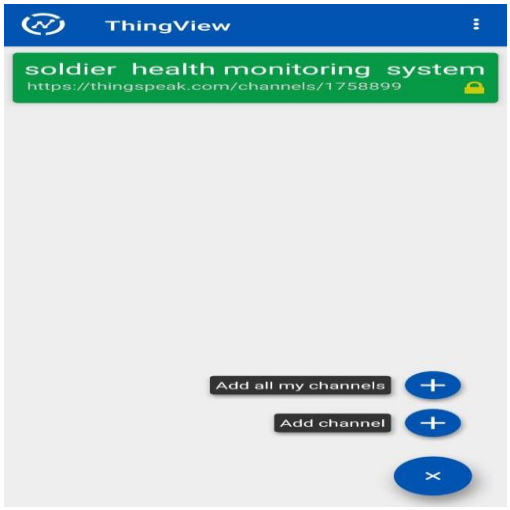

Fig 11: ThingView App display

2.2 Source code

https://docs.google.com/document/d/1d68MUC8aC2KvfCTb6rbt4fsbPqT6G4nl_r3saaf692E/edit?usp=drivesdk

2.3 Hardware model

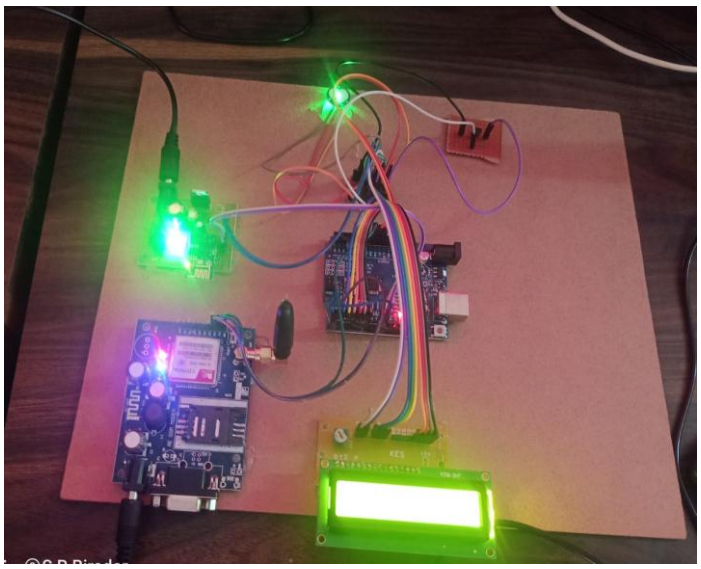

Fig12: Hardware Kit

Chart 1: The temperature sensors have well known applications in environmental and process control and also in test, measurement and communications. A digital temperature is a sensor, which provides 9-bit temperature readings. Digital temperature sensors offer excellent precise accuracy, these are designed to read from 0°C to 70°C and it is possible to achieve ±0.5°C accuracy. These sensors completely aligned with digital temperature readings in degree Celsius.

Fig13: Temperature Graph

Chart 2: The sensor clips onto a fingertip or earlobe and plugs right into Arduino with some jumper cables. It also includes an open-source monitoring app that graphs your pulse in real time.

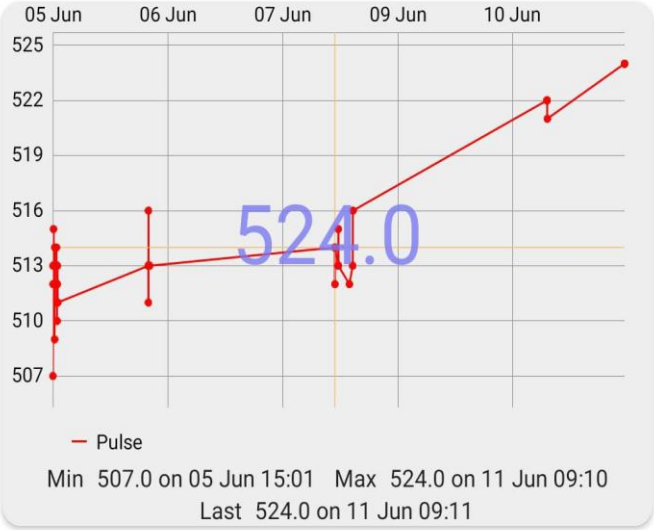

Fig 14: Pulse Graph

2.4 Applications

- The communication between soldier to soldier can be established.
- The betterment of base station unit can also be done by making proper GUI at base station PC and officials at base station can also send feedback or any order to soldiers via base unit.
- By use of this system, we can condense casualties of battle.
- It assists to give critical information's and cautions to soldiers so that they can survive for long and aim of war or secret operation can be obtained.
- This system gives strength to the defense system to country. So, we can accomplish that these types of strategies are very supportive for certifying security of the soldier.

Fig 15: soldier unit

3. CONCLUSION

As this is IoT based project Due to high speed internet access and advanced sensor technology it is possible to track human and other objects. Through the GPS as we connected in our project we can locate the lost soldier by means of messaging. It is in the form of link we can check it through a google maps with the help of GSM module. As discussed above the health parameters are seen in the app called ThingView which is available in the playstore in androids or any other smartphones.

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