

SOLDIER STRAP

A PROJECT REPORT

Submitted by

BALAJI T

GOVARDHANAN S

DEERAJ CHARAN J

in partial fulfillment for the award of the degree

of

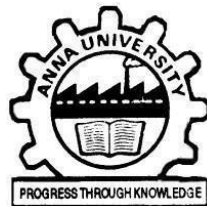
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ANNA UNIVERSITY :: CHENNAI 600 025

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ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report “**SOLDIER STRAP**” is the bonafide work of “**BALAJI T (210417105007), GOVARDHANAN S (210417105016) and DHEERAJ CHARAN J (210417105010)**” who carried out the project work under my supervision.

SIGNATURE

Dr. M. ETTAPPAN, M.E., Ph.D.

HEAD OF THE DEPARTMENT

Professor

Department of Electrical and
Electronics Engineering
Chennai Institute of Technology,
Kundrathur, Chennai – 600 069.

SIGNATURE

Mr. N. RAVI KUMAR, M.E

SUPERVISOR

Assistant Professor

Department of Electrical and
Electronics Engineering
Chennai Institute of Technology,
Kundrathur, Chennai – 600 069.

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INTERNAL EXAMINER

EXTERNAL EXAMINER

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ABSTRACT

The heart rate, temperature, and oxygen level in the blood will all be constantly tracked by a health monitoring system. Only that individual has access to this information. However, in my project, a health monitoring device would be used to track a soldier's health and communicate the information with nearby soldiers and the control room in the event of an emergency. These will lessen the soldier's risk and provide medical attention as quickly as possible.

Soldier identification tags prove to be one of the most under-studied and under-researched areas of study. The only distinguishing object in combat is a metal identification tag with the soldier's information on it. To locate and recognize those who have been killed, scan the entire war zone for dead bodies or identification tags. This task is not only time-consuming but also expensive, and it necessitates a large number of people to search the area. This device is often used to determine a soldier's position while he or she is in a lost state or situation.

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CHAPTER 1

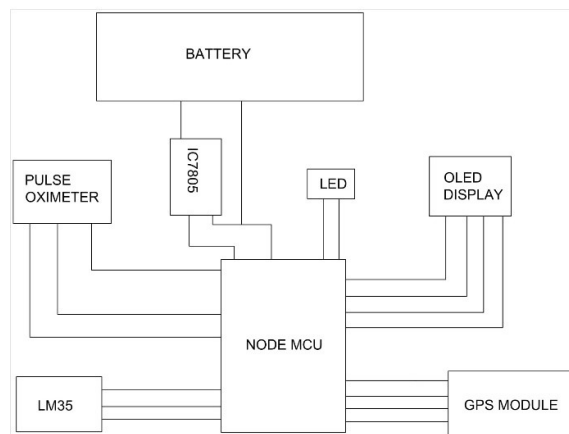
INTRODUCTION

Introduction

In today's world, enemy warfare is a critical consideration for every country's survival. Soldiers in the military play a significant and critical role. There are numerous questions about those soldiers' safety.

In our project, we came up with the idea of monitoring the soldier as well as providing the soldier's health status during the war, allowing military personnel to prepare the war more effectively.

1.1 Block diagram of Soldier Strap



1.1.1 Arduino

Arduino is an electronic controller with multiple input output ports that allows us to monitor devices and read our sensors, among other things. It is designed to allow a whole new breed of projects to be developed that can be operated by a computer. Project prototyping is a popular application.

1.1.2 ESP8266 NodeMCU

NodeMCU is an open-source firmware and development unit for demonstrating and collecting IoT devices. It brings together firmware for Espressif Systems' ESP8266 Wi-Fi SoC and package that uses the ESP-12 module. Lua is the scripting language used by the firmware. It is committed to the eLua project and the Espressif Non-OS SDK for

ESP8266.

1.1.3 Pulse Oximeter

Heartbeat oximetry is a noninvasive and effortless test that actions your oxygen immersion level, or the oxygen levels in your blood. It can quickly distinguish even little changes in how proficiently oxygen is being conveyed to the limits uttermost from the heart, including the legs and the arms.

The beat oximeter is a little, cut like gadget that connects to a body part, similar to toes or an ear cartilage. It's most generally put on a finger, and it's regularly utilized in a basic consideration setting like trauma centers or clinics. A few specialists, like pulmonologists, may utilize it in office.

1.1.4 GPS

The most widely used satellite navigation system in the world is the Global Positioning System (GPS). It's a global Navigation Satellite System (GNSS) that provides geolocation, time, and velocity data. GPS has been in use since 1978, and it has been available worldwide since 1994. The most recent GPS receivers have a precision of 30 centimetres in geolocation. The US government owns and maintains the GPS system, which is managed by the US Space Force.

1.1.5 Temperature sensor

A temperature sensor is an electronic sensor that measures the temperature of its current state and transforms the information into electronic data in order to log, track, or sign temperature changes. Temperature sensors come in a variety of shapes and sizes. Some temperature sensors (touch temperature sensors) involve direct contact with the important article being tested, while others calculate the temperature of a thing by suggestion (non-contact temperature sensors).

1.1.6 OLED Display

The natural light-producing diode or OLED is a light-emanating diode (Driven) in which the emissive electroluminescent layer is a film of a natural compound that emanates light because of an electric flow. fundamentally its presentation, definitely a showcase, a little one. so in this instructional exercise, I'm going to utilize SSD1306 Oled show and an Arduino Nano SSD1306 model is a mono-shading, 0.96-inch show with 128×64 pixels it just four pins and speaks with the Arduino utilizing the I2C correspondence convention

CHAPTER 2

LITERATURE SURVEY

2.1 Literature:

SURVEY

This system contains health measuring modules like Pulse Oximeter, Thermal sensor. This will let you know about that person's heart rate, Oxygen level, Body temperature.

The proposed system will transmit and receive health update of a soldier to a nearby soldier and to the control station for medical emergency. This will let the soldier to send an alert message to the control station in case of any emergency.

2.3 EXISTING SYSTEM

In our real time the health monitoring system will continuously monitor that person's health and display that information in a monitor or through mobile apps.

These health monitoring system data can only be viewed by that individual person through mobile apps or by doctors through monitors.

2.3.1 DRAWBACKS OF EXISTING SYSTEM

- The health information cannot be shared.
- It can be used only for personal view of our health and is not recommended for medical purposes.
- These systems are can only be used by normal people for their regular health updates and are not accurate.

2.4 PROPOSED SYSTEM

This project is mainly for army who will be protecting our nation in any kind of situation. Our system will continuously monitor the soldier's health condition and keep on update that information to a nearby control station. When the soldier's heart rate or oxygen level decreases the strap will send an alert message to a nearby control station

and other soldier near him.

2.4.1 ADVANTAGES

1. This system will alert the nearby soldier in case of any emergency about the target soldier.
2. We can also track and locate the soldiers using soldier strap.
3. This system will reduce the time taking for medical emergency.
4. This system will be very much useful for soldiers to protect themselves from enemies as well as any natural situations by alert message for help.
5. It will prevent the army from missing other soldiers during any emergency situations.

2.5 OBJECTIVES

- 1) The main objective for this project is to protect and reduce the emergency time for our soldiers.
- 2) The full system will fit inside a strap which can be easily worn by the soldier as a watch.
- 3) The soldiers also can view their health status through an OLED screen and they can also call for emergency by pressing SOS button.

CHAPTER 3

MICROCONTROLLER

3.1 WHAT IS ARDUINO?



Figure 3.1 ARDUINO UNO

Arduino is an liberate contraptions archetype stage subject to adaptable, easily useable hardware and programming. It's proposed for artists, designers, hobbyists, and anyone enthused about making brand name things or conditions. It's a open-source guaranteed picking platform subject to a microcontroller. and an improvement software for making programme for the it.

Inshort, Arduino is a simple microcontroller load up having a USB fitting to interface with PC and this clearly explains that each port is programmed which is that it needs a language to command the controller, in here we use C language which is the basic and easy to program to as like most embedded programs, now a days processors have come up handy and are few 100bucks costly than the arduino which infact makes it more available too.

Any individual can purchase this contraption online closeout page or search engine. Since the regulator is a Free to utilize gear plans, making of many controller or a processor needs permission from the owner in most cases but in case of Arduino it works different as the company lets anyone make and sell it which can make people a self-employed too at instances, where they want to start making electronic devices and electronic projects.

Its name "Arduino" is held by the key creators who made the chip initially. Notwithstanding, clone Arduino plans every so mostly have the finish as "Arduino" of

their name, for instance, Freeduino or DFRduino. The thing for Arduino programming isn't difficult to utilize other than wholeheartedly open for LINUX, Mac, and Windows PCs to zero deficiency.

3.1.1 Microcontroller:

Microcontroller can be depicted as a PC presented within a truly little circuit board. If was to portray the fundamentals of a microcontroller more clearly, it is a particular electronic chip that can perform different evaluations and duties, also send/get electronic signals from different gadgets through its open pins. They are able to control devices only by putting a high/low signal which can change various results and calculations completely from the other with simple and single commands.

In any case, the microcontroller without help from some other individual, can't achieve a ton; it a couple outside wellsprings of data: power, for one; an average clock signal, for another. Furthermore, made by programming it ought to be made by an outer circuit. So for what it's worth, a uC is utilized nearby circuits which gives signals to it; this mix is known as a microcontroller board. Arduino Uno is also of the same type where it leads its process by the signals from various transmitting sensors.

3.1.2 Open-source hardware:

Since the hardware is an open source design that can be created and redesigned by any other person independently it is also made sure to be standard in designs so that users does not face any issue and always find it best and easy to use. In various conditions, this by the way makes it unique where it is largely available.

The Arduino making PC programs is other than open-source. The source code for the Java climate is passed on inside the GPL libraries and the C/C++ libraries are inside the LGPL.

3.2 PLATFORM

Arduino is microcontroller platform which is open source and based on easy-to-use hardware and software.

3.2.1 HARDWARE

3.2.1.1 ARDUINO Board Layout

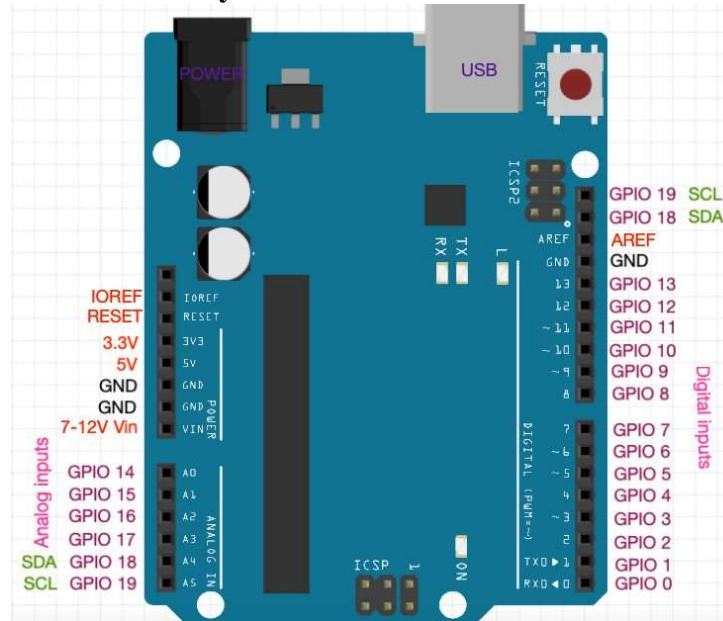


Figure 3.2 ARDUINO board layout

3.2.1.1.1 ATmega8(Microcontroller)

- 14 digital Input/Output Ports
- 8 Kbyte Flash RAM(1K taken by the boot loader)
- 1 Kbyte RAM(eg.for auto/local variables and stack)
- Frequency of 16 MHz

3.2.1.1.2 Single chip USB to async. Serial data transfer interface

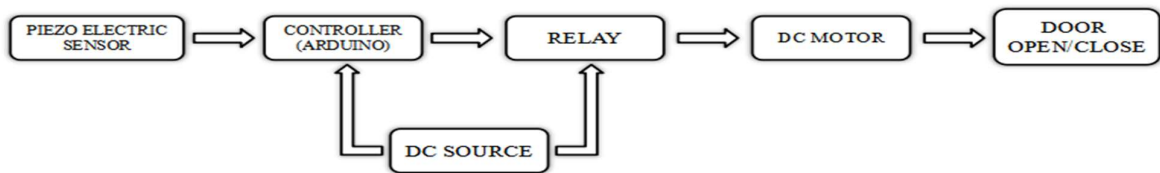
- Data transfer rate from 300bits/sec to 2 Mb/sec
- 256 Byte receive,128 Byte transmit buffer
- Transmit and receive LED drive signals
- USB 2.0 compatible

CIRCUIT LAYOUT

There is three section to focus on

- Light Automation with dimming
- Door Automation
- Fan Automation

BLOCK DIAGRAM AUTOMATIC DOOR OPENING SYSTEM



As Shown Above Signal From PIEZO sensor will control the entire system working,When The Pizo sensor senses a persons entry,It lets all the home appliances to be on,and every appliances based on its values will work by itself by atmospheric sensed outputs.

3.3 APPLICATIONS OF ARDUINO

Arduino was on a critical level designe that made the course towards making use of the contraptions in different disciplinary projects which becomes easily accessible.Any type of enthusiast for any type of project ideas that run in their mind can use it.Arduino works by either directly controlling the devices directly or else first takes input from sensors which in turn helps make decision on what to do to what devices(motors,lights,actuators) apparently.because of all those features ,arduino finds widely used across many application. Arduino developed in a way that it can talk back with th programmable PC connected to it.

Arduino got a Honorary Mention in Digital Communication part of the 2006 Ars Electronica Prix Arduino was been by all class type people in an other way.UG stendents use this mostly for their projects,some some also use this a play toy making funny designs ,Some were at another level by inventing and starting projects as an entrepreneur.We can by this understand how important arduino has been for many.

Making of many controller or a processor needs permission from the owner in most cases but in case of Arduino it works different as the company lets anyone make and sell it which can make people a self-employed too at instances, where they want to start making electronic devices and electronic projects.

Its name "Arduino" is held by the key creators who made the chip initially. Notwithstanding, clone Arduino plans every so mostly have the finish as "duino" of their name, for instance, Freeduino or DFRduino. The thing for Arduino programming isn't difficult to utilize other than wholeheartedly open for LINUX, Mac, and Windows PCs to zero deficiency.

Boundless exercises have been done as a last resort by making use of this small electronics controller, projects as given below:

- ☐ To read the temperature of the room electronically
- ☐ Interactive strong hear-competent information structure
- ☐ GPS authority Module
- ☐ Ultrasonic Sensor
- ☐ Infrared finders SONAR

Express sensor projects like

- Keypad security code
- Sensor tube for heart screen
- Pulse rate screen

Various light endeavors like

- Multicolor light introduction
- Seven-pack LED show

- Double seven-pack LED dice
- LED pack
- LCD module

Various sound endeavors like

- Oscilloscope
- Light harp
- VU meter

Various power projects like

- LCD Thermostat
- Computer controlled fan
- The cover subject expert

Miscellaneous Projects like

- Lie locator
- Magnetic way lock
- Infrared discarded
- Lilypad made with clock

Why Arduino?

3.4.1. Here are reasons why the Arduino is utilized more than beagleboard:

Starter Projects:

Many from young age kids have now started using it for their projects where they design their own imagination in gadgets, college and school children have used it to develop projects to compete in project competition this has largely affected the starting to project community as they learn it easy to use than any other device that is present for this project like application, where the beagle board came lately it also it difficult to get cope up with it newly when many already started using arduino and can help each other in their doubts for solving issues in it while on starter projects that really has a bigger community to support it completely.

Cost and Durability: The cost of a beagleBoard is 180\$ which is too much costly for a basic project to work but Arduino has made it easy by giving it as 30\$ treasure to whoever wants it so that it becomes even affordable for everyone, nobody wants to lose more money everyone would look for a better way and go for it so arduino is the durable and less in cost easily maintainable device that is designed by many people independently this could cause reduced in price since anyone can make it by themselves and many become to stocky all who can make it, hence in either way arduino stands out to be the best in this place.

A Thriving Community: Unlike the other micro controller community the arduino community not just has help and support of itself it has various support from the surrounding people who use it so that makes it a thriving community where the complete need for support is got as it needed instantly, The first thing that comes to controlling devices based project in a mind of person would be arduino which is the only controller that comes initially at any controller based design made by various people, but at any circumstances the community is so big that they don't mostly try to buy a easily doable processors for this purposes but tend to finish with the controller itself no matter how costly that turns out to be, Thus by this we can design an easy to use but budget friendly end ect., based device.

Improvement is the key: Improvement is something that is happening continuously in an arduino community where arduino has released more than 50000 copies for updates for its design for its betterment this makes it a super controller on a daily basis from its first day on 2008.

BeagleBoard is just two years old: Since the BeagleBoard is not been long as arduino it doesn't have greater influence to the society but to the usage in it also so less for the most application unlike arduino from 2008 is older enough with vast experience in this field and knows its users better and clear.

key and pulling in: With a 1GHz controlling ody the Beagle Board it certainly a beast of its kind but fo the projects that people make it is so sad that the use of interfacing to the sensors has been difficult for the system as the system has the higly complex interfacing and take out values also less no of sensors for its type to directly get the output , but incase of aurdino sensors their easily read out for the correct output that can come when in the correct system which can come over to design a greater I,pact to starters for easily useable comunity which canget the direct desired values and directly process it like a simple math calculstion and easily also let the devices control the input as like the the complete system.

NodeMCU ESP8266

3.5 Brief About NodeMCU ESP8266

The ESP-12E module comes with the NodeMCU ESP8266 advancement board, which contains an ESP8266 chip with a Tensilica Xtensa 32-digit LX106 RISC microchip. This chip supports RTOS and has a clock frequency range of 80MHz to 160MHz. To store information and projects, NodeMCU has 128 KB of RAM and 4MB of non-volatile storage. It's suitable for IoT ventures because of its high processing speed, built-in Wi-Fi/Bluetooth, and Deep Sleep Operating features.

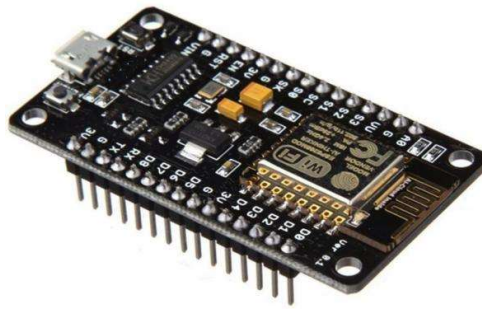


Fig:3.5 Node MCU ESP266

Micro USB jack and VIN pin are often used to power NodeMCUs (External Supply Pin). It is compatible with UART, SPI, and I2C interfaces.

3.6 Programming NodeMCU ESP8266 with Arduino IDE

Since the Arduino IDE is so simple to use, the NodeMCU Development Board can be easily customised.

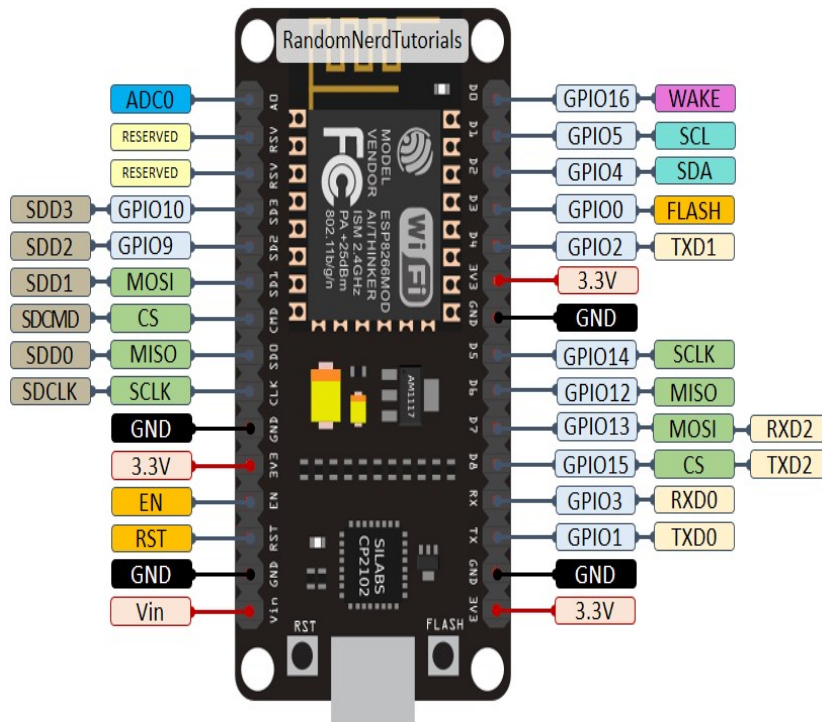
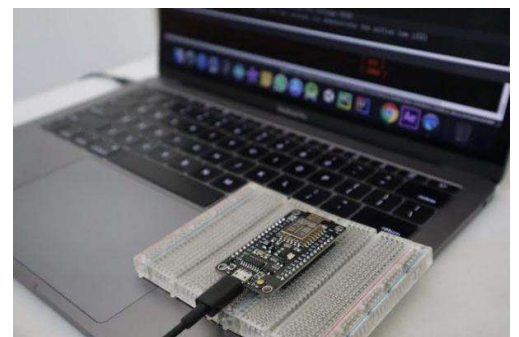


Fig:3.6 NodeMCU ESP8266 Layout

The Arduino IDE would only take 5-10 minutes to programme NodeMCU. All you need is the Arduino IDE, a USB connection, and the NodeMCU board. To set up your Arduino IDE for NodeMCU, go to this [Getting Started Tutorial for NodeMCU](#).

3.7 Transferring your first program

Connect the board to the PC using the USB connection once the Arduino IDE has been installed on the PC. Open the Arduino IDE and select the appropriate board by going to Tools>Boards>NodeMCU1.0 (ESP-12E Module) and the appropriate port by going to Tools>Port. Load the model code from Files>Examples>Basics>Blink to get started with the NodeMCU board and flicker the underlying LED. When you've stacked the model code into your IDE, press the 'move' button on the top bar. When the move is complete, you should see the board's underlying LED flicker.



3.8 Application of NodeMCU

Connect the board to the PC using the USB connection once the Arduino IDE has been installed on the PC. Open the Arduino IDE now and select the appropriate board. IoT gadget prototyping

- Low force battery worked applications
- Organization projects
- Tasks requiring various I/O interfaces with Wi-Fi and Bluetooth functionalities
- IoT applications.
- IoT GPS Location Tracker Using NodeMCU and GPS Module – Save GPS co-ordinates and use Google Maps to see where you are.
- We'll use the NEO-6M GPS Module to create an IoT-based GPS location tracker in this DIY instructional exercise. This Tracker of Locations...
- An RFID and ThingSpeak-based IoT-based event management system
- How to configure an ESP Mesh Network using the Arduino IDE bit by bit – ESP32, ESP8266, and NodeMCU can communicate with each other.
- NodeMCU Motor Driver Shield for Robotic Applications Powered by a Battery
- Arduino-based Roller Blinds with Google Assistant to Automate and Monitor Your Window Curtains
- Using the Arduino IDE to communicate with the ESP8266/NodeMCU through MQTT.
- The most effective method for developing an Internet of Things-based Voice Activated Smart Rocket Igniter

- Using ESP32 and ThingSpeak, IoT-based solar array power monitoring
- Electric metre based on ESP32 - Measuring Input and Output Power to Calculate Efficiency
- With the ESP8266 and AJAX, you can update your website dynamically without having to reload it.

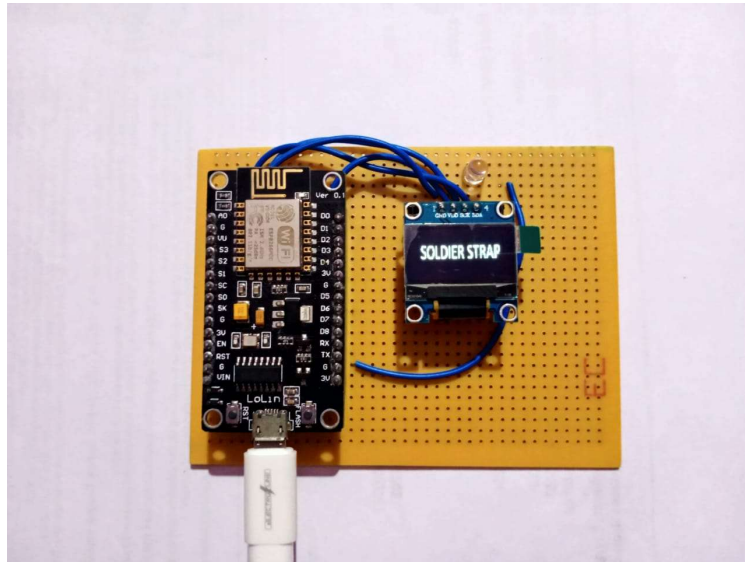


Fig3.7: Node mcu with OLED display

The above graphic depicts the operation of a nodemcu with an OLED display, as well as the title of our project, "Soldier Strap."

CHAPTER 4

OXIMETRY SENSOR

MAX30100 could also be a consolidated heartbeat oximeter and heartbeat screen sensor course of action. It's an optical sensor that gets its readings from transmitting two frequencies of sunshine from two LEDs – a red and an infrared one – by then assessing the absorbance of beating blood through a photodetector. This particular LED concealing mix is improved for scrutinizing the data through the tip of one's finger. it's very configurable through programming registers and thus the automated yield data is taken care of during a 16-significant FIFO inside the device. It has an I2C progressed interface to talk with variety microcontroller.



Fig:4.1 oximeter

The beat oximetry subsystem in MAX30100 involves encompassing light dropping (ALC), 16-cycle sigma delta ADC, and elite discrete time channel. it's a really low-power movement which makes it ideal for battery worked structures. MAX30100 chips away at a store within the extent of 1.8 to 3.3V. It are often utilized in wearable devices, health accomplice devices, clinical checking devices, etc. The MAX30100 works from 1.8V and 3.3V power supplies and may be closed down through programming with irrelevant hold current, permitting the facility supply to stay related reliably.

4.1 Pin Configuration of MAX30100 Pulse Oximeter Heart Rate Sensor Module:-

SN	PINS	DEFINITION OF PINS
1	VIN	Input voltage (1.8V to 5.5V)
2	SCL	IIC-SCL
3	SDA	IIC-SDA

4 INT MAX30100INT
5 IRD MAX30100 IR_DRV
6 RD MAX30100 R_DRV
7 GND Ground

Subtleties and Features of MAX30100 Pulse Oximeter Heart Rate Sensor Module:-

- It is an organized heartbeat oximetry and beat screen sensor game plan.
- Fused LEDs, Photo Sensor, and High-Performance Analog Front - End
- Complete Pulse Oximeter and Heart-Rate Sensor Solution Simplifies Design
- Measures absorbance of beating blood
- I2C interface notwithstanding INT pin
- Little 5.6mm x 2.8mm x 1.2mm 14-Pin Optically Enhanced System-in-Package
- Excessively Low-Power Operation Increases Battery Life for Wearable Devices
- Programmable Sample Rate and LED Current for Power Savings
- Excessively Low Shutdown Current (0.7 μ A, typ)
- Advanced Functionality Improves Measurement Performance
- High SNR Provides Robust Motion Artifact Resilience
- Composed Ambient Light Cancellation
- High Sample Rate Capability
- Fast Data Output Capability
- Employments of MAX30100 Pulse Oximeter Heart Rate Sensor Module:-
 - Wellbeing Assistant Devices
 - Clinical Monitoring Devices

- Wearable Devices

4.2 Reason and employments

The reason for beat oximetry is to check how well your heart is siphoning oxygen through your body.

It very well might be utilized to screen the soundness of people with a condition that can influence blood oxygen levels, particularly while they're in the medical clinic. These conditions include:

- constant obstructive aspiratory sickness (COPD)
- asthma
- pneumonia
- cellular breakdown in the lungs
- pallor
- coronary episode or cardiovascular breakdown
- innate heart absconds
- There are various diverse regular use cases for beat oximetry, including:
 - to survey how well another lung medicine is functioning
 - to assess whether somebody needs assistance relaxing
 - to assess how accommodating a ventilator is
 - to screen oxygen levels during or after surgeries that require sedation
 - to decide how viable supplemental oxygen treatment is, particularly when

treatment is new

- to evaluate somebody's capacity to endure expanded actual work
- to assess whether somebody immediately quits breathing while at the same time resting — like in instances of rest apnea — during a rest study

4.3 How it functions

During a heartbeat oximetry perusing, a little cinch like gadget is set on a finger, ear cartilage, or toe. Little light emissions go through the blood in the finger, estimating the measure of oxygen. It does this by estimating changes of light ingestion in oxygenated or deoxygenated blood. This is an easy cycle.

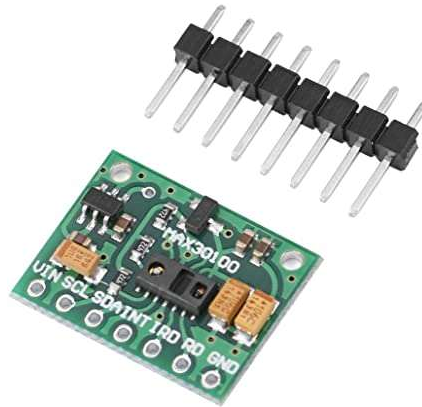


Fig:4.3.1 MAX30100

The beat oximeter can hence reveal to you your oxygen immersion levels alongside your pulse. Watch Lesley Stahl, Alyssa Milano, D.L. Hughley and more as they describe the previous year and look forward to what's to come. Watch our keen and elevating discussion on trust, immunizations, psychological wellness and more.

4.4 Technique steps

Heartbeat oximetry might be utilized in both inpatient and outpatient settings. At times, your primary care physician may suggest that you have a heartbeat oximeter for home use.

The beat oximetry measure is as per the following:

Most ordinarily, a clasp like gadget will be set on your finger, ear cartilage, or toe. You may feel a modest quantity of pressing factor, however there is no torment or squeezing. Now and again, a little test might be set on your finger or brow with a tacky cement.

You might be approached to eliminate your fingernail clean if it's being joined to a finger.

You'll keep the test on however long expected to screen your heartbeat and oxygen immersion. When observing actual work capacities, this will be during the degree of the activity and during the recuperation time frame. During medical procedure, the test will be connected heretofore and eliminated once you're alert and not, at this point under oversight. At times, it might be utilized to take a solitary perusing rapidly.

When the test is finished, the clasp or test will be taken out.

4.5 Heartbeat oximetry readings

Heartbeat oximetry is ordinarily a genuinely exact test. This is particularly evident when utilizing excellent gear found in most clinical workplaces or medical clinic settings. It reliably gives results inside a 2-percent distinction whichever way of what it genuinely is. In the event that your perusing was 82%, for instance, your actual oxygen immersion level might be somewhere in the range of 80 to 84 percent. Notwithstanding, the nature of the waveform and evaluation of the individual should be thought of. Factors like development, temperature, or nail clean can affect the precision.

Normally, in excess of 89% of your blood ought to convey oxygen. This is the oxygen immersion level expected to keep your cells — and your body — sound. While having an oxygen immersion beneath this incidentally isn't accepted to cause harm, rehash or steady cases of brought down oxygen immersion levels might be harming.

An oxygen immersion level of 95% is viewed as typical for most sound people. A degree of 92% shows potential hypoxemia, or lack in oxygen arriving at tissues in the body.

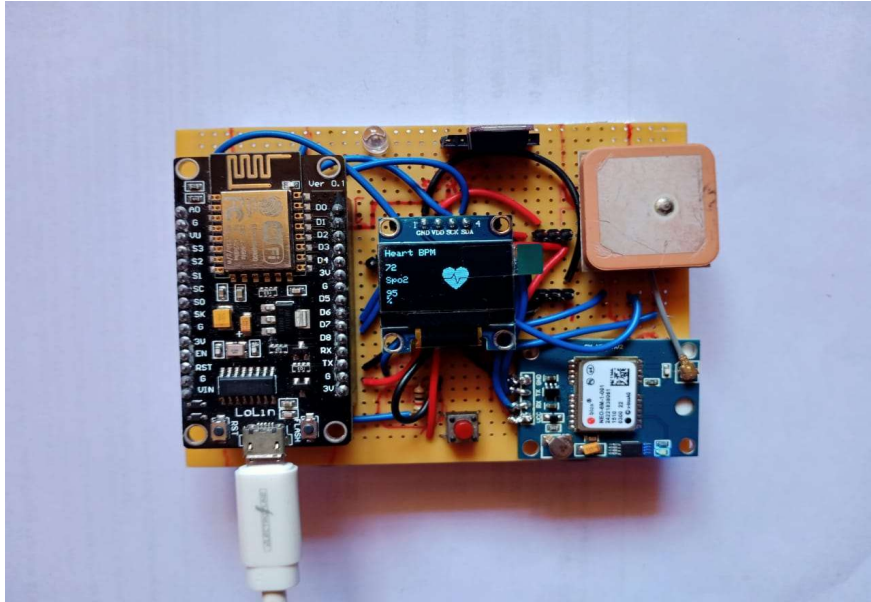


Fig 4.2: Pulse Oximeter

Output

In the OLED display, the output of a human heart beat and SpO2 is shown above. If a soldier's heart rate or oxygen saturation falls below a certain level, the device transmits an alert to the control room as well as a nearby soldier.

CHAPTER 5

GPS

5.1 General outline of GPS

GPS stands for Global Positioning System, which allows you to obtain location data from anywhere on the planet.

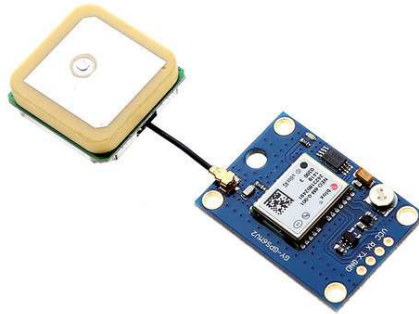


Fig:5.1.1 GPS

5.2 Essential construction of GPS

- **Three-block design**
- **GPS comprises of the accompanying three sections.**
- **Space section (GPS satellites)**

Various GPS satellites are transported around the earth in six circles at an altitude of approximately 20,000 km (four GPS satellites for each circle) and travel around the earth in 12-hour intervals.

5.3 Control section (Ground control stations)

Ground control stations are responsible for checking, regulating, and maintaining the satellite circle to ensure that satellite deviations from the circle, even when GPS timing is accurate, are kept within the resilience limit.

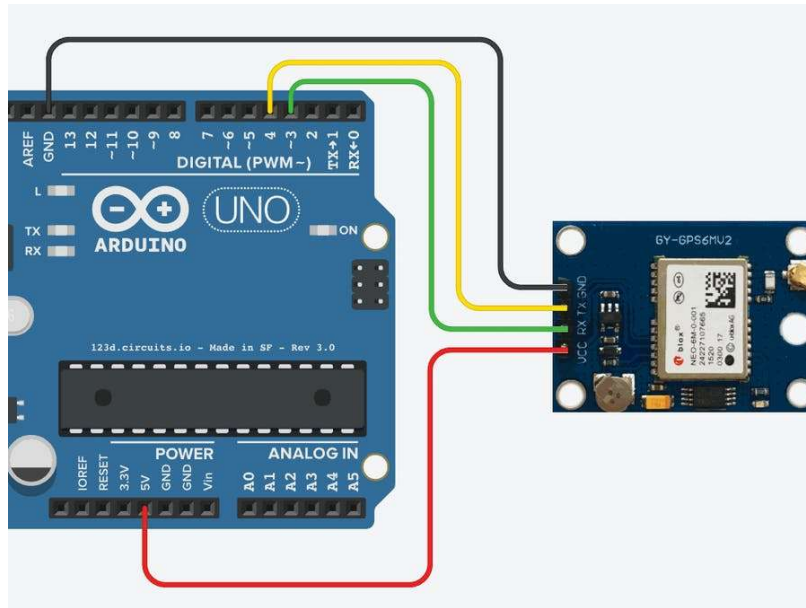


Fig:5.3.1 GPS Control Interfacing

Client section (GPS recipients)

Client section (GPS beneficiaries)

GPS situating

Right away, a GPS satellite at a specific location sends the signal of your time. As a result, the time difference between GPS time and the mark of the time clock from which the GPS beneficiary receives the time signal will be measured in order to calculate the distance from the collector to the satellite. A similar period will be completed with three other available satellites. It is possible to calculate the GPS beneficiary's items based on the distance between the GPS receiver and three satellites. Nonetheless, the location created by this strategy's methods isn't exact, because there's an error in the calculated distance between satellites and a GPS receiver, which arises from a time blunder on the clock consolidated into a GPS beneficiary. A nuclear clock is consolidated for a satellite to generate on-the-spot time data, but the time generated by clocks connected to GPS receivers isn't nearly as precise as the time produced by nuclear tickers on satellites. Here, the fourth satellite plays a role: the distance between the fourth satellite and the beneficiary is often used to work things out in relation to the position information provided by the distance between three satellites and thus the collector, reducing the room for position precision errors.

The diagram 1-3 below depicts a two-measurement method of positioning (position securing by utilising two given focuses). We'll find out where we are by calculating the distance between two points, and the GPS is the system that will be defined on this diagram by increasing the number of points and replacing them with GPS satellites.

5.4 GPS signals

GPS signal strength - frequency domain

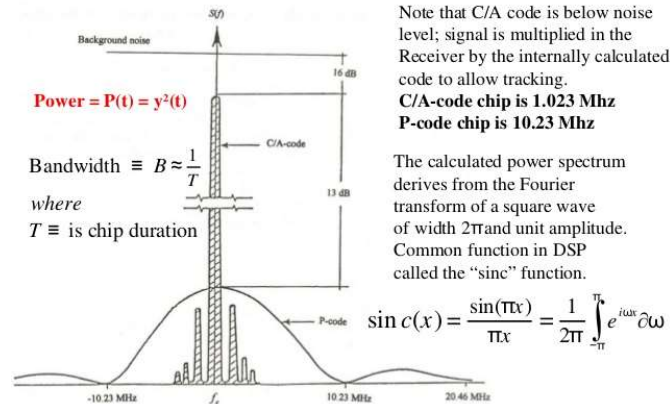


Fig:5.4.1 GPS Signal

L1 (1,575.42 MHz) and L2 (1,227.60 MHz) are the two transporter frequencies used by GPS satellites (1,227.60 MHz). The pillars that will only be used by the US military force are encoded in P (Precise) code, while the bars that will be accessible to the general public are encoded in C/A (Coarse/Acquisition) code. The C/A code is made up of the ID codes of each satellite and is sent along with route messages. The ephemeris* is used to understand the circle of each satellite, and the almanack** is used to understand the details about the circle of all satellites. At a rate of fifty pieces per second, the route messages are transmitted. The GPS beneficiary calculates the distance between satellites using this collection of data, allowing the collector to provide location information. The subtleties of C/A code are depicted in Figure 1-4, and route messages are depicted in Figure 1-5.

*The ephemeris assigns a specific circle to each satellite, which can be used to determine the exact area of the satellite, which is crucial for determining location data. It is the native data that is only used by all GPS satellites with a specific identifiable proof number.

**The chronological registry, which includes coarse circle and standing data for all satellites within the organisation, is frequently viewed as worked on ephemeris information. It's used to find available satellites at the same time as a GPS beneficiary to provide current location and time. It takes 12.5 minutes to urge all of the details from the chronicle.

5.5 What is C/A code?

The GPS satellites' L1 signal is phase balanced in C/A code, which is a pseudorandom code. Pseudorandom commotion code, also known as a Gold code, is another name for the pseudorandom code. C/A code may be a grouping of advanced signs "1" and "0," as seen in Fig. 1-4. Since 1,023 continuous examples in GPS include an appointment, this sequence will rehash over and over again in a steady progression.

5.6 Route message

The route message is made up of 25 edges, each with 5 subframes of 300 bits. Every subframe is 6 seconds long, and every edge may be a gathering of 1,500 pieces of information with a string length of 30 seconds during this process. Since a route message can have up to 25 casings, the message duration can be up to 12.5 minutes (30 seconds x 25=12.5 minutes). When the GPS beneficiary initiates the beginning power, it takes 12.5 minutes to urge all of the critical data arrangement, which is a prerequisite for positioning. When power is reactivated, the GPS collector is capable of storing this arrangement of data acquired during the previous inward reinforcement battery, and it peruses the arrangement of data when power is reactivated, allowing it to quickly begin getting GPS location.

5.7 Situating exactness

5.7.1 Elements that trigger GPS position mistakes

Ionosphere

Between the thermosphere and the exosphere is the ionosphere, which is a part of the upper atmosphere. As GPS signals pass through this sheet, the signal's proliferation speed slows down, resulting in a blunder.

Lower atmosphere

The lower atmosphere is the smallest part of the Earth's atmosphere. GPS location errors are caused by radio reflections caused by a dry atmosphere and water fume within.

Multipath proliferation

When GPS signals reach the ground, structures, and other objects, they are susceptible to reflection. This phenomenon is known as multipath proliferation, and it is one of the causes of GPS location errors.

DOP (Dilution Of Precision)

DOP is a value that indicates the degree of GPS positioning accuracy corruption. The more modest the value, the more precise the positioning. This value is based on the locations of the GPS satellites used for positioning. If the followed satellites spread out equally ridiculous, the positioning precision would improve, and if the followed satellites' locations are lopsided, the positioning precision would decrease.

Signal strength

The frequency of GPS signals determines the GPS gathering condition. The higher the sign power, the more stable the gathering status is. When the GPS signal became more sensitive due to deterrents or clamour sources near a GPS recipient, the gathering status became shaky.

Number of satellites followed for situating

Condition of gathering of GPS relies on the quantity of satellites followed for situating.

When the number of followed satellites is large, GPS positioning becomes more significant; however, when there are less satellites followed for positioning, GPS positioning becomes more difficult. The event depicted in Fig. 1-11 occurs when the GPS receiver monitors a larger number of satellites for positioning. The GPS collector is shown in Fig. 1-12 during an operation.

CHAPTER 6

TEMPERATURE SENSOR

6.1 Temperature Sensor:

A temperature sensor is an electronic sensor that practices the temperature of its present condition and converts the data into electronic data to record, screen, or sign temperature changes.

Highlights

- ☐ Calibrated straightforwardly in Celsius (Centigrade)
- ☐ Linear + 10-mV/°C scale factor.
- ☐ 0.5°C guaranteed precision (at 25°C)
- ☐ Rated for full –55°C to 150°C territory

6.2 Types of temperature sensors

A temperature sensor can be of various designs sizes shapes properties constructional change ect., which lets the delicacy application and things like that to change between each one of them.

The clash of particles or removal of electron or movement in particle leads to cause in temperature change within it ,the temperature sensor is just the vice-versa of what we learnt in our science classes where the heat outside makes the particle movement to change based on surrounding temperature, which leads to change in its conductance to, some material is conductor only at cold temperature, likewise the temperature change affects the material to reveal its temperature based on the conductivity change in that case.

Even if there are various types of sensors the particularly two type that all temperature sensors are separated into is given below.

- **Contact Temperature Sensor**
- **Non-contact Temperature Sensor**

Contact Temperature Sensor Type – To get the temperature output physical touch of the sensor is needed for sure as the sensor cannot sense the untouched device

temperature due to the material characteristics of that particular sensor, so they can be used to accurately define the temperature of solid materials, liquids, and gaseous materials too.

Non-contact Temperature Sensor Type – The light through a different temperature molecule is different that's the case in this temperature based on the temperature sensed the light from the infrared beam is reflected and based on which the temperature of some objects checked.

These two types of sensors is further divided based on electrical, mechanical types, based on accuracy and material used etc.,.

6.2.1 The Thermostat

The thermostat is a sensor which senses the temperature with its electro-mechanical property based on which the direct contact will determine the temperature, this is purely based on the electrical contact of the system where the metal strips tend to come in contact with each other.

The bi-metallic strip is something that acts as a switch by itself by changing its contact on/off based on the temperature, it is largely used in transformers and other heat-based switching required systems.

6.2.2 The Bi-metallic Thermostat

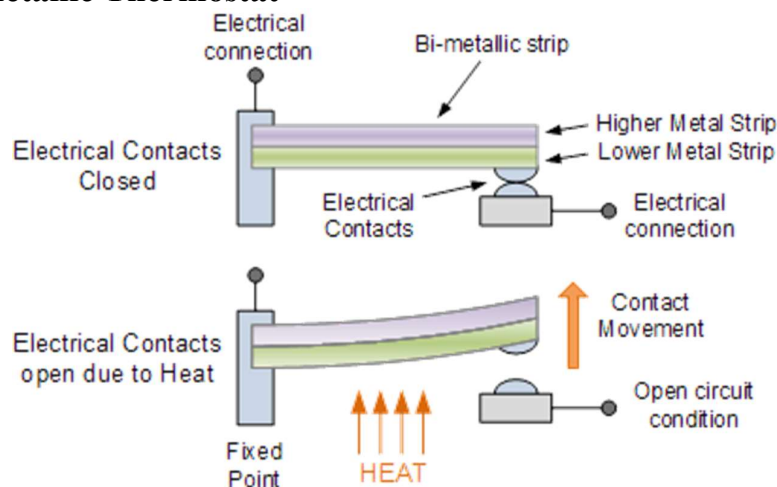


Fig:6.2.2 bi-metallic strip indoor regulator

The indoor regulator incorporates two thermally different metals stayed together in a reliable development. The current flow is allowed when it is low in temperature as the bi metallic stays in contact with each other, but as the temperature rises the strip has a force acting tending the strip to move up or downwards which infect disconnects the strip from each other leaving the circuit open leading to off switch type of operation,

thus the system works based on the heat.

6.2.3 Indoor regulator temperature sensor



Fig:6.2.3 On/Off Thermostat

The moving or bending end is arranged in two ways based on the type of the switch it must act as, as the system has ON/OFF type and the OFF/ON type of temperature sensor based on the application the system sensor will be used where in some application is different from the other.

Snap activity or OFF/ON type sensor is used in various home appliances where the system tends to off after the certain heat reached as like the electric heater, electric stove, iron box, Air conditioner, etc.,

Creeper type temperature is the other kind where on heat contact bends to make it an OFF/ON type were based on the heat the bending of the strip occurs and mostly used as an off/on type only, this type sensors are having default off and bends to on the device to on the temperature mostly.

In applications as boilers, iron box etc., the system disconnects the circuit to save the system from over heat, but in case of the fire alarm pump like design where there arises fire or heat the system will connect to turn on the power supply to the pump.

However, the full system is less temperature accurate, and operates between small differences only, for example a system where the temperature of the sensor is set as 23°C will only fluctuate between + or - 2°C i.e., it turns on while it goes down to 21°C and turns off while up to 25°C which is just 2°C difference, which is a small scale of temperature based.

Therefore, the temperature-based bend can be incredibly high. Currently open bi-metallic indoor regulators that are used at home have setpoint to the temperature and the present value of the hysteresis within it.

6.3 The Thermistor

A thermistor is of a different kind as it is thermal based resistor which is delicate in nature as it gives the change in resistive characteristics based on the temperature input.

Thermistor temperature sensor



Fig:6.3 Thermistor

Thermistors are by and large made using completed materials like oxides of nickel, manganese or cobalt solicited some types of glasses which can make them change their character if ambiently disturbed. The greatest advantage of this type is that it can change its characteristics in a very speed manner with respect to the temperature change.

Most type of thyristors or of type where their conductivity increases with respect to the increase in temperature, but whereas there are also few of a kind with positive movement where the temperature increase would cause conductivity to drop i.e., the resistance increases with respect to temperature.

Thermistors are worked from an imaginative kind semiconductor material utilizing metal oxide improvement like manganese, cobalt and nickel, and so on, this semiconductor is connected to terminal and a flat ball roll over it of the oxide material let sit to conduct very fast to bring out accurate results faster.

The thermistor has the room temperature initially set for example of about 20°C then the change in temperature up to a 10°C would cause MΩ difference in the system where the system takes in the temperature to produce output resistance in kilo ohms in a quick time duration.

An impulse or a peak temperature may cause this resistance to fall to zero which in the end leads to the fully conductive thermistor but in circumstances where the complete system is dependent on temperature it still produces some resistance to the part, this can cause some unwanted waste to power sometimes.

6.3.1 Example

The accompanying thermistor has an opposition estimation of $10\text{K}\Omega$ at 25°C and an obstruction estimation of 100Ω at 100°C . Compute the voltage drop across the thermistor and subsequently its yield voltage (V_{out}) for the two temperatures when associated in arrangement with a $1\text{k}\Omega$ resistor across a 12V force supply.

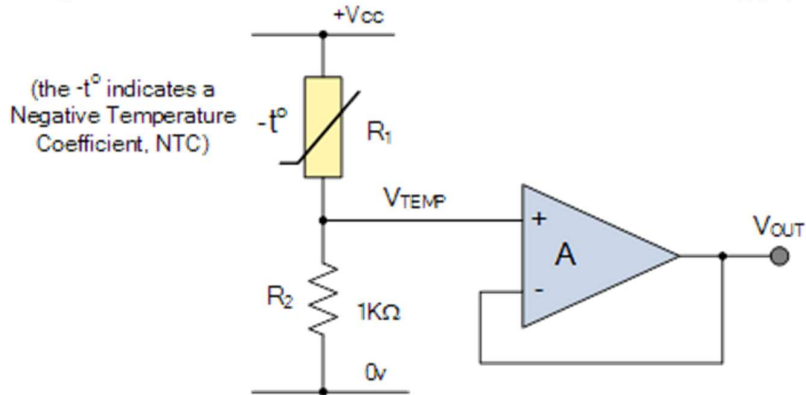


Fig:6.3.1 Thermistor circuit

At 25°C

$$V_{out} = \frac{R_2}{R_1 + R_2} \times V = \frac{1000}{10000 + 1000} \times 12\text{V} = 1.09\text{V}$$

thermistor at 25 degrees

At 100°C

$$V_{out} = \frac{R_2}{R_1 + R_2} \times V = \frac{1000}{100 + 1000} \times 12\text{V} = 10.9\text{V}$$

thermistor at 100 degrees

We can change the value of output easily by changing the R_2 resistor where we can change control to output where the completely control is taken where the system works the system where absorption of heat change the characteristic of the thermistor too.

The thermistor regardless of everything work on just by temperature change directly affecting it so fast but the other type of material flowing across it which is a Beta temperature solid (β) which in capricious temperature point can be used to shield the system from damages.

It works regardless of type of circuit as example let's take the voltage divider circuit which is like present in a wheat stone bridge, so in this case the divider will work perfectly regardless of their type of circuit by affecting the temperature directly the

output gets affected.

6.4 Resistive Temperature Detectors (RTD).

An RTD is a resistive temperature detector which detects the temperature based on the resistance change in the circuit as the current is passes by the materials experience different conductivity at different temperature, so by change in temperature the resistance changes, as increase with increase with temperature and resistance decrease with decrease in temperature this is the basic principle between the working of an RTD.

A Resistive RTD

The resistive RTD is a highly accurate straight detector that works by Resistive change and is not like the thermistor but is of positive change type of RTD temperature detector.



Fig:6.4 RTD

Notwithstanding, WE can help it as it has warm affect ability problems due to which it gives a change of around let's say a $1\omega/oC$.

Commonly a RTD is made with a Platinum where as it can stay costly but the thermometers use this for the sensing of temperature from things at the end tip of it where it is made up of pt100 type of a platinum.

Like thermistor the RTD's also have the particular hindrance, where an RTD carries it to be around 100ω in a $0^{\circ}C$ and around 120 in a higher temperature whereas they also have their temperature they operate on just like the thermistor where in case of RTD it operates at a temperature starting from $-200^{\circ}C$ and way up to $+600^{\circ}C$ as their working temperature.

Since the RTD is a resistive type of a gadget part it would need supplying power to it or passing current through it which is then calculated to be put on a display, thus at circumstances the system needs additional things to be complete to use it.

6.5 The Thermocouple

A thermocouple is a temperature sensor that can used in all types of application when this so quick to respond I.e., it is at higher speed with direct update to the change in temperature in the surrounding which makes it more special, just like other temperature sensor Thermocouple has a very big range of temperature that it can work between, the working temperature would be from -200 to around $+2000$ which is a very advantageous application.

A thermocouple is simply built by rolling in the two ends of iron and constantan as junctions where it works basis of the two-junction mythology where different temperature junctions produce different emf within them and where one free junction is which sense the temperature of the sample and the other junction is default cold.

Thermocouple Construction

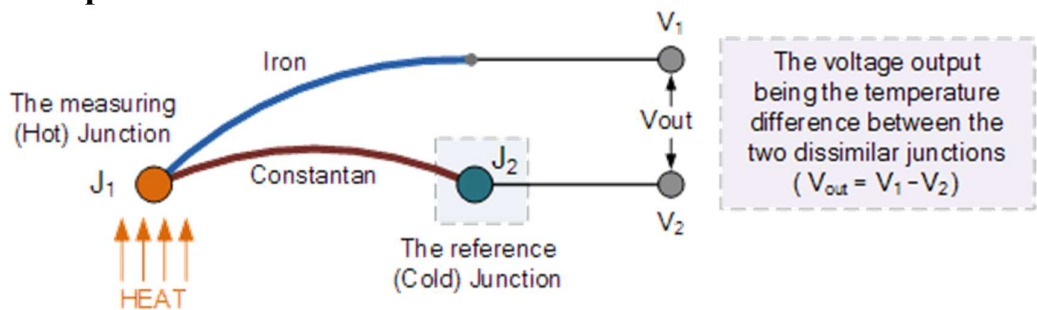


Fig:6.5 Thermocouple Temperature sensor

The thermocouple is so accurate and genius plan to execute as it gives the precise difference in temperature to voltage where the hot end or cold end is let out but the other end is consistently given with fixed opposite temperature based on the junction this design is made which is a easy to construct model and also a simple easy working of the system make this the famous idea that is never costly as the others , but the problem is that the one junction needs to be given with constant opposite temperature.

The difference in temperature is what makes it the accurately define the output both junction is given with voltage as V₁, V₂ but the thing is that the system works as a voltage difference circuit therefore here the voltages get cancelled when the temperature at vout the ends are equal by this we can directly define current temperature as V₁=V₂ in this case the output remains zero and the temperature of the both junctions are same.

Thermocouple has a various select able range of the temperature of around -200°C to +2000°C, but the temperature of the system is highly maintainable, and is vastly useable across as the thermocouple has large difference in temperature capability it is found to be used in various application where also the system has different models based on the application it is used for.

6.5.1 Thermocouple Color Codes

Thermocouple Sensor Color Codes Extension and Compensating Leads

Code Type	Conductors (+/-)	Sensitivity	British BS 1843:1952
-----------	------------------	-------------	----------------------

E	Nickel Chromium/Constantan	-200 to 900oC	type e thermocouple
J	Iron/Constantan	0 to 750oC	type j thermocouple
K	Nickel Chromium/Nickel Aluminum	-200 to 1250oC	type k thermocouple
N	Nicrosil/Nisil	0 to 1250oC	type n thermocouple
T	Copper/Constantan	-200 to 350oC	type t thermocouple
U	Copper/Copper Nickel Compensating for "S" and "R"	0 to 1450oC	type u thermocouple

There is three most type of temperature sensor that works in daily basis with a higher application and uses they are Iron-Constantan (Type J), Copper-Constantan (Type T), and Nickel-Chromium (Type K). They give out voltage of millivolts (mV) in a 10°C of temperature whereas the change in temperature changes the voltage developed too.

6.5.2 Thermocouple Amplification

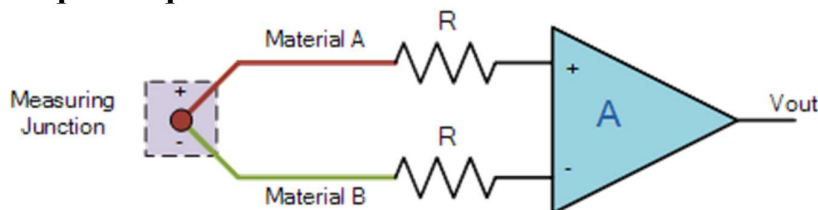


Fig:6.5.2 Temperature sensor Intensifier

The sensor is a separate kind of an amplifier implanted so as to improve the voltage output as the voltage output that happens there are so low in nature than the requirement therefore this system of the amplifier is used where we use a highly sensitive thing to bring out the exact result to it.

There are various other types to like infra-red temperature sensor, thermal radiation-based sensor, junction-based sensors et., too.

In this type the sensor has various aspects it depends on based on type of working or construction while coming to a temperature sensor as Photodiodes, Phototransistors, Photovoltaic Cells and the Light Dependent Resistor.

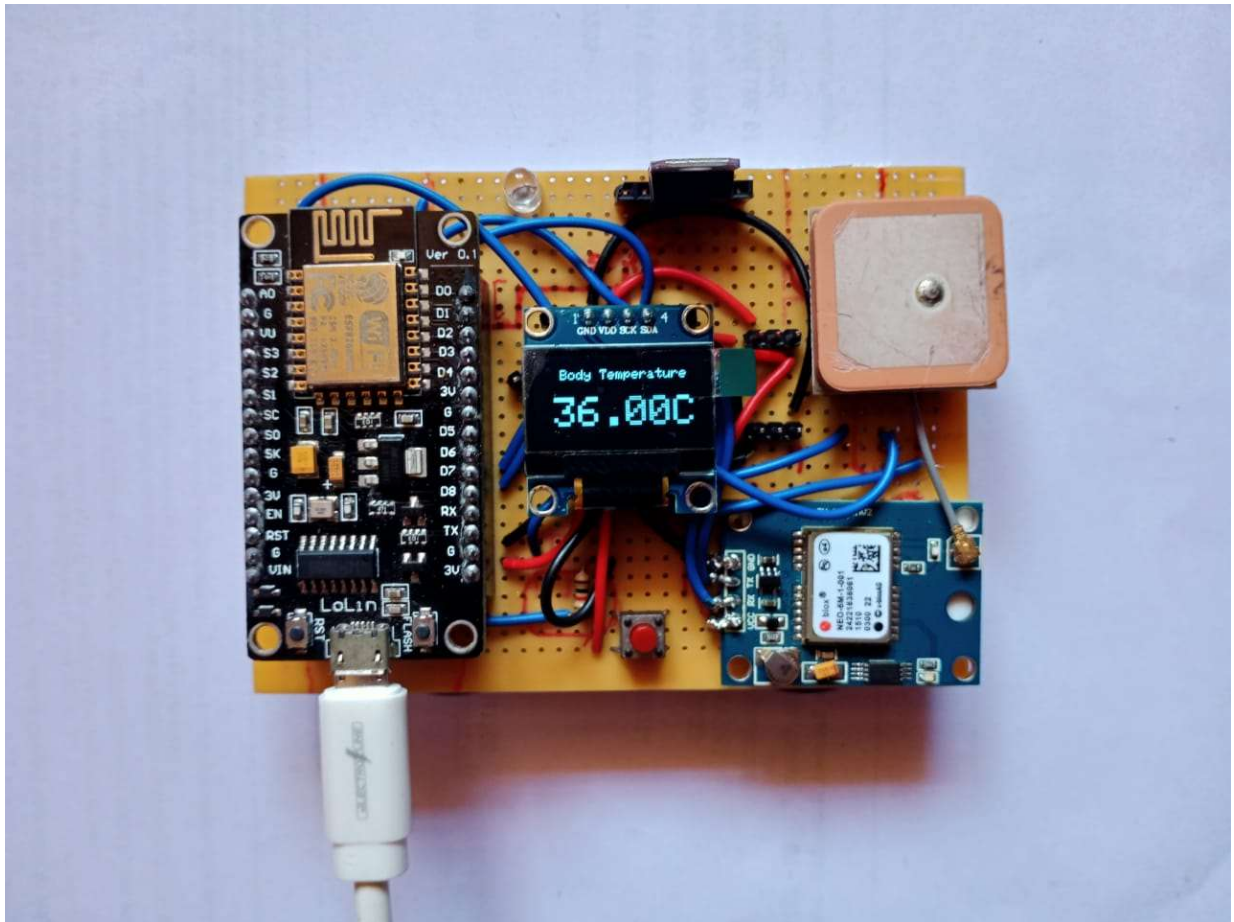


Fig 6.1: Temperature Output

The output temperature of a soldier is shown above, and when it exceeds 45 degrees Celsius, another soldier is alerted. Normal standard temperature established in the controller; it alerts when abnormal level approaches.

CHAPTER 7

OLED

0.96 INCH BLUE OLED:

A 0.96-inch blue OLED Display module can be used with any microcontroller that supports SPI/IIC interfaces. It has a target size of 128x64 pixels. The event includes a show board, a display, and a pre-soldered 7-pin male header.

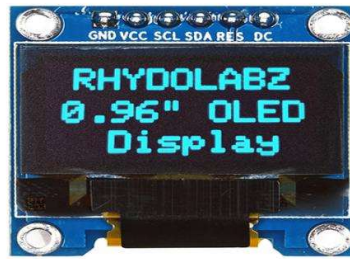


Fig 7: 0.96 inch blue OLED Display

OLED (Organic Light-Emitting Diode) is a self-conveying light source made of a thin, complex normal film sandwiched between an anode and a cathode. Instead of improving LCD, OLED does not require scene illumination. OLED has a lot of potential for essentially successful level presentations and is seen as a compelling innovation for the front time of level load shows.

The vital strategy of OLEDs includes average materials between the cathode and thus the anode, both of which are made of electrically conductive clear Indium Tin Oxide (ITO). The name materials combine the opening Transporting Layer (HTL), Emission Layer (EML), and thus the Electron Transporting Layer to create a posh thin film (ETL). Openings and electrons are granted into the EML from the anode and thus the cathode, in a sense, by applying the appropriate electric voltage. Inside the EML, the openings and electrons combine to form excitons, after which electro glimmer occurs. The main factors that determine the probability of OLED parts are the exchange content, flooding layer material, and terminal selection.

7.1 Introduction to 0.96-inch OLED Display

The SSD1306 model of natural light-transmitting diode (OLED) Display will be used in this instructional exercise: a monicolor, 0.96-inch Display with 128-64 pixels, as shown in the accompanying figure.

SSD1306 I2C OLED Display

The OLED Display does not need background illumination, which makes a significant difference in dim lighting. Furthermore, since its pixels only consume energy once they are turned on, the OLED Display consumes less power as compared to other displays.

The model we're using here has only four pins and communicates with the Arduino through the I2C protocol. There are several versions that come with an additional RESET pin. There are also OLED Displays that communicate using SPI communication.

7.2 Pin wiring

Since the OLED Display uses the I2C communication protocol, wiring is easy. All you have to do now is attach your Arduino Uno to the I2C sticks as shown in the table below.

Pin Wiring to Arduino Uno

Vin 5V

GND GND

SCL A5

SDA A4

In case you're utilizing an alternate Arduino board, make sure you check the proper I2C pins:

Nano: SDA (A4); SCL (A5);

MEGA: SDA (20); SCL (21);

Leonardo: SDA (20); SCL (21);

arduino with OLED Display schematic graph

7.3 Libraries

The adafruit SSD1306.h and thus the adafruit GFX.h libraries are needed to monitor the OLED Display. To introduce such libraries, follow the instructions below.

1. Go to Sketch > Include Library > Manage Libraries in the Arduino IDE. The Library Manager should now be accessible.
2. Introduce the SSD1306 library from Adafruit by typing "SSD1306" into the inquiry box.
SSD1306 OLED Library for ESP8266 and ESP32 Arduino is a microcontroller board that
3. After you've introduced the Adafruit SSD1306 library, type "GFX" into the search box and introduce the library. GFX Library for ESP8266 and ESP32 Arduino is now available.
4. Restart your Arduino IDE after you've installed the libraries.

7.4 Tips for composing text utilizing these libraries

Here's certain capacities which will assist you handle the OLED Display library to compose text or draw straightforward illustrations.

`display.clearDisplay()` – all pixels are off

`display.drawPixel(x,y, shading)` – plot a pixel within the x,y arranges

`display.setTextSize(n)` – set the text dimension, upholds sizes from 1 to eight

`display.setCursor(x,y)` – set the directions to start composing text

`display.print("message")` – print the characters at area x,y

`display.display()` – call this system for the progressions to form impact

7.5 Compose Text – OLED Display

The Adafruit library for the OLED show accompanies a couple of capacities to compose text. during this part, you'll find out the way to compose and scroll text utilizing the

library capacities.

"Hi, world!" OLED Display

```
#include <Wire.h>

#include <Adafruit_GFX.h>

#include <Adafruit_SSD1306.h>

#define SCREEN_WIDTH 128 // OLED display width, in pixels
#define SCREEN_HEIGHT 64 // OLED display height, in pixels

// Declaration for an SSD1306 display connected to I2C (SDA, SCL pins)

Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);

void setup() {

  Serial.begin(115200);

  if(!display.begin(SSD1306_SWITCHCAPVCC, 0x3C)) { // Address 0x3D for 128x64

    Serial.println(F("SSD1306 allocation failed"));

    for(;;);

  }

  delay(2000);

  display.clearDisplay();

  display.setTextSize(1);

  display.setTextColor(WHITE);

  display.setCursor(0, 10);

  // Display static text

  display.println("Hello, world!");

  display.display(); }

void loop() {

}
```

The accompanying portrayal shows Hello, world! message in the OLED show.

Subsequent to transferring the code, this is the thing that you'll get in your OLED:

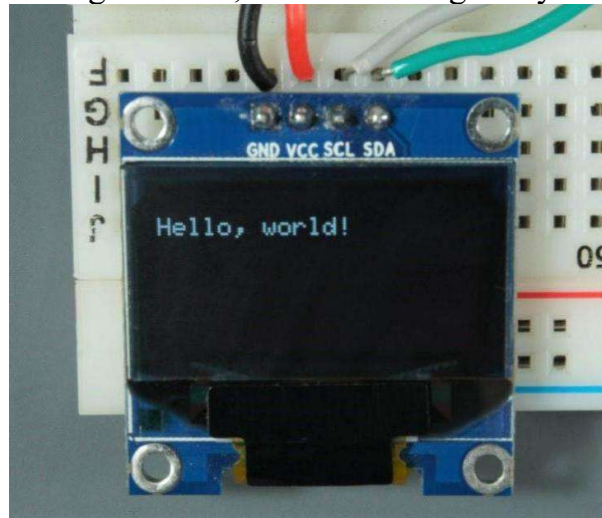


Fig:7.5 ESP32 ESP8266 Arduino OLED Display “hello world!”

7.6 Setting up SPI/I2C Connection with GMS096A OLED Module

Only held assets are open on this tiny piece of supernatural occasion, adding another bit to the economy (GMS096A). As in any situation, the I2C/SPI technique demands obliging properties on a regular basis. The module comes with a 4 wire SPI plan clearly marked, and you'll use these Adafruit libraries to make it work with the Arduinos.

The I2C plan necessitates a labour scramble on the module. Starting with resoldering the resistor from location R3 to R1 and thus shorting the R8 resistor with some patch tin, one of our clients bestowed these fair arrangement attempts on us (0 Ohm resistor). The R6 and R7 pullup resistors are already welded, so there's nothing else to do. When done, the module is fully ready for I2C communication! Because the CS Pin isn't required, connect it to GND. The universe is chosen by the DC Pin. Connect it to GND in the usual region. A 100nF capacitor to GND and a 10k res to VCC would be suitable for the RES-pin, which needs a coffee heartbeat at startup and high voltage during creation (as in SPI mode).

7.7 Highlights:

OLED Driver IC: SSD1306

Objective: 128 x 64

Visual Angle: >160°

Information Voltage: 3.3V ~ 6V

Possible I/O Level: 3.3V, 5V

Cut back Size: 2.7 x 2.8cm

Essentially Need 2 I/O Port to Control

Pixel Color: Blue

Full Compatible with Arduino

Working temperature: - 30°C ~ 70°C

Module volume (liberal): 27.0 x 27.0 x 4.1mm

Creation line made game plans for SPI Display

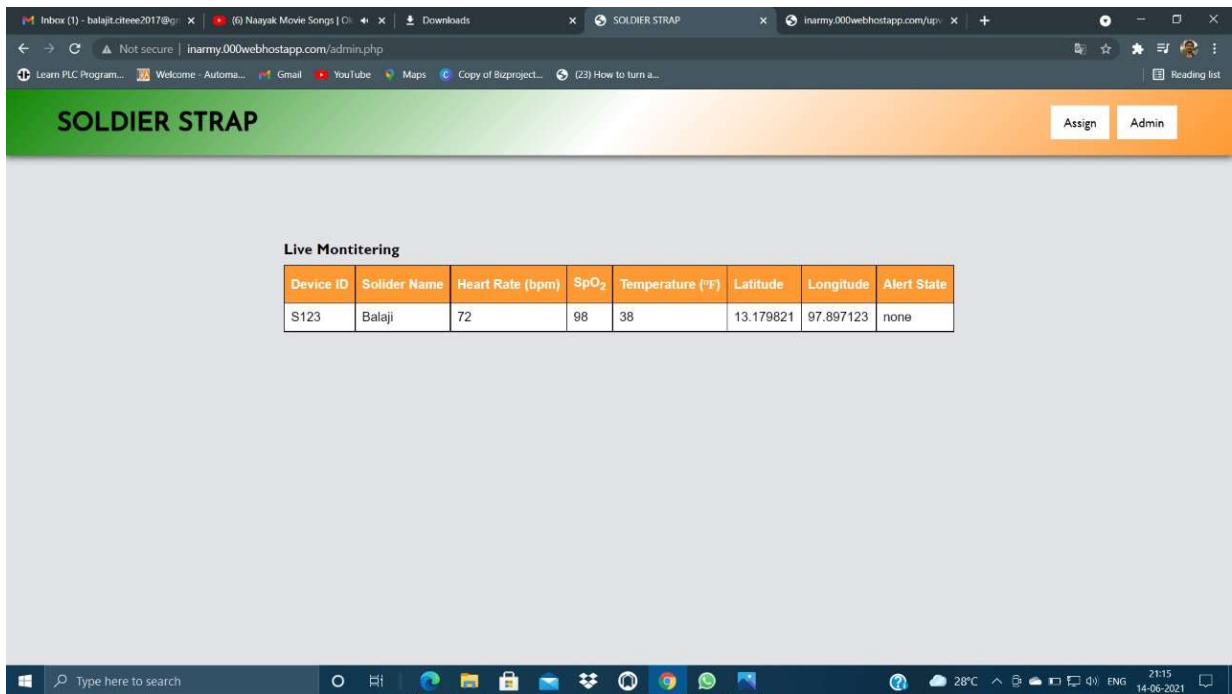
CHAPTER 8

RESULT

ANALYSIS

Based on the test results obtained from test strategies we can define the performance of the soldier strap works fine and has produced good results of transmitting and receiving emergency signal from the strap when needed.

The accuracy of the model from the lab test under certain condition as the average score about 80%.



The screenshot shows a web browser window with the URL `inarmy.000webhostapp.com/admin.php`. The page has a green header with the title "SOLDIER STRAP" and two buttons, "Assign" and "Admin". Below the header, there is a section titled "Live Monitoring" containing a table with the following data:

Device ID	Soldier Name	Heart Rate (bpm)	SpO ₂	Temperature (°F)	Latitude	Longitude	Alert State
S123	Balaji	72	98	38	13.179821	97.897123	none

Fig8.1: Health condition of soldier before warning

The soldier's health is shown in the above diagram, as well as their location. In the event that a soldier is obliged to respond to an emergency, the warning will be displayed in a red hue based on their health state.

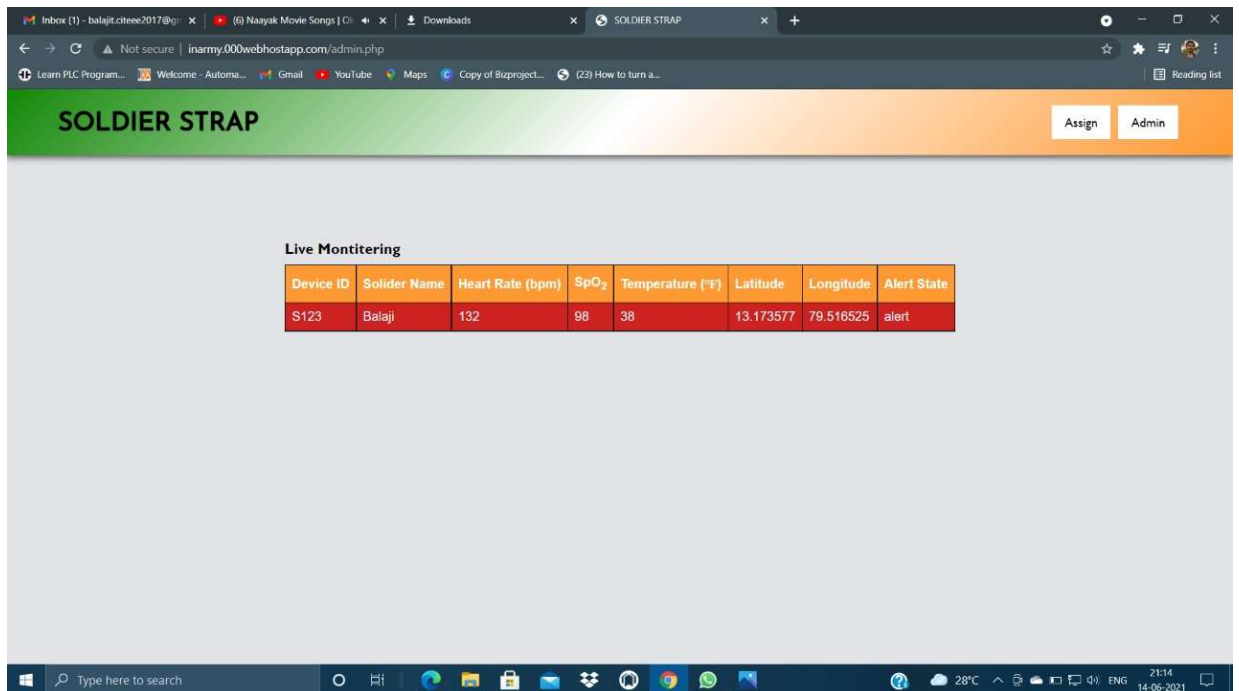


Fig 8.2: Health condition of soldier after warning

The above figure depicts a warning about a soldier who need immediate medical attention, as well as the location of that individual.

CHAPTER 9

CONCLUSION

Solder strap is similar to normal health monitoring system but it can able to send and receive other nearby solders health and location in case of any emergency due to their decreased level of heart rate and oxygen level. This will help other soldiers to identify the soldier suffering from health-related issues and provide medical emergency as soon as possible.

FUTURE WORKS:

In future enhancement, we can implement this project at further minimal cost by embedding the full system with micro-controller with required no of pins and applying advanced military technology to transmit and receiving solders location as well as health condition.

CHAPTER 10

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