DAYANANDA SAGAR UNIVERSITY

MINOR PROJECT REPORT

ON

"Tactical Rescue Analysis System"

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE & ENGINEERING

Submitted by Team 23

Name: Shreyansh JV

(USN): ENG18CS0268

Name: Shylesh Suresh

(USN): ENG18CS0274

Name: SrishtiRanjan

(USN): ENG18CS0284

Name: V A S Kiranmayee

(USN): ENG18CS0304

V Semester, 2020

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING SCHOOL OF ENGINEERING

DAYANANDA SAGAR UNIVERSITY KUDLU GATE

BANGALORE – 560068

Under the Guidance of:

Dr Shamanth N, Assistant Professor, Dept. of CSE, DSU

DAYANANDA SAGAR UNIVERSITY

CERTIFICATE

This is to certify that the Object Oriented Programming Mini-Project report entitled **"TACTICAL RESCUE ANALYSIS SYSTEM"** being submitted by V A S Kiranmayee ENG18CS0304 to Department of Computer Science and Engineering, School of Engineering, DayanandaSagar University, Bangalore, for the 5th semester B.Tech C.S.E of this university during the academic year

2020-2021.

Date:_____ _____

Signature of the Faculty in Charge

_____

Signature of the Chairman

DAYANANDA SAGAR UNIVERSITY

CERTIFICATE

This is to certify that the Object Oriented Programming Mini-Project report entitled **"TACTICAL RESCUE ANALYSIS SYSTEM"** being submitted by SrishtiRanjan ENG18CS0284 to Department of Computer Science and Engineering, School of Engineering, DayanandaSagar University, Bangalore, for the 5th semester B.Tech C.S.E of this university during the academic year

2020-2021.

Date:_____ _____

Signature of the Faculty in Charge

_____

Signature of the Chairman

DAYANANDA SAGAR UNIVERSITY

CERTIFICATE

This is to certify that the Object Oriented Programming Mini-Project report entitled **"TACTICAL RESCUE ANALYSIS SYSTEM"** being submitted by Shylesh Suresh EMG18CS0274 to Department of Computer Science and Engineering, School of Engineering, DayanandaSagar University, Bangalore, for the 5th semester B.Tech C.S.E of this university during the academic year

2020-2021.

Date:_____ _____

Signature of the Faculty in Charge

_____

Signature of the Chairman

DAYANANDA SAGAR UNIVERSITY

CERTIFICATE

This is to certify that the Object Oriented Programming Mini-Project report entitled **"TACTICAL RESCUE ANALYSIS SYSTEM"** being submitted by Shreyansh J V ENG18CS0268 to Department of Computer Science and Engineering, School of Engineering, DayanandaSagar University, Bangalore, for the 5th semester B.Tech C.S.E of this university during the academic year

2020-2021.

Date:_____ _____

Signature of the Faculty in Charge

_____

Signature of the Chairman

DECLARATION

We **Shreyansh JV, Shylesh Suresh, SrishtiRanjan and V.A.S Kiranmayee**students of 5th semester **B.Tech in Computer Science and Engineering, DayanandaSagar University,** Bengaluru, hereby declare that titled **"Tactical rescue analysis system"** submitted to the DayanandaSagar University during the academic year 2020- 2021, is a record of an original work done by me under the guidance of**Prof. Samanth, Associate professor,** Department of computer science engineering, DayanandaSagar University, Bengaluru. This project work is submitted in partial fulfilment for the award of the degree of Bachelor of Technology in Computer Science. The result embodied in this thesis not been submitted to any other university or institute for the award of any degree.

ACKNOWLEDGEMENT

The success and final outcome of this software requirement document required a lot of guidance and assistance from many people and we are extremely privileged to have got this all through the completion of the project. All that we have done is only due to such supervision and assistance and we would not forget to thank them.

We respect and thank our mentor, Professors and the Chairman for providing us an opportunity to do the Software Requirement Document and giving us all support and guidance which made me complete the project duly. We are extremely thankful to him for providing such a nice support and guidance, even though he has busy schedule managing the departmental affairs.

We owe our deep gratitude to our mentor Prof.Samanth**,** who took keen interest on our Software Requirement Document and guided us all along, till the completion of our project work by providing all the necessary information for developing a good system document.

We are thankful to, and fortunate enough to get constant encouragement, support and guidance from all Teaching staffs of the Computer Science Engineering department, which helped us in successfully completing our report. Also, we would like to extend our sincere esteems to all staff in laboratory for their timely support.

Name: Shreyansh JV
(USN): ENG18CS0268

Name: Shylesh Suresh
(USN): ENG18CS0274

Name: SrishtiRanjan
(USN): ENG18CS0284

Name: V A S Kiranmayee
(USN): ENG18CS0304

ABSTRACT

This Iot based device comprises of few sensors to measure environmental parameters which in turn monitor logging system to analyse these parameters. So, this scheme will be conceptualized to build a wireless IoT based station which can measure critical environmental parameters like Temperature, Humidity, Pressure, altitude and concentration of gas.

Our rescue analysis system is ideally used to analyse the situation of our surrounding environment which will assist us to determine the risks of the rescue operation.

Also, since our station is IoT enabled, we can send these parameters to aThingSpeakchannel (IoT cloud) where we can store, analyse and access the data remotely.

We will be using the Arduino board along with DHT11 sensor which is used to monitor temperature and humidity with Arduino, BMP180 sensor to make a complete risk analyser using Arduino, and ESP8266 Wi-Fi module. The DHT11 sensor senses the temperature and humidity, while BMP180 sensor calculates the pressure and ESP8266 is used for internet connectivity. We will also use a MQ2 gas sensor to monitor the concentration of explosive gases.

Sending this information to ThingSpeak enables live monitoring from anywhere around the world and we can also view the logged data which will be stored on their website, plus, graph it over time to analyse it.

Our rescue analysis system is ideally used to analyse the situation of our surrounding environment which will assist us to determine the risk of the rescue operation. By this project we can tackle the first step of the rescue process, i.e. identification of risks by analysing the situation of the surrounding. That would help us determine a suitable course of action and provide information about the situation.

TABLE OF CONTENTS

TABLE OF FIGURES

1. Introduction

When discussing disaster management, the process starts with identification of risks, disaster preparedness, emergency response, resource allocation, reaction planning, and lastly disaster recovery.

Our aim is to develop a rescue analysis system which is ideally used to analyse the situation of our surrounding environment which will further assist us to determine the risk of the rescue operation at the time.

Rescue forces and drones can be deployed quickly in areas deemed unsafe for humans, and are used to guide rescuers collect data, deliver essential supplies or provide communication services.

It also measures the temperature, and the pressure of the area is sent to monitor. Not only that but it also helps rescuers ascertain the person's situation and decide on the best course of action.

1.1 Problem Statement

Common disasters include tornadoes, hurricanes, drought and extreme heat/extreme cold weather. Natural disasters can cause other traumatic events to occur as well, such as floods, landslides and mudslides.

Natural disasters are dictated by natural forces that people have little to no influence over. These are the disasters people learn to prepare for and survive because very little can be done to prevent them.

A disaster is a serious disruption of the functioning of a community or a society involving widespread human, economic or environmental loss and impacts.

It exceeds the ability of the affected community or society to cope using its own resources. It is usually proven difficult to restore what was once lost.

When discussing disaster management, we are well apprised of the fact that the most habitual type of natural disasters are caused by the weather.

During disaster, you face the danger of death or physical injury. You may also lose your home, possessions, and community. Such stressors place you at risk for emotional and physical **health** problems.

Man-made disasters are difficult to predict, however they are preventable. With a little

vigilance, they shouldn't occur in the first place. Events such as gas leaks, oil spills, nuclear meltdowns, and industrial fires transpire through human error and carry grave consequences. Although the world has seen many natural disasters over time, man-made disasters continue to grow, with equally tragic results.

2. Literature Survey

Serial No.	Paper Name	Author Name	Aim of the Paper	Year
1	Disaster Relief and Data Gathering Rover	S. V. V. Srinivas Aditya Kumar Singh, Aman Raj AbhishekShukla Rachit Patel Aviral Malay Department of ECE, ABESIT, Ghaziabad, India	The objective of this work is to provide the concerned authorities with a tool to help them gather data by reconnaissance using the rover and help them to form the strategy for the rescue operation that is cost effective, efficient, fast as well as secure for the rescue workers.	2018
2	Earthquake rescue robot.	Shubham Sarkar AkashPatil Aditya Hartalkar Aditya Wasekar Electrical Engineering, Fr.C. Rodrigues Institute of Technology, Vashi, Navi Mumbai, India	This paper intercepts the need of the hour to efficiently pose a path of saving lives and precious time during an earthquake. Earthquake is accompanied by huge hue and loss, along with accumulation of debris leading to make search operation difficult. This paper suggests the use of rescue robot car for such rescue operation, to determine the people stuck in a particular region.	2017

3. Requirement Analysis

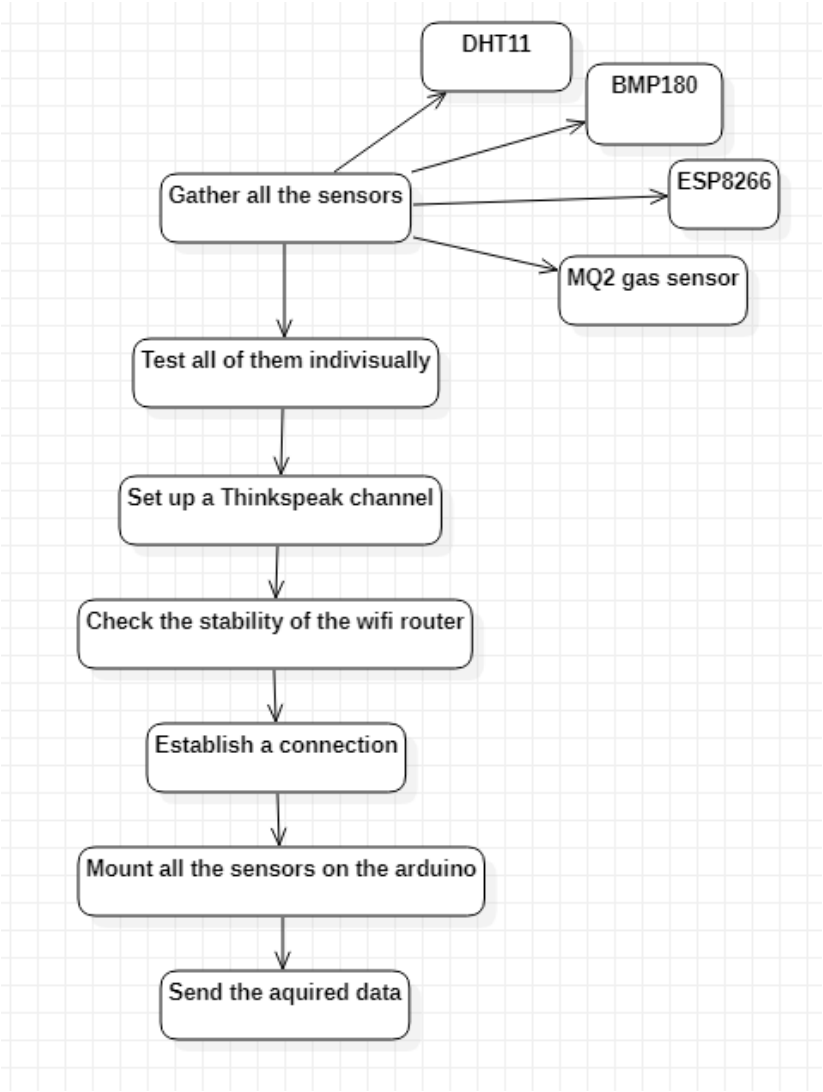


Fig 3.1 Requirement Analysis

4. Design Methods

4.1 Algorithm

- Since our rescue analysis system is IoT enabled, we can send these parameters to a ThingSpeak channel (IoT cloud) where we can store, analyse and access the data remotely.
- Programming part plays a very important role to perform all the operations in a project.
- Start the code by including all the required libraries and defining all the variables.
- After this enter the WiFi name, password of your Wi-Fi router and then also enter the API key that you copied from the ThingSpeak channel.

- We create a function where connects with the Wi-Fi and starts the sensors.
- Using “calculate” function we calculate the temperature, humidity, pressure, altitude and gas concentration using the BMP180, MQ2 and DHT11 sensor.
- Commands are used to connect with ThingSpeak server and then print the temperature, humidity and pressure values in different fields. (In the channel that we create.)

4.2 Architecture Diagram

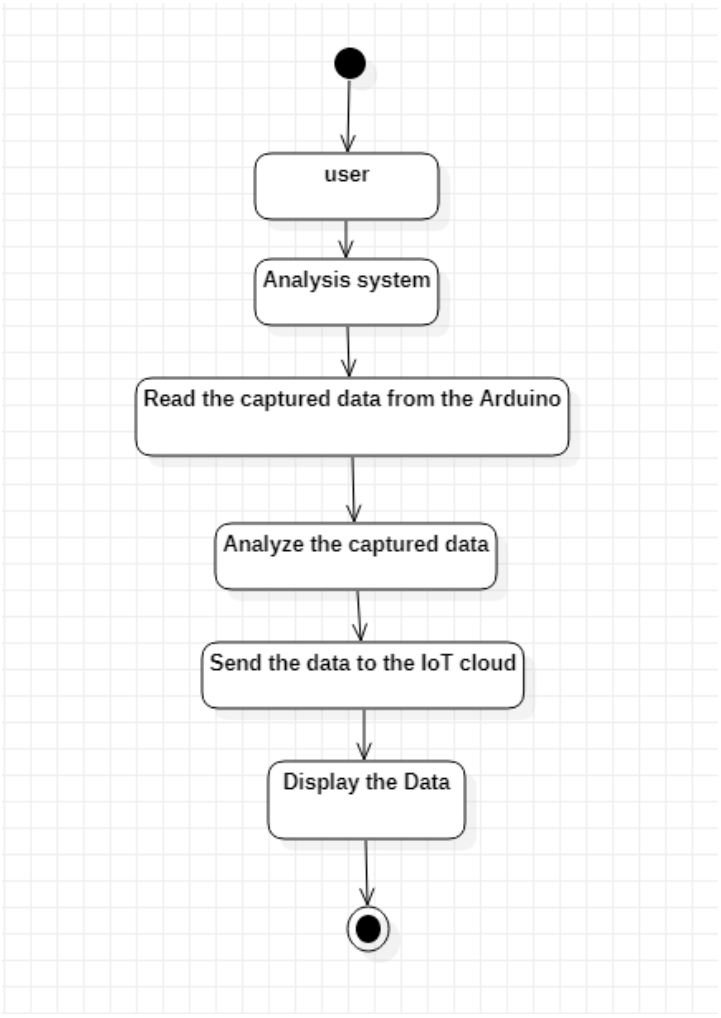


Fig 4.2.1 Flow chart

4.3 Flow chart/ DFD/ UML Diagrams

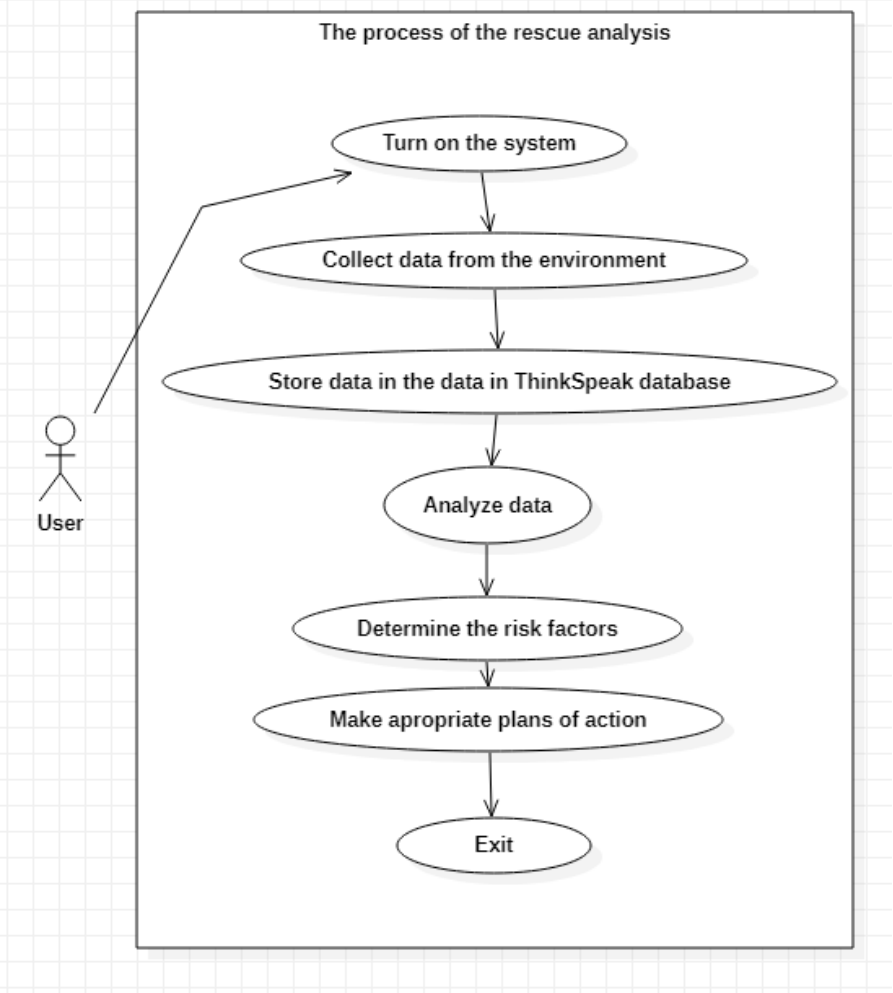


Fig 4.3.1 Use case diagram diagram

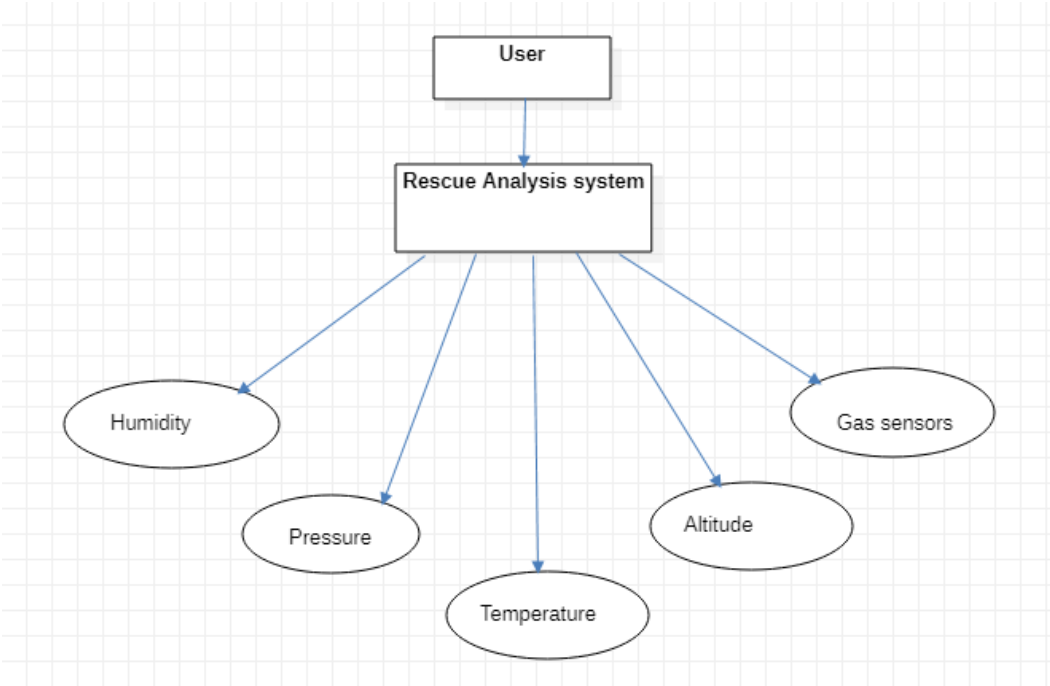


Fig 4.3.2 ER Diagram

5. Project Breakdown

- The process starts with identification of risks, disaster preparedness, emergency response, resources allocation, reaction planning, and lastly disaster recovery.
- Our aim is to develop a rescue analysis system which is ideally used to analyze the situation of our surrounding environment which will further assist us to determine the risk of the rescue operation at the time.

➢ **Module 1:**Environment assessment

- As the very first step suggests, identification of the risk, our analysis system will first begin to analyze the external conditions like temperature, pressure, and humidity.
- So, after analyzing these basic environmental conditions, our analysis system further decides on how to get a better approach on the given circumstances of the situation.

➢ **Module 2:**Collecting data

- As our analysis system follows up on the given conditions, we will further determine the case much more effectively by collecting the data and keeping a record of the on-going situation which will in turn be stored in our thingspeak channel.

➢ **Module 3:**Analyzing the collected data

This is our crucial step of the project where we observe and analyse the recorded data on thingspeak channel, which will help us determine the risk factors involved in our situation.

➢ **Module 4:**Determining the risk factor

- So, once the data is analyzed carefully, our rescue team decides the extremities of the risk, with the help of other functional requirements used in our project like a camera which will be mounted on our analysis system and help us in visually monitoring the situation.
- We also have a MQ2 gas sensor, which will determine the presence of inflammable gas leaks.
- Our switches will also play a crucial part in assisting the rescue teams aid the person in danger by simply sending out a message through the switches, which will send the signal to the other crew members of the rescue teams.

➢ **Module 5:**Execution and personal aid

At the final stage, the rescue team chooses an appropriate plan of action considering the risk factors involved in the rescue operation.

6. Implementation

Lets see how the code was implemented.

PART 1: Inclusion of all the libraries and declaration of globl variables.

```
#include <SoftwareSerial.h>
#include <dht11.h>
#include <Wire.h>
#include <Adafruit_BMP085.h>

float pressure = 0.0;
floataltitudee = 0.0;
Adafruit_BMP085 bmp;
#define RX 2
#define TX 3
#define dht_apin 11
dht11dhtObject;
String AP = "HiraChak";       // WIFI NAME
String PASS = "SnehLata79"; // WIFI PASSWORD
String API = "4V8TGO5TT855YACW";   // Write API KEY
String HOST = "api.thingspeak.com";
String PORT = "80";
intcountTrueCommand;
intcountTimeCommand;
boolean found = false;
intvalSensor = 1;
int buzzer = 10;
int smokeA0 = A1;
intsensorThres = 400;
SoftwareSerialesp8266(RX,TX);
String pressureread();
String altituderead();
```

PART 2: Defining the setup() and loop() functions.

```
void setup() {
```

```
Serial.begin(9600);
esp8266.begin(115200);
bmp.begin(9600);
sendCommand("AT",5,"OK");
sendCommand("AT+CWMODE=1",5,"OK");
sendCommand("AT+CWJAP=\""+ AP +"\",\""+ PASS +"\"",20,"OK");
}
void loop() {
 String getData = "GET /update?api_key="+ API + "&field1=" + getTemperatureValue() +
"&field2="+getHumidityValue()+"&field3="+getGasdata()+"&field4="+
pressureread()+"&field5="+altituderead();
sendCommand("AT+CIPMUX=1",5,"OK");
sendCommand("AT+CIPSTART=0,\"TCP\",\""+ HOST +"\","+ PORT,15,"OK");
sendCommand("AT+CIPSEND=0," +String(getData.length()+4),4,">");
esp8266.println(getData);delay(1500);
countTrueCommand++;
sendCommand("AT+CIPCLOSE=0",5,"OK");
}
```

PART 3: Defining indivisual functions to collect data from all the sensors and return them to the loop.

```
String getTemperatureValue()
{
dhtObject.read(dht_apin);
Serial.print(" Temperature(C)= ");
int temp = dhtObject.temperature;
Serial.println(temp);
delay(50);
return String(temp);
}

String getHumidityValue()
{
dhtObject.read(dht_apin);
```

```
Serial.print(" Humidity in %= ");
int humidity = dhtObject.humidity;
Serial.println(humidity);
delay(50);
return String(humidity);
}

String getGasdata()
{
pinMode(buzzer, OUTPUT);
pinMode(smokeA0, INPUT);
Serial.begin(9600);
intanalogSensor = analogRead(smokeA0);
Serial.print("Gas sensor: ");
Serial.println(analogSensor);
if (analogSensor>sensorThres)
  {
tone(buzzer, 1000, 200);
return String(analogSensor);
  }
else
  {
noTone(buzzer);
return String(analogSensor);
  }
Serial.println(analogSensor);
delay(100);
}

String pressureread()
{
pressure = bmp.readPressure() / 100.0;
```

```
Serial.print("Pressure = ");
Serial.print(pressure / 100.0);
Serial.println(" hPa");
return String(pressure);
}

String altituderead()
{
altitudee = bmp.readAltitude();
Serial.print("Altitude = ");
Serial.print(altitudee);
Serial.println(" meters");
return String(altitudee);
}
```

7. Testing

During the testing phase of our project, we tested each of the sensors indivisually. Then sent the data to invisual think speak channel. The serial monior in Arduino served as a base to witness all the data being captured. The data for each sensor was recrded and analysed.

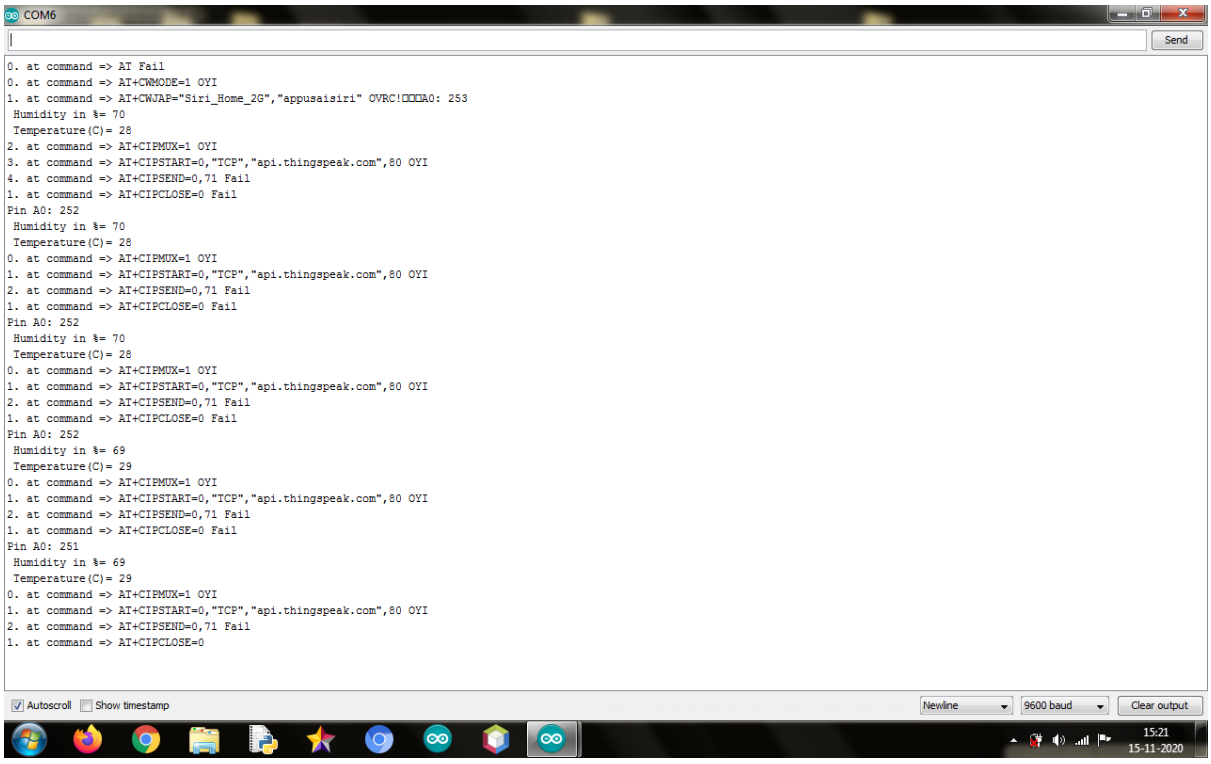


Fig 7.1 Testing results for Temperature, Humidity and Gas concentration

```
0. at command => AT+CIPMUX=1 OYI
1. at command => AT+CIPSTART=0,"TCP","api.thingspeak.com",80 OYI
2. at command => AT+CIPSEND=0,99 Fail
1. at command => AT+CIPCLOSE=0 Fail
Altitude = 30367.23 meters
Pressure = 0.02 hPa
Gas sensor: 176
 Humidity in %= 71
 Temperature(C)= 24
0. at command => AT+CIPMUX=1 OYI
1. at command => AT+CIPSTART=0,"TCP","api.thingspeak.com",80 OYI
2. at command => AT+CIPSEND=0,99 OYI
4. at command => AT+CIPCLOSE=0 OYI
Altitude = 30367.23 meters
Pressure = 0.02 hPa
Gas sensor: 176
 Humidity in %= 71
 Temperature(C)= 24
5. at command => AT+CIPMUX=1 OYI
6. at command => AT+CIPSTART=0,"TCP","api.thingspeak.com",80 OYI
7. at command => AT+CIPSEND=0,99 Fail
```

Fig 7.2 Testing results for all the sensors

8. Results/Output Screenshots

The result is nothing but the visualization of the collected data. As shown below, There is a visual representation for all the attributes present in our project, such as temperature, pressure, humidity, altitude and gas sensors. The collected data from the sensors are sent to the arduino which uses the ESP8266 wifi module to send the data to the thinkspeak channel, where the inbuilt MATLAB featured visualize the received data. This way we can observe the anomalities in the surrounding environment and determine the risk factors.

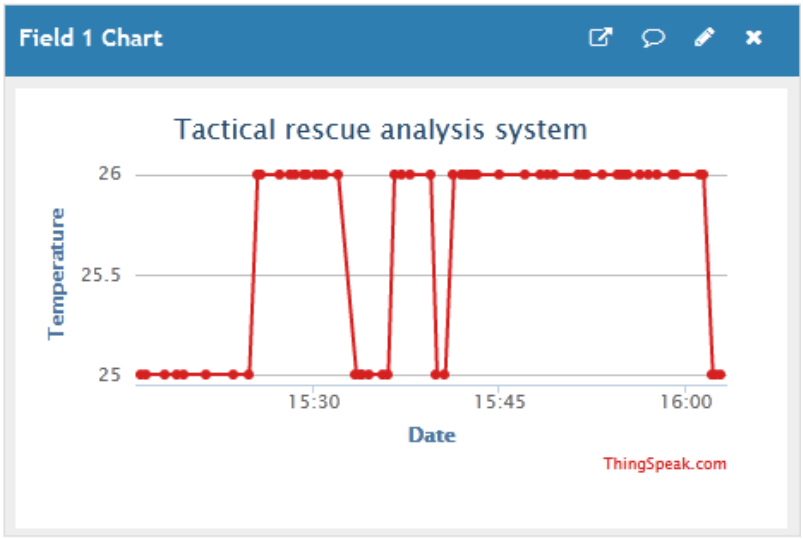


Fig 8.1 Temperature graph

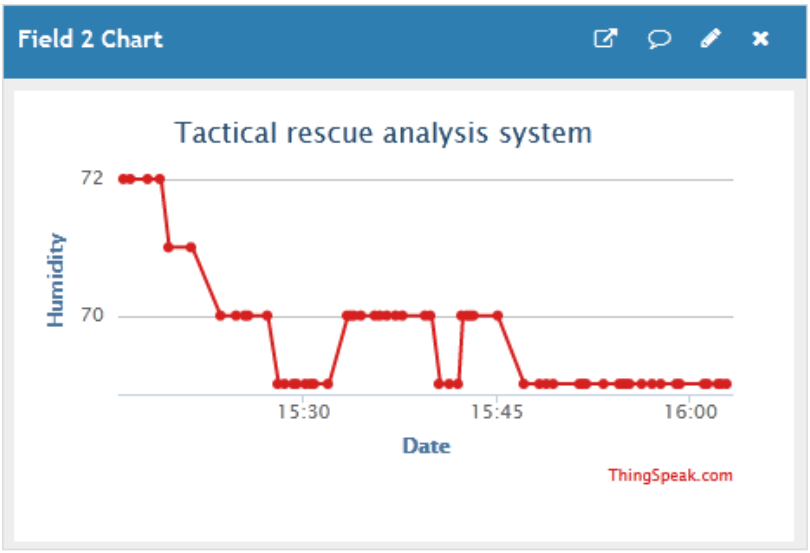


Fig 8.2 Humidity Graph

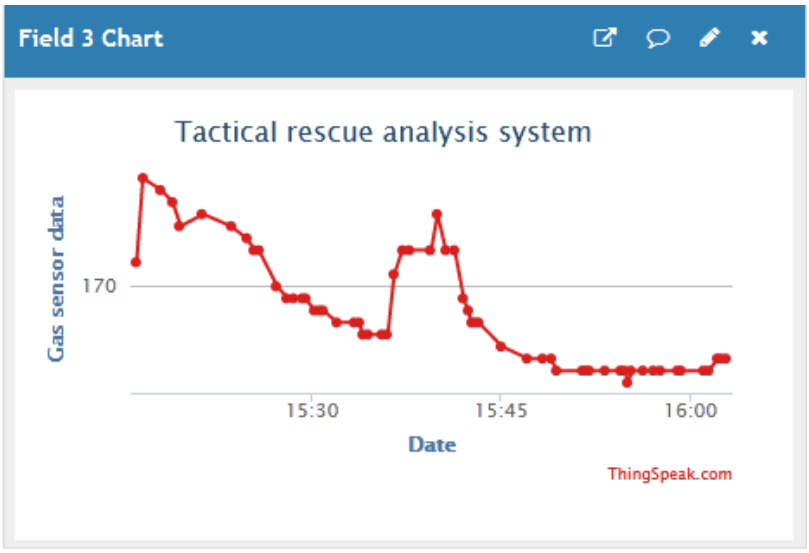


Fig 8.3 Concentration of gas graph

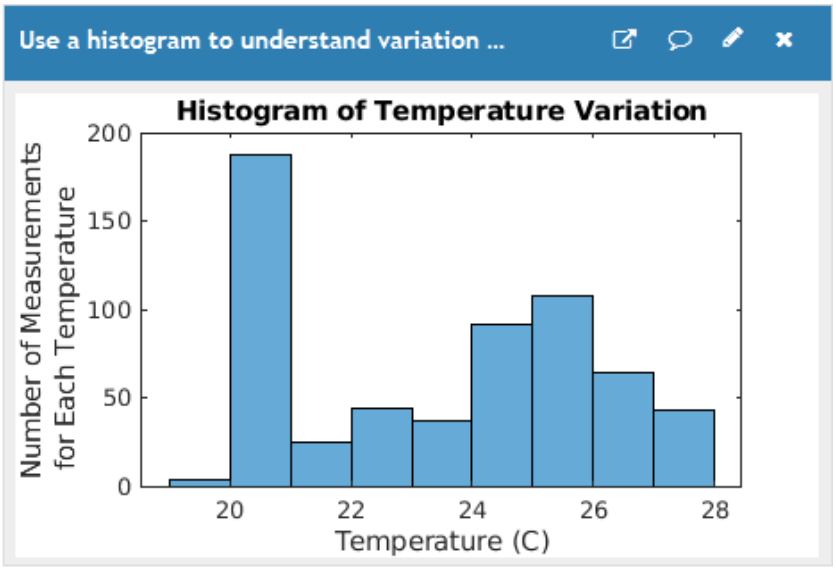


Fig 8.4 Histogram of temperature

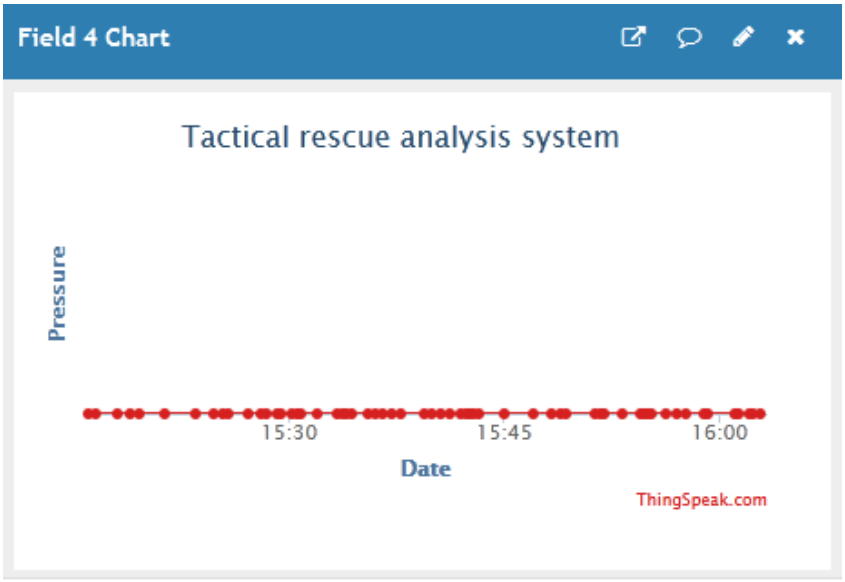


Fig 8.5 Pressure graph

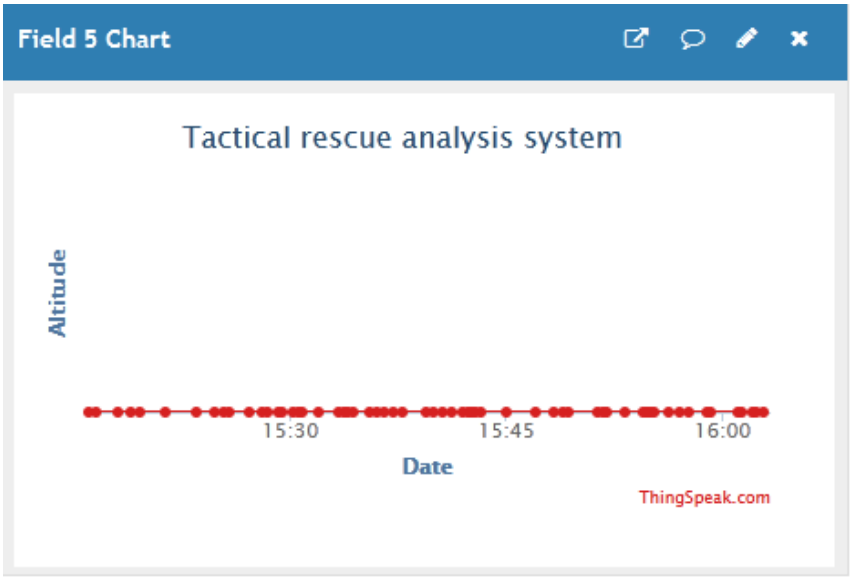


Fig 8.6 Altitude graph

9. Prototype

The rescue analysis system is a prototype that has limited features. The sensors and the wifi module's has a rather small range. We have built a working prototype of the analysis system and the picture is shown below.

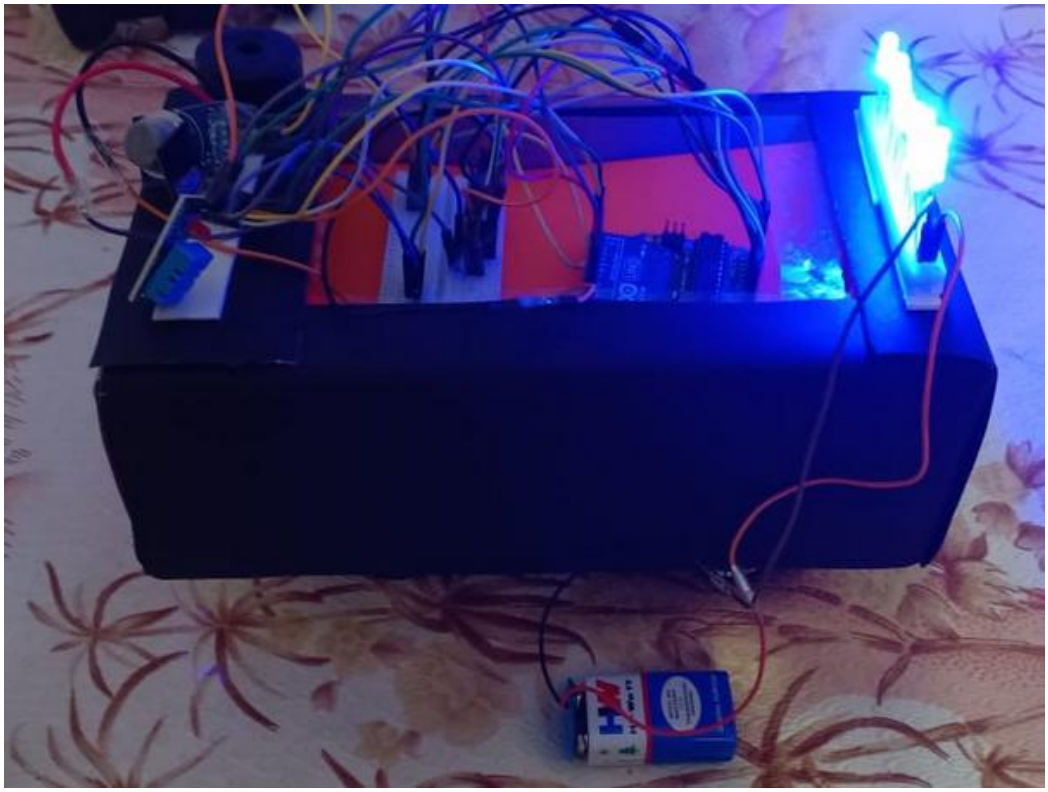


Fig 9.1 Rover prototype

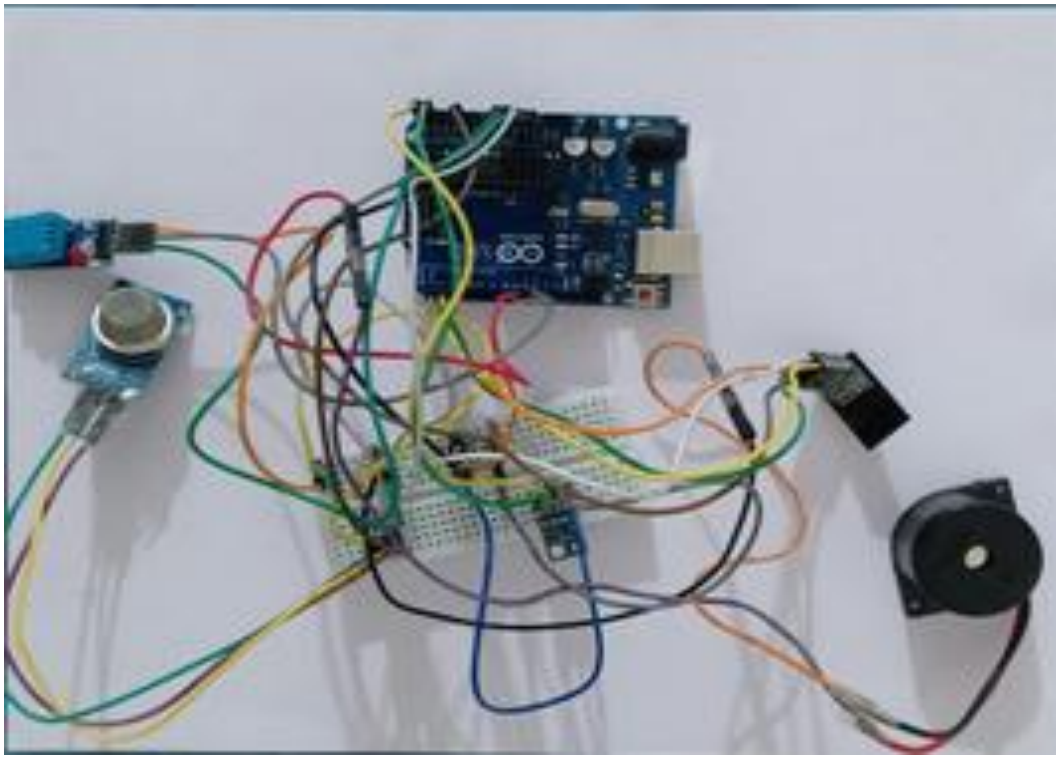


Fig 9.2 Arduino connection

Fig 9.3 Rover with lights

10. Conclusion and Future work

- The objective of our project was to detect extremities in the temperature and humidity levels, it also contributed to monitor the presence of harmful gas leaks or explosive gases. Through which our rescue teams could identify and analyze data from our thingspeak channel.
- We demonstrate the collected data in the form of graphs which is visually accessible since it forms a live graph. It helps us in learn about the environmental conditions and predict unforeseen events.
- The objective of our project was to detect extremities in the temperature and humidity levels, it also contributed to monitor the presence of harmful gas leaks or explosive gases. Through which our rescue teams could identify and analyze data from our thingspeak channel.
- We demonstrate the collected data in the form of graphs which is visually accessible since it forms a live graph. It helps us in learn about the environmental conditions and predict unforeseen events.
- One can implement a few more sensors and connect it to the satellite as a global feature of this system.
- Adding more sensor to monitor other environmental parameters such as CO2 and Oxygen Sensor. In aircraft, navigation and military there is a great scope of this real-time system.
- It can also be implemented in hospitals or medical institutes for the research & study in "Effect of Weather on Health and Diseases", hence, to provide better precaution alerts.
- We can even use Big data analytics to analyze and compare the collected data so we can predict the upcoming disasters based on the abnormalities.

References

The References for this project from IEEE Papers

Paper: Earthquake rescue robot.

Year: 2017

Authors:

- Shubham Sarkar, Electrical Engineering, Fr.C. Rodrigues Institute of Technology, Vashi, Navi Mumbai, India
- AkashPatil, Electronics and Telecommunication Engineering, Fr.C. Rodrigues Institute of Technology, Vashi, Navi Mumbai, India
- Aditya Hartalkar, Electronics and Telecommunication Engineering, Fr.C. Rodrigues Institute of Technology, Vashi, Navi Mumbai, India
- Aditya Wasekar, Electronics Engineering, Vidyalankar Institute of Technology, Mumbai, India

Paper: Design and development of a low cost search and rescue robot.

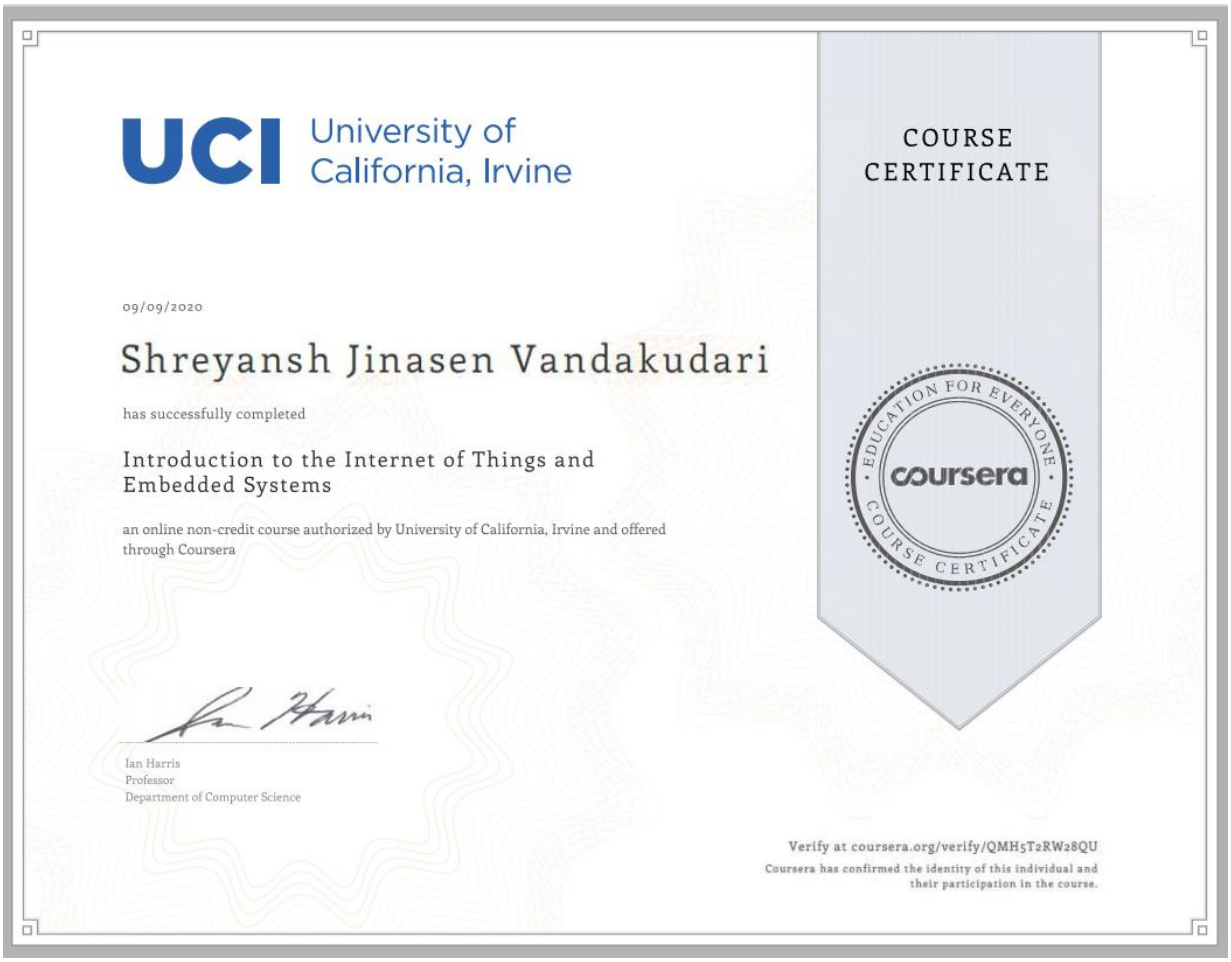
Year: 2019

Authors:

- AhalyaRavendran, School of Manufacturing Systems and Mechanical Engineering, Thammasat University, PathumThani, Thailand
- PoomPonpai, School of Manufacturing Systems and Mechanical Engineering, Thammasat University, PathumThani, Thailand
- ParinthornYodvanich, School of Manufacturing Systems and Mechanical Engineering, Thammasat University, PathumThani, Thailand
- WimonsiriFaichokchai, School of Manufacturing Systems and Mechanical Engineering, Thammasat University, PathumThani, Thailand
- Chung-Hao Hsu, School of Manufacturing Systems and Mechanical Engineering, Thammasat University, PathumThani, Thailand

MOOC Certificates

ENG18CS0268-Shreyansh JV



UCI University of California, Irvine

COURSE CERTIFICATE

09/09/2020

Shreyansh Jinasen Vandakudari

has successfully completed

Introduction to the Internet of Things and Embedded Systems

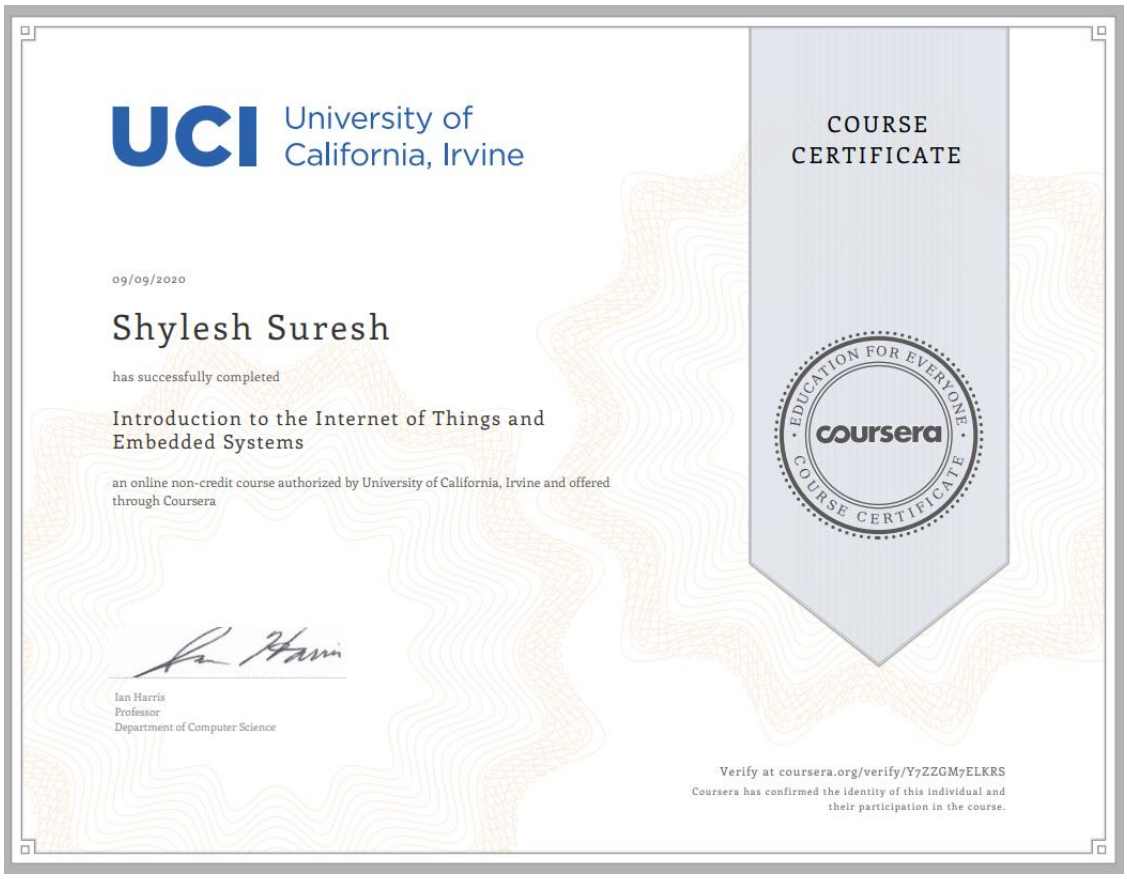
an online non-credit course authorized by University of California, Irvine and offered through Coursera

EDUCATION FOR EVERYONE · coursera · COURSE CERTIFICATE

Ian Harris
Professor
Department of Computer Science

Verify at coursera.org/verify/QMH5T2RW28QU
Coursera has confirmed the identity of this individual and their participation in the course.

ENG18CS0274-Shylesh S



UCI University of California, Irvine

COURSE CERTIFICATE

09/09/2020

Shylesh Suresh

has successfully completed

Introduction to the Internet of Things and Embedded Systems

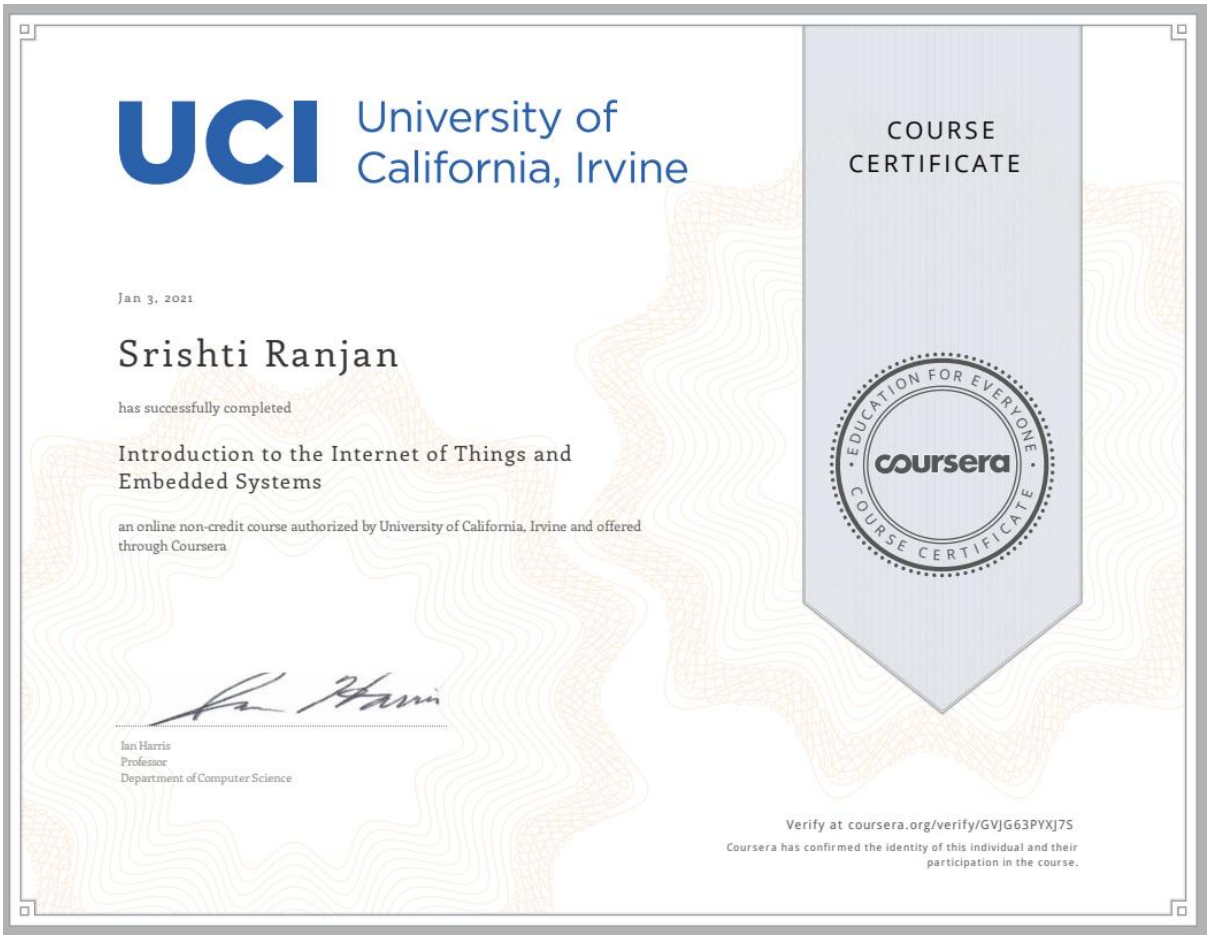
an online non-credit course authorized by University of California, Irvine and offered through Coursera

EDUCATION FOR EVERYONE · coursera · COURSE CERTIFICATE

Ian Harris
Professor
Department of Computer Science

Verify at coursera.org/verify/Y7ZZGM7ELKRS
Coursera has confirmed the identity of this individual and their participation in the course.

ENG18CS0284-Srishti Ranjan



UCI University of California, Irvine

COURSE CERTIFICATE

Jan 3, 2021

Srishti Ranjan

has successfully completed

Introduction to the Internet of Things and Embedded Systems

an online non-credit course authorized by University of California, Irvine and offered through Coursera

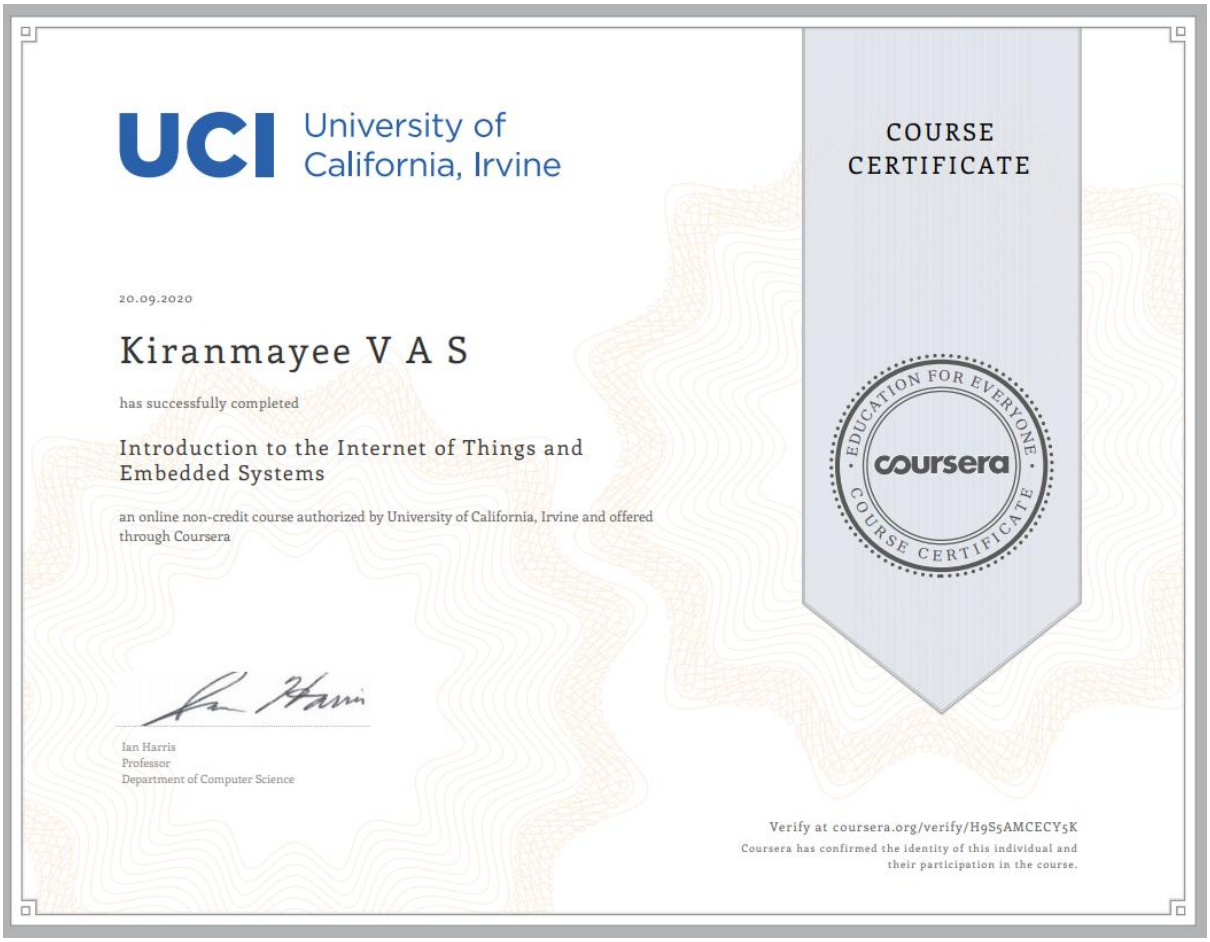
Ian Harris
Professor
Department of Computer Science

EDUCATION FOR EVERYONE · coursera · COURSE CERTIFICATE

Verify at coursera.org/verify/GVJG63PYXJ7S

Coursera has confirmed the identity of this individual and their participation in the course.

ENG18CS304-VAS Kiranmayee



UCI University of California, Irvine

COURSE CERTIFICATE

20.09.2020

Kiranmayee V A S

has successfully completed

Introduction to the Internet of Things and Embedded Systems

an online non-credit course authorized by University of California, Irvine and offered through Coursera

EDUCATION FOR EVERYONE · coursera · COURSE CERTIFICATE

Ian Harris
Professor
Department of Computer Science

Verify at coursera.org/verify/H9S5AMCECY5K
Coursera has confirmed the identity of this individual and their participation in the course.