Mid Term Report

by Ninni Singh

Submission date: 08-Apr-2020 11:53AM (UTC+0530)
Submission ID: 1292569048
File name: Mid_term_report_1.docx (1.35M)
Word count: 3624
Character count: 18175

IOT Based Alert Generator for Mining workers

A Project Report

Submitted in Partial Fulfillment of the Requirements

for the Course of

Minor Project - II

In

Third year – Sixth Semester of

Bachelor of Technology, Computer Science

specialization

In

E-Commerce, Retail and Automation

Under the Guidance of

Ms. Ninni singh

By

500055050	**R114216021**	**Shivang Raj**
500063395	**R114217005**	**Nitish Kumar**

DEPARTMENT OF INFORMATICS

SCHOOL OF COMPUTER SCIENCE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES, BIDHOLI,
DEHRADUN, UTTRAKHAND, INDIA, Jan, 2020.

CANDIDATE'S DECLARATION

I/We hereby certify that the project work entitled **"IOT Based Alert Generator For Mining Workers"** in partial fulfilment of the requirements for the award of the Degree of BACHELOR OF TECHNOLOGY in COMPUTER SCIENCE AND ENGINEERING with specialization in e-commerce and retail automation and submitted to the School of Computer Science, Department of Informatics, University of Petroleum & Energy Studies, Dehradun, is an authentic record of my/ our work carried out during a period from **January,2020** to **May**, **2020** under the supervision of **Ms. NINNI SINGH, Assistant Professor**.

The matter presented in this project has not been submitted by me/ us for the award of any other degree of this or any other University.

Shivang Raj	**Nitish kumar**
R114216021	**R114217005**

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Date: _____2020

(Ms. NINNI SINGH)
Project Guide

Dr. T.P Singh
HOD - Informatics
School of Computer Science
University of Petroleum & Energy Studies
Dehradun – 248001 (Uttarakhand)

Contents

Page Number

ACKNOWLEDGEMENT

We wish to express our deep gratitude to our guide **Ms. Ninni Singh**, for all advice, encouragement and constant support he has given us through out our project work. This work would not have been possible without his support and valuable suggestions.

We sincerely thank to respected **Dr. T.P Singh(HOD)**, for his great support in doing our project in **IOT Based Alert Generator For Mining Workers (in IOT)** at **SoCS**.

We are also grateful to **Mr. Manish Prateek(Dean)** CoES, UPES for giving us the necessary facilities to carry out our project work successfully.

We would like to thank all our **friends** for their help and constructive criticism during our project work. Finally we have no words to express our sincere gratitude to our **parents** who have shown us this world and for every support they have given us.

Name	**Shivang Raj**	**Nitish Kumar**
Roll No.	**R114216021**	**R114217005**

Mid Semester – Report (2020-21)

Project Title

IOT Based Alert Generator for Mining Workers

ABSTRACT

This project focuses on a hazardous gases area supervising system. Our project aims at developing real-time surveillance with early-warning intelligence on harmful gases, temperature, humidity. All these parameters are detected continuously by temperature sensor, carbon monoxide, gas sensor, humidity sensor and if they cross the pre-defined limit, then the user gets alert as the buzzer will automatically turn on with LED indications.

Keywords: IOT, Sensors, Buzzer, Embedded C Language, DHT11, MQ135, MQ2, Arduino Uno, LCD Display.

LIST OF FIGURES **Page Number**

INTRODUCTION

The most important part of any type of industry is safety. In the hazardous gases area like mining industry safety and security is a first aspect of all. To avoid any types of unwanted conditions, every mining industry follows some basic precaution. Communication is the most vital key factor today, to monitor different parameters such as temperature, increasing humidity level and carbon monoxide gas continuously using sensors such as DHT11(is a basic, ultra low cost digital temperature and humidity sensor), gas sensor CO(Carbon Monoxide Detector) sensor MQ2 (MQ-2 can detect CO-gas concentrations anywhere) to avoid any types of hazardous conditions and gives an alert using buzzer.[1] To achieve safety in underground mines, a suitable communication system must be created between workers, moving in the mine, and a fixed base station. The wired communication network technology system will be not so effective. Under the mines due to uncomfortable situation the installation cost as well as maintenance cost is high for wired communication networks. A cost effective based wireless mine supervising system with early-warning security system on LPG, carbon monoxide, temperature and humidity in hazardous gases area is proposed.In this project we are going to make an IOT Based Alert Generator for mining workers in which we will monitor the Air Quality [2]over a webserver using internet and will trigger a alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases are present in the air like CO2, smoke, alcohol, benzene and NH3. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily.We have used MQ135 sensor which is the best choice for monitoring Air Quality as it can detects most harmful gases and can measure their amount accurately. In this IOT project, you can monitor the pollution level from anywhere using your computer or mobile.

PROBLEM STATEMENT

Our aim is to design a IOT Based Alert Generator Device for workers working in mining industries. Miners working at field are exposed to different hazardous gases. This is very harmful for their health. So There is a need to design a system to warn them when level of gases parameters are not good for their health.

LITERATURE REVIEW

A paper, "Existing System" focuses on the intelligent system for hazardous gas detection with emergency alarm. It is monitored microcontroller. A signal is generated and message is sent to the licensed user as an alerting system to help in faster reduction of the critical situation. It mainly focuses on devious monitoring composition of wireless sensor network. This inquiry focuses on decision making about safety improvements only in restricted areas of mines and hence it shall be unaffordable in monitoring drainage systems where the whole atmosphere differs huge. Since the modeling of WSN is based on ambient intelligence the monitoring agent should be a skilled person to maintain the system with flexibility. "In the Existing System, It is proposed" a paper proposed a concept of using a drifting sensors for the purpose of monitoring sewer gas, temperature. Sewer Snort dispensers are executed at strategic areas by analyzing the sewer map and inspection demands. The dispensing schedule is framed based on the applications. Once it is deployed, there is a need to track its position. This system operates with the construction of pipe profile.

Jagadeesh R, Dr. R. Nagaraja,et al., "IoT based Smart Helmet for unsafe event detection for mining industry" A classic model of the smart helmet has been developed for the mining industry in order to detect hazardous events in the mining environment. The developed prototype is able to sense the quality of air, humidity, removing the helmet by miner, and crash of an object on head. The air quality is determined by the saturation level of the dangerous gas such as carbon monoxide. The removal of helmet by miner is also considered as one of the unsafe event and it is detected by using Infrared (IR) sensor. The crash of an object on head is determined using pressure sensor. **[1]** According to head and neck injury criteria, if the force excreted on head exceeds 34 psi, it is considered to be a hazardous. Implementation consists of two modules- the helmet module and reporting (or monitoring) module. The helmet module includes ARM7 microcontroller in conjunction with various sensors and ZigBee, while reporting module includes ZigBee at the

receiving end and raspberry pi controller. An automated e-mail alert generation system is also developed in a reporting module of proposed system, it generates and delivers an automated alert email to authorized personnel, if a miner has experienced hazardous event.

M. Naveenraj, P. Ashwin Kumar, R. Vignesh, K. Iniyan, M. Sri Krishna Prasath, et al., "IOT Based Smart Helmet For Unsafe Event Detection For Mining Industry" A classic model of the project is to detect hazardous events in the mining environment by using the smart helmet, which has been developed for the mining industry . **[2]** The developed prototype is highly used to prevent miner from hazardous situation. In mining industries, it can be able to indicate the information from the loss of air, humidity, removing the helmet by miner and crashing on head by any objects. The air condition is detected by carbon monoxide which is a dangerous gas, it can be determined by the saturation level. The removal of helmet is monitored by using Infrared (IR) sensor and it is an unsafe for miners. The input module consists of ARM7 microcontroller, various sensors and ZigBee. The output module consists of ZigBee and raspberry pi controller. In output module, an automated e-mail alert is generated by the system and is delivered to the authorized personnel, if a miner has experienced any hazardous event.

G. Ravi Kumar & B. Keerthi Reddy, et al., "Internet of Things Based an Intelligent Helmet For Wireless Sensor Network" The main aim of the paper is to develop a smart helmet for mining industry workers. The problem addressed in this paper was the improvement of a mining helmet in order to ensure more safety awareness between miners.**[3]** When working with noisy equipment, being aware of one's surroundings can sometimes be challenging. In the mining trade miners tend to get rid of their safety gear because the gear is too significant, heat or uncomfortable to work with. So, this system is developed to intimate the authorities in critical conditions. To overcome the above problem, we are developing a smart helmet for mining industry workers. Firstly, to identify the worker, each worker will be having different tag. Once the tag is identified, person's data will be sent to the PC through ZIGBEE. In order to check whether the worker has been using the helmet or not, IR sensors are used to check the helmet presence. The surrounding hazardous gases will be detected by the gas sensor present in the helmet. When gas is detected voice notification will be given through speaker. By the use of MEMS sensor, the head injuries occurrence will be identified. All the data related to sensors will be posted into the PC through ZIGBEE transceiver.

Shruti P. Borkar, V. B. Baru, et al., "IoT Based Smart Helmet for Underground Mines" A mining helmet is developed that is able to detect different types of hazardous events such as, humidity

condition of mines, then temperature and existence of combustible gases, the helmet removing by miner, and light intensity inside the mines. **[4]** Heart of the system is Raspberry pi 3 who control and monitor the all these events using IOT. This system is displaying the parameters on the base station PC and alerting miner, from base station higher authority can monitor every thigh, which can provide rescue operation for the miner.

Twentyman, J. et al.," Wearable devices aim to reduce workplace accidents" A mining helmet used to monitors the worker's health (breath, heart rate) from a remote location and in the case of some accident they provide the rescue operation. The proposed**[5]** methodology is focusing on providing rescue operations. The proposed methodology claims to examine the real-time health analysis of workers in extreme environmental conditions and generating an alert when the worker's health is not supporting his duty.

Babburi Santhoshi, Santhosh B Panjagal, Balakrishna Masanam, et al. "Design and Development of Smart Rescue System for Workers in Land Mines through Wireless Sensor Networks and IoT" The objective of this paper is to develop a wireless networked embedded system to monitor the health conditions of the worker in underground land mining, for providing immediate rescue in case of **[6]**emergency. This system also provides the working Zone of the miner to speed up the rescue operation under emergency situations like landslides, equipment failure etc. and also monitor the emission of the marsh gases like methane and carbon monoxide and also monitor the temperature of the mining environment. The land miner is continuously monitored by using heartbeat sensor and fall detection techniques to provide him emergency rescue if needed. Emission parameter like CH4, CO etc. is continuously monitored by using Gas sensors, temperature monitored by temperature sensor and these values are sent to the database using ZigBee module.

OBJECTIVE

IOT Based Alert Generator for Mining Workers

Sub Objective 1: Our project aims at developing real-time surveillance with early warning intelligence on harmful gases, temperature, humidity which Minimize Health Risks of Workers Within Mining Industry.

Sub Objective 2 : All these parameters are detected continuously by temperature sensor, carbon monoxide, gas sensor, humidity sensor and if they cross the pre-defined limit, then the user gets

alert as the buzzer will automatically turn on with LED indications.Our project involves implementation of Wi-Fi module and add-on of heartbeat sensor.

METHODOLOGY

This project follows "**Prototype Model**" approach to design the helmet which a prototype is built, test, and then reworked when needed until an acceptable prototype is achieved. It also creates a base to produce the final system

Phase 1: **Requirement Analysis**

In this system we have used RF which has two parts Transmitter and Receiver. In the Transmitting part we have all the sensor attached such as Temperature & Humidity, DHT11. MQ135 gas sensor has high sensitivity to Ammonia, Sulfide and Benze steam, also sensitive to smoke and other harmful gases. It is with low cost and particularly suitable for Air quality monitoring application. All these parameter are detected continuously by DHT11, MQ135 sensors and if they crosses predefined limit then user get alert as a buzzer automatically turn on with LED indications.

DHT11 TEMPERATURE AND HUMIDITY SENSOR

The DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data.

Figure 1(DTH11 Sensor)

Technical Details

- Low cost

- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 20-80% humidity readings with 5% accuracy
- Good for 0-50°C temperature readings ±2°C accuracy
- No more than 1 Hz sampling rate (once every second)
- Body size 15.5mm x 12mm x 5.5mm
- 4 pins with 0.1" spacing

Hardware Connections

DTH11 To Arduino

- Vcc --- 5v
- GND --- GND
- Data Pin --- DIGITAL PIN of Arduino

Arduino:

A microcontroller board, contains on-board power supply, USB port to communicate with PC, and an Atmel microcontroller chip.

It simplifies the process of creating any control system by providing the standard board that can be programmed and connected to the system without the need to any sophisticated PCB design and implementation.

It is an open source hardware, anyone can get the details of its design and modify it or make his own one himself.

Micro-Controller:

It is a micro-computer. As any computer it has internal CPU, RAM, IOs interface. It is used for control purposes, and for data analysis.

Famous microcontroller manufacturers are MicroChip, Atmel, Intel, Analog devices, and more.

Arduino board:

Figure 2(Arduino Board)

Gas Sensor:

This sensor module utilizes an MQ-135 as the sensitive component and has a protection resistor and an adjustable resistor on board. The MQ-135 gas sensor is highly sensitive to Carbon mono oxide, iso-butane, propane and less sensitive to alcohol, cooking fume and cigarette smoke. It could be used in gas leakage detecting equipment's in family and industry. The resistance of the sensitive component changes as the concentration of the target gas changes.

Hardware requirement :

- 5v Power Supply
- Microcontrollers
- Humidity and Temperature Sensor
- Carbon Monoxide Sensor
- LCD 20x4
- Buzzer

Software Requirement :

- Arduino IDE 1.8.6
- Embedded C language

Phase 2: **Designing and Development**

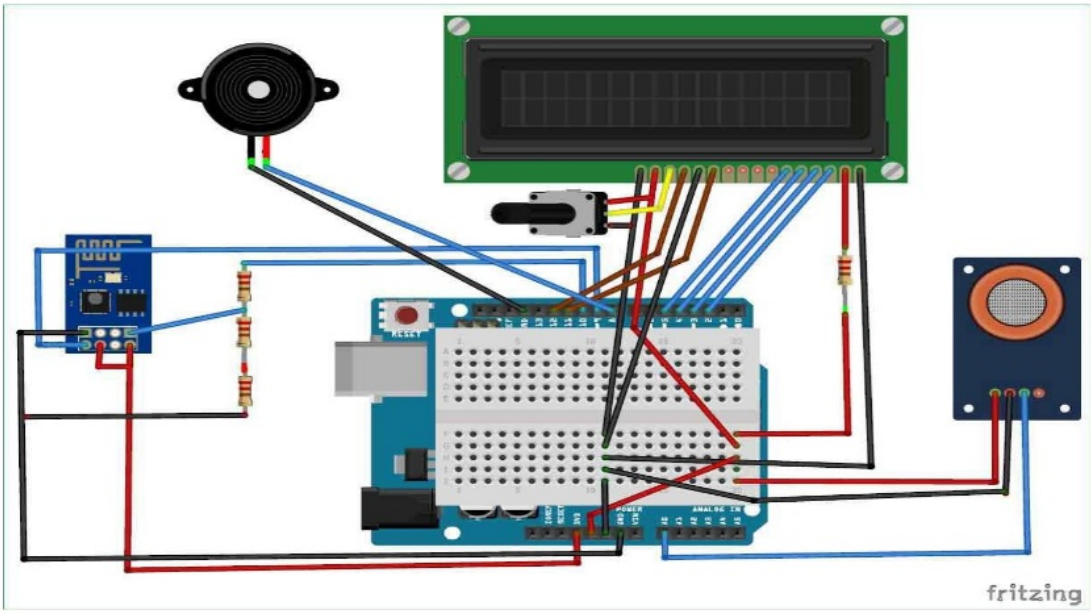


Figure 3 Circuit Designing

First of all we will connect the **ESP8266 with the Arduino**. ESP8266 runs on 3.3V and if you will give it 5V from the Arduino then it won't work properly and it may get damage. Connect the VCC and the CH_PD to the 3.3V pin of Arduino. The RX pin of ESP8266 works on 3.3V and it will not communicate with the Arduino when we will connect it directly to the Arduino. So, we will have to make a voltage divider for it which will convert the 5V into 3.3V. This can be done by connecting three resistors in series like we did in the circuit. Connect the TX pin of u8the ESP8266 to the pin 10 of the Arduino and the RX pin of the esp8266 to the pin 9 of Arduino through the resistors.

ESP8266 Wi-Fi module gives your projects **access to Wi-Fi or internet**. It is a very cheap device and make your projects very powerful. It can communicate with any microcontroller and it is the most leading devices in the IOT platform. Then we will connect the **MQ135 sensor with the Arduino**. Connect the VCC and the ground pin of the sensor to the 5V and ground of the Arduino and the Analog pin of sensor to the A0 of the Arduino. Connect a buzzer to the pin 8 of the Arduino which will start to beep when the condition becomes true. In last, we will connect LCD with the Arduino. The connections of the LCD are as follows

- Connect pin 1 (VEE) to the ground.
- Connect pin 2 (VDD or VCC) to the 5V.

- Connect pin 3 (V0) to the middle pin of the 10K potentiometer and connect the other two ends of the potentiometer to the VCC and the GND. The potentiometer is used to control the screen contrast of the LCD. Potentiometer of values other than 10K will work too.
- Connect pin 4 (RS) to the pin 12 of the Arduino.
- Connect pin 5 (Read/Write) to the ground of Arduino. This pin is not often used so we will connect it to the ground.
- Connect pin 6 (E) to the pin 11 of the Arduino. The RS and E pin are the control pins which are used to send data and characters.
- The following four pins are data pins which are used to communicate with the Arduino.
- Connect pin 11 (D4) to pin 5 of Arduino. Connect pin 12 (D5) to pin 4 of Arduino. Connect pin 13 (D6) to pin 3 of Arduino. Connect pin 14 (D7) to pin 2 of Arduino.
- Connect pin 15 to the VCC through the 220 ohm resistor. The resistor will be used to set the back light brightness. Larger values will make the back light much more darker.
- Connect pin 16 to the Ground.

WORKING EXPLANATION

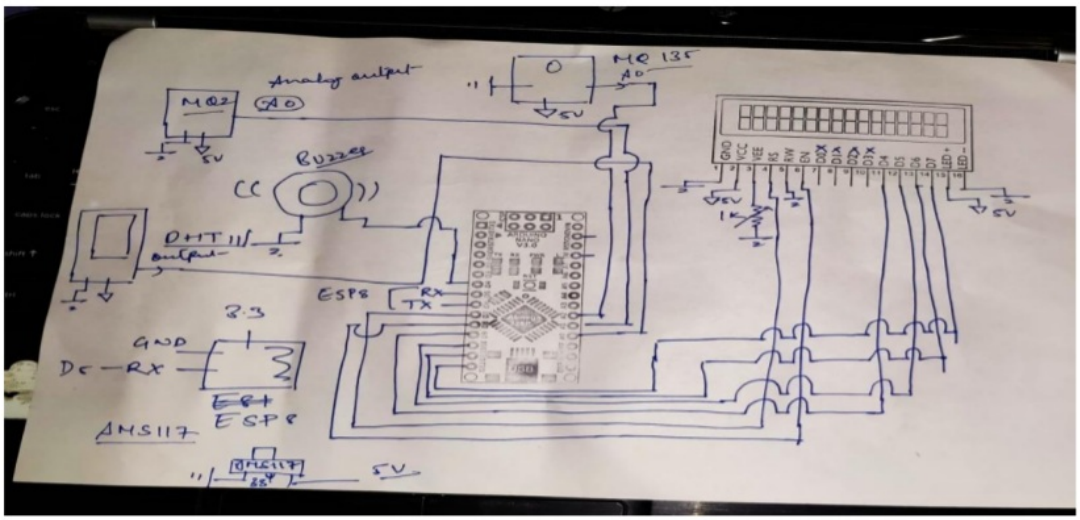


Figure 4 Circuit Diagram

The MQ135 sensor can sense NH3, NOx, alcohol, Benzene, smoke, CO2 and some other gases, so it is perfect gas sensor for our **IOT Based Alert Generator For Mining Workers**. When we will connect it to Arduino then it will sense the gases, and we will get the Pollution level in PPM (parts per million). MQ135 gas sensor gives the output in form of voltage levels and we need to convert it into PPM. Therefore, for converting the output in PPM, here we have used a library for MQ135 sensor. Sensor was giving us value of 90 when there was no gas near it and the safe level of air quality is 350 PPM and it should not exceed 1000 PPM. When it exceeds the limit of 1000 PPM, then it starts cause Headaches, sleepiness and stagnant, stale, stuffy air and if exceeds beyond 2000 PPM then it can cause increased heart rate and many other diseases. When the value will be less than 1000 PPM, then the LCD will display “Fresh Air”. Whenever the value will increase 1000 PPM, then the buzzer will start beeping and the LCD will display “Poor Air, Open Windows”. If it will increase 2000 then the buzzer will keep beeping and the LCD will display “Danger! Move to fresh Air”.

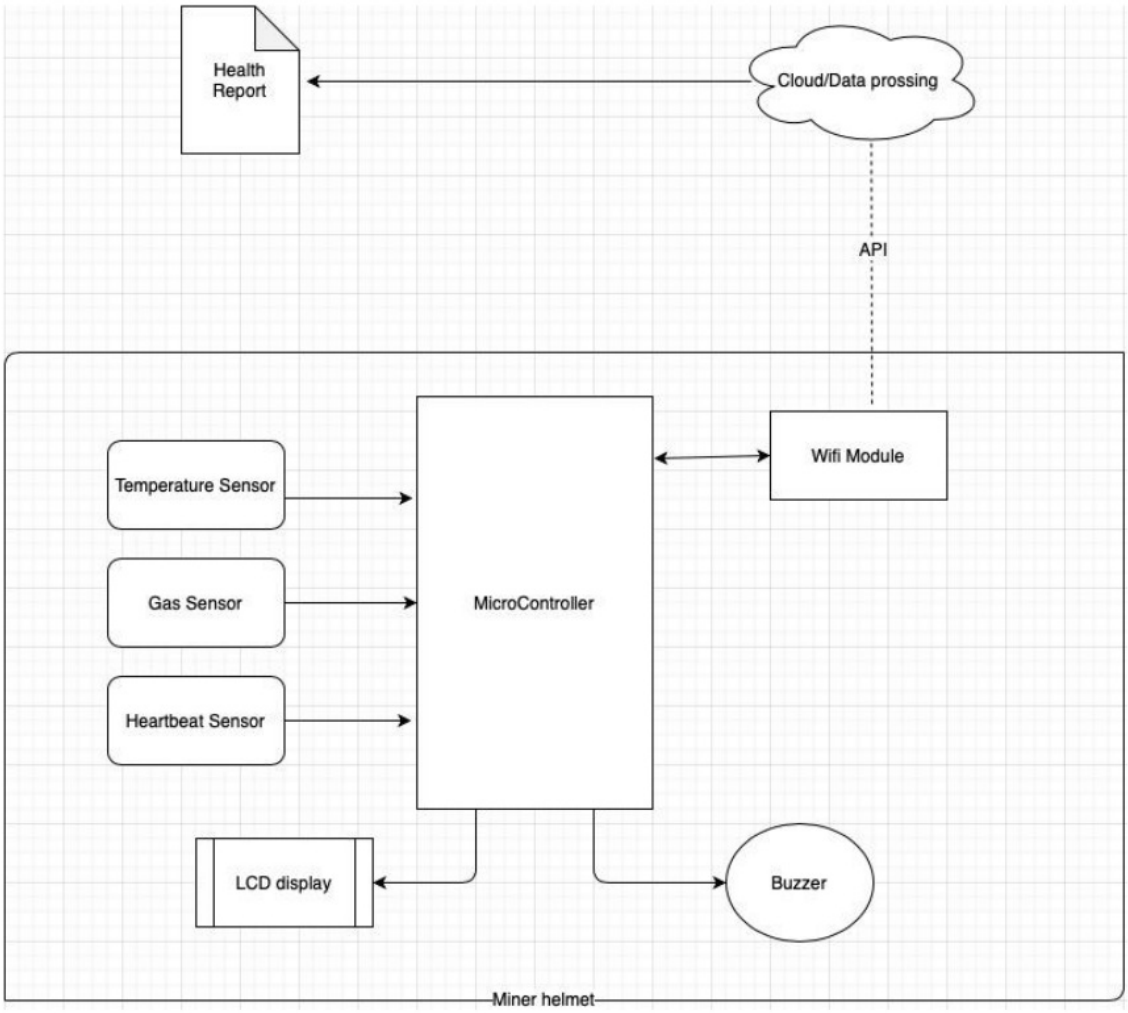
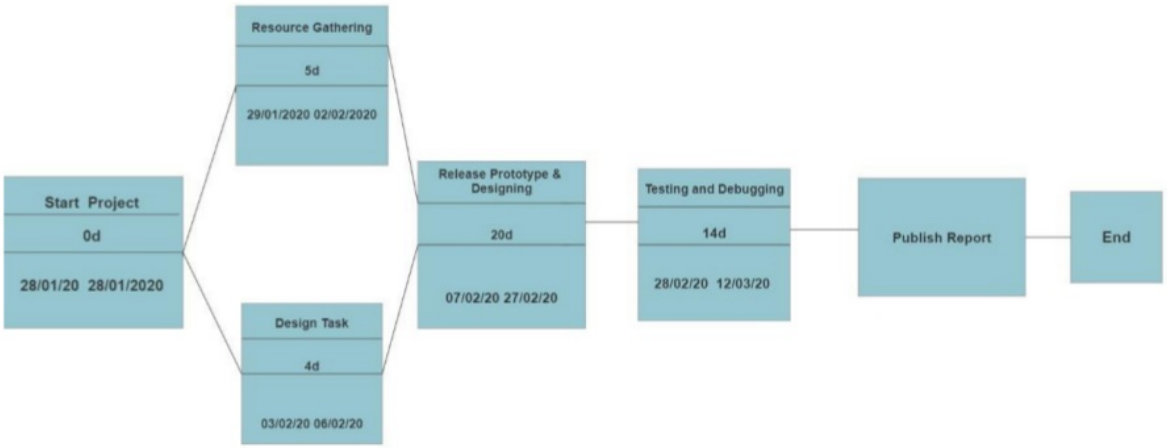


Figure 5 Architecture

Plan of Work (PERT Chart)



Developed Prototype

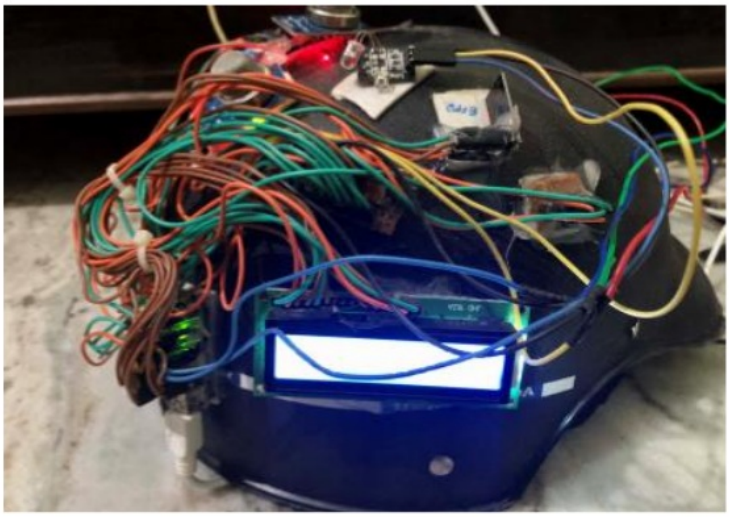


Figure 6 Circuit connection

Figure 7 Retrieving Data sets from Sensor

REFERENCES :

[1] Jagadeesh R, Dr. R. Nagaraja, et al., "IoT based Smart Helmet for unsafe event detection for mining industry" "International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 04 Issue: 01 | Jan -2017".

[2] M. Naveen raj, P. Ashwin Kumar, R. Vignesh, K. Iniyan, M. Sri Krishna Prasanth, et al., "IOT Based Smart Helmet for Unsafe Event Detection for Mining Industry" International Journal of Pure and Applied Mathematics Volume 118 No. 20 2018, 533-538.

[3] G. Ravi Kumar & B. Keerthi Reddy, et al., "Internet of Things Based an Intelligent Helmet for Wireless Sensor Network" International Journal of Engineering Sciences & Research Technology, June, 2018

[4] Shruti P. Borkar, V. B. Baru, et al., "IoT Based Smart Helmet for Underground Mines" International Journal of Research in Engineering, Science and Management Volume-1, Issue-9, September-2018

[5] G. Prabhakar Reddy et al., "IoT in Mines for Safety and Efficient Monitoring" International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 4 Issue 11, November 2015.

[6] Twentyman, J. (2016). Wearable devices aim to reduce workplace accidents. Financial Times, June.

Report verified by:

Ms. Ninni Singh
(Project Guide)

Dr. T.P Singh
(Program Head)

Mid Term Report

ORIGINALITY REPORT

11%	0%	0%	23%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Vel Tech University Student Paper	11%

Exclude quotes	On	Exclude matches	< 11%
Exclude bibliography	On		

Mid Term Report

GRADEMARK REPORT

FINAL GRADE

/0

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14

PAGE 15

PAGE 16

PAGE 17

PAGE 18

PAGE 19

PAGE 20