An Internship Report

IoT Developer Intern at Tek Certify Training Solutions

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

by

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[2022-2023]

Tek Certify Training Solutions PVT. LTD.

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-- Life is to Learn

Certificate of Internship

This is to certify that

ABHINAV SANDRU

(160120733090) from CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

has successfully completed internship as an IOT DEVELOPER at

Tek Certify Training Solutions Pvt. Ltd., Hyderabad

from 11-SEP-2022 to 29-OCT-2022.

Certificate ID : 9
Scan/Click QR to Verify

www.tekcertify.in

Aparna Narayandas
(Executive Director, TeK Certify)

DECLARATION

*I hereby declare that the internship entitled "**IoT Developer Intern**" is my original work carried out by me.*

Name and Signature of the Student

Place:

Date:

CERTIFICATE

*This is to certify that the internship titled "**IoT Developer Intern"** is the work carried out by **ABHINAV SANDRU 160120733090**,a student of B.E.(CSE) of Chaitanya Bharathi Institute of Technology(A), Hyderabad, affiliated to Osmania University, Hyderabad, Telangana(India) during the academic year 2022-2023.*

Mentor	***Head, CSE Dept.***
Smt. S. Durga Devi	***Dr. Y Rama Devi***
Assistant Professor	***HOD, Dept of CSE***

Place:
Date:

Acknowledgments

We have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals. I would like to extend my sincere thanks to all of them who helped us in completing the project to Dr. Rama Devi mam Cse dept.HOD, Pallati Narsimhulu Sir Cse dept. Assistant professor. It has been a great honor and privilege to undergo training and internship at Tek Certify Training and Solutions. We are highly indebted to our mentors for their guidance and constant supervision as well as for providing necessary information regarding the project and also for their support in completing the project. My thanks and appreciation also go to my colleagues and teammates in developing the project and people who have willingly helped me out with their abilities and guidance.

Abstract

Smart Mining Gear is an IOT technology based device used for safety purposes of the employees who work in mining sites and construction sites. By carrying out research on construction and mining industries the statistical report says that the accident is always a combination of hazards and cause. The collapse and flood of underground working could be a consequence of gas explosion or dust. Similarly, a fire could cause the release of toxic contaminants. The use of explosives might cause an earthquake that collapses mine workings and traps miners as happened to 33 miners who were stuck underground from August to October 2010 in a Chilean mine near the city Copiapo. As reported by the National Institute for Occupational Safety and Health(NIOSH), in the underground mines most explosive related fatalities were caused by miners being too close to the blast followed by explosive fumes poisoning, misfires and premature blasts. Mine induced seismicity must be added to that list. The hazardous gasses present in the mining area like carbon dioxide, carbon monoxide, methane, ethane, Propene, etc..., will cause the harmful disease to the miners. If we take proper preventive measures, all the above issues can be avoided.

The solution for this involves an IOT device fixed on the safety jacket which is called Smart safety jacket. This smart jacket is connected with different types of sensors like Temperature Sensor, Humidity Sensor, Ultrasonic sensor, Motion sensor, Gas sensor, Sound sensor, RFID, Emergency Panel, Notification Panel. These sensors connected to the network through wi-fi makes more relevant and valuable than ever before.By turning sensor information into actions, real-time data from mining environments can be monitored and controlled remotely from anywhere. The network connected sensors fetch the information from the mining environment and process that information through controllers and store that information in a database for future purpose. The information can be monitored through a web application

Internship Objective

To learn the required basics of IoT and to solve a Smart India Hackathon(SIH) 2022 problem using Cisco Packet Tracer (or) TinkerCAD or any other appropriate software

Weekly overview of Internship activities

11-09-2022: Week-1 Level-1: Live Session-1: (Offline mode)
09:00 am - 04:00 pm: Learning Control Systems & Embedded Systems via Simulation using Packet Tracer
11-09-2022 to 16-09-2022: Week-1 Level-1: Self Study Session-1: (Online mode) Self-paced Course(s): Introduction to Packet Tracer & IoT

17-09-2022: Week-2 Level-2: (Offline mode)
09:00am - 11:00am: Exam: Introduction to Packet Tracer & IoT
Participants who do not clear the exam are disqualified from Boot Camp
11:00 am - 04:00 pm: Live Session-2: Simulating IoT using packet tracer
18-09-2022 to 23-09-2022: Week-2 Level-2: Self Study Session-2: (Online mode) Self-paced Course: Linux Essentials

24-09-2022: Week-3 Level-3: (Offline mode)
09:00am - 11:00am:Exam: Linux Essentials
Participants who do not clear the exam are disqualified from Boot Camp
11:00 am - 04:00 pm: Live Session-3: Hands-on IoT with Raspberry Pi
25-09-2022 to 30-09-2022: Week-3 Level-3: Self Study Session-3: (Online mode) Self-paced Course: Networking Essentials

01-10-2022: Week-4 Level-4: (Offline mode)
09:00am - 11:00am:Exam: Networking Essentials
Participants who do not clear the exam are disqualified from Boot Camp 11:00 am-02:00 pm: Live Session-4: Connecting Raspberry Pi & the Cloud
02:00pm - 04:00pm: Teaming-up for Project Work based on Smart India Hackathon(SIH) Problem Statements

07-10-2022: Week-5 Level-4: Implementation: (Online mode)
Self-paced Course: Entrepreneurship

08-10-2022 to 28-10-2022: Project Work: Hacking the SIH Problem Statement

29-10-2022: Week-5 Level-5: Project Evaluation (Offline mode)

Table of Contents

1. Introduction

1.1. Problem Definition including the significance and objective

Mining workers are affected by many hazards – from ventilation problems, mine flooding, gas explosions, ceiling collapsing, mine haulage, sudden inrush and mine inundation, spontaneous combustion, to un-optimized evacuation routes. And mine operators have been working for decades to ensure no fatal accident results in death, injury, or poor health of miners.

The objective is to give a solution to design smart work clothing that has sensors embedded in it to securely transmit data to managers about hazardous conditions and the workers' physical conditions, improving safety overall.

1.2. Methodology

We made a simulation for the Smart Mining Gear using Cisco Packet Tracer and 000webhost by using components like Temperature and Humidity Sensor, Sound Sensor , Smoke Sensor , Photo Sensor, Heating Element, Water Sprinkler, Loud Speaker, LED, Emergency Buzzer, MicroController Board, etc and the data from these is sent to the cloud in the webhost stored in a database , displayed on the website and various analysis can be performed using this data.

1.3 Outline of Results :

The administrator can view and visualize various environmental conditions of different miners using the administrator portal which also includes data analysis by a line chart generated by the system. An emergency buzzer and LED are switched "ON" if any of the environmental parameters exceed the threshold values

2. Requirement Specification:

2.1 Software Requirements

- phpMyAdmin
- Packet Tracer
- ArduinoIDE

2.2 Hardware Requirements

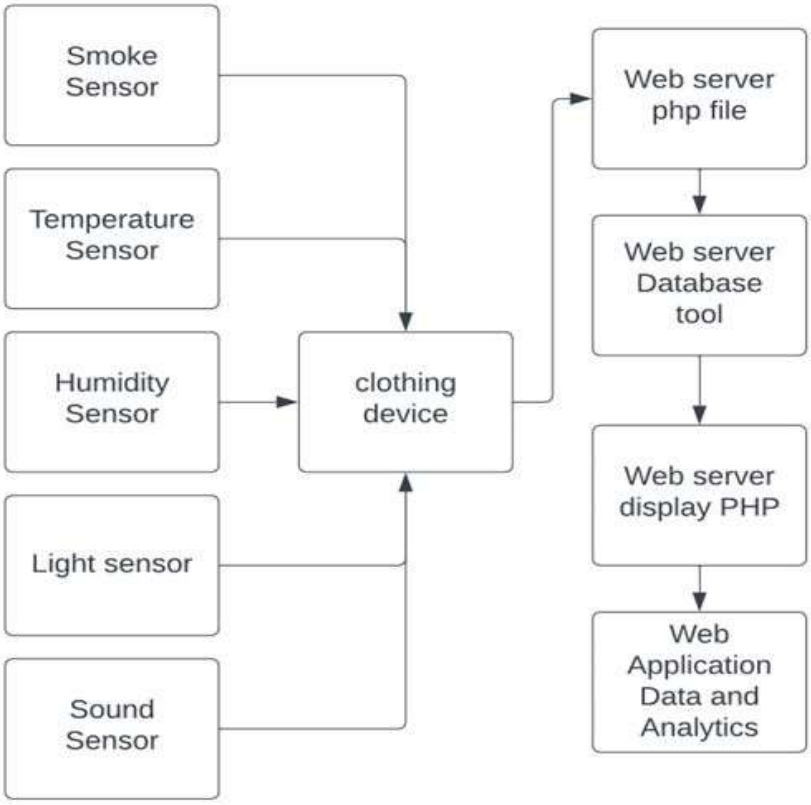
- Temperature Sensor
- Humidity Sensor
- Photo Sensor
- Sound Sensor
- Smoke Sensor
- LED
- Buzzer
- MicroController (NodeMCU ESP8266/ESP32)

2.3 System Requirements

Intel i5 Processor or above with 8GB RAM

3. Design of Proposed System

3.1 Block Diagram



3.2 Module Description

3.2.1 Smoke Sensor : Smoke sensor is a sensor that detects smoke as a primary indication of fire.

3.2.2 Temperature Sensor : Temperature sensor that uses an external diode-connected transistor as the sensing element to measure temperatures external to the sensor

3.2.3 Humidity Sensor : A humidity sensor is an electronic device that measures the humidity in its environment and converts its findings into a corresponding electrical signal.

3.2.4 Light Sensor : A light sensor is a photoelectric device that converts light energy (photons) detected to electrical energy (electrons).

3.2.5 Sound Sensor : The sound sensor is a module that monitors and detects the sound signals like voice, claps, snaps, knicks, etc.

3.2.6 Clothing Device : It is a Microcontroller that gathers and controls the sensors and sends the sensor data to the cloud**.**

3.2.7 Web Server : The webserver is used to store the sensor data in the database, display the data accordingly in the web application and perform analytics on the data.

3.3 Theoretical Foundation

Packet Tracer

Cisco Packet Tracer is a powerful network simulation program that allows students to experiment with network behavior and ask "what if" questions. As an integral part of the Networking Academy comprehensive learning experience, Packet Tracer provides simulation, visualization, authoring, assessment, and collaboration capabilities to facilitate the teaching and learning of complex technology concepts.

000webhost

000webhost is a free website hosting solution that provides an array of valuable features, including a website builder, WordPress support, and no ads.

phpMyAdmin:

phpMyAdmin is a free and open source administration tool for MySQL and MariaDB. As a portable web application written primarily in PHP, it has become one of the most popular MySQL administration tools, especially for web hosting services.It supports a wide range of operations on MySQL and MariaDB. Frequently used operations (managing databases, tables, columns, relations, indexes, users, permissions, etc) can be performed via the user interface.

TinkerCAD

Tinkercad is a free 3D modeling program known for its ease of use. It's 100% web-based, making it available to anyone with an internet connection.Kids, educators, and hobbyists use it to design anything imaginable. Utilizing 3D printing, laser cutting, or building blocks can bring Tinkercad projects into real life.

Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

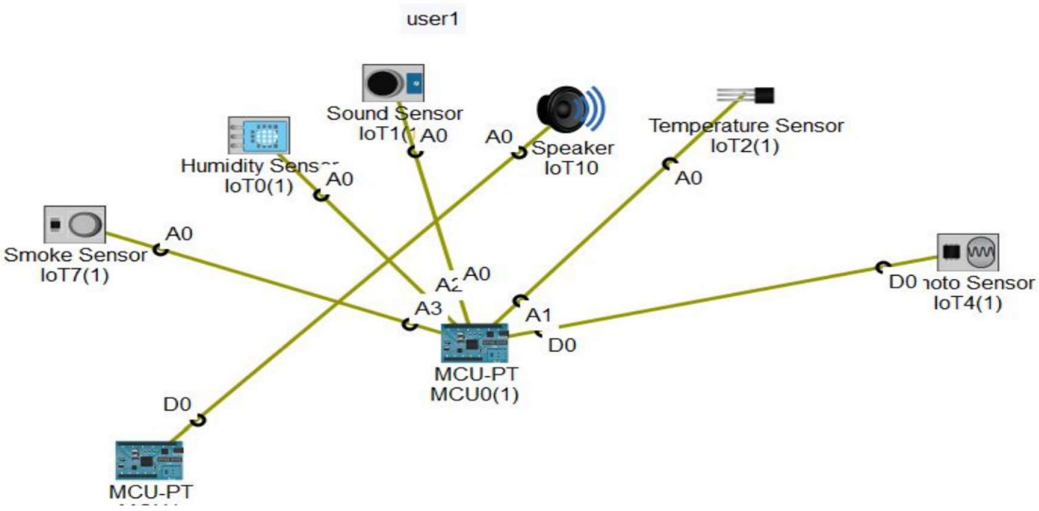
NodeMCU

NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added

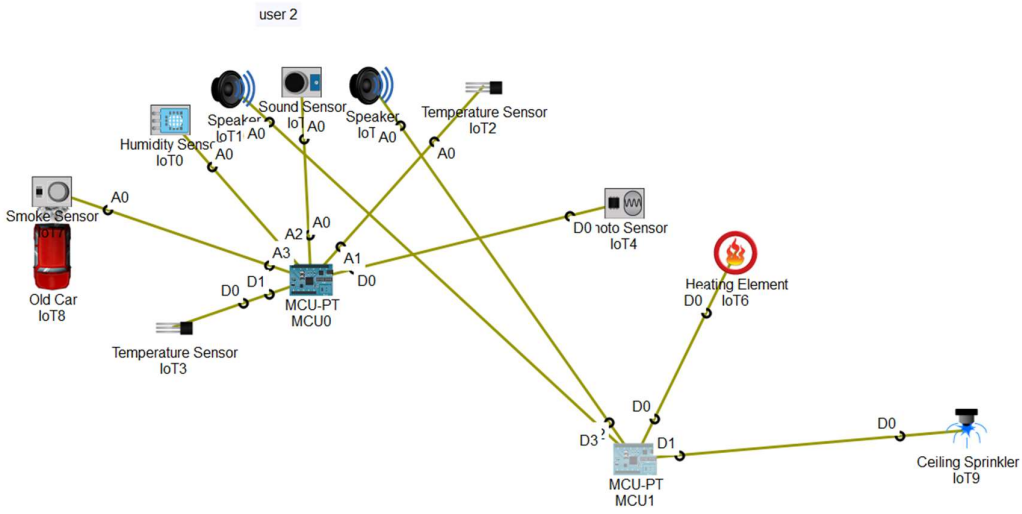
4. Implementation of the proposed system

4.1 Design and Test steps :

4.1.1 Miner 1 Sensor Arrangement



4.1.2 Miner 2 Sensor Arrangement



- The Old Car is used to mimic the hazardous gas present in the mines
- The Speakers are used to imitate the explosions in the mines
- The Heating Element and Ceiling Sprinklers are used to simulate the hot and damp conditions in the mines

To differentiate the environment conditions of users working in different positions in a mine, we have used different combinations of actuators for each user.

4.2 Algorithms or Pseudo Code

Code for the simulation and sending data to the database

```
var url = "https://drytadpole.000webhostapp.com/db.php?UNAME=U2";
var http = new RealHTTPClient();

function setup() {
    pinMode(A0, INPUT);
    pinMode(A1, INPUT);
    pinMode(A2, INPUT);
    pinMode(A3, INPUT);
    pinMode(0, INPUT);
}

function loop() {
    var temp = analogRead(A1)/1024*10;
    var smoke = analogRead(A3);
    var hum = analogRead(A2);
    var sound = analogRead(A0);
    var light = digitalRead(0);

    var http = new RealHTTPClient();

    Serial.println(temp);
    Serial.println(hum);
    Serial.println(smoke);
    Serial.println(light);
    Serial.println(sound);

    http.get(url+"&d1="+temp+"&d2="+hum+"&d3="+smoke+"&d4="+light+"&d5="+sound);
    delay(5000);

}
```

Output inside Serial Monitor in Packet Tracer:

```
Starting U2 (JavaScript)...
5.01953125
762
0
0
16
Data Sent to User DB
```

000Webhost:

- We create a php file to connect to the database and we can write a SQL query to retrieve this data from there.
- We display this data on our website by sending this data to frontend.
- We encode data into a JSON file with name and value for each of the attributes of the database and store it inside the server.
- We then perform analytics on this data using google charts and display them on the website

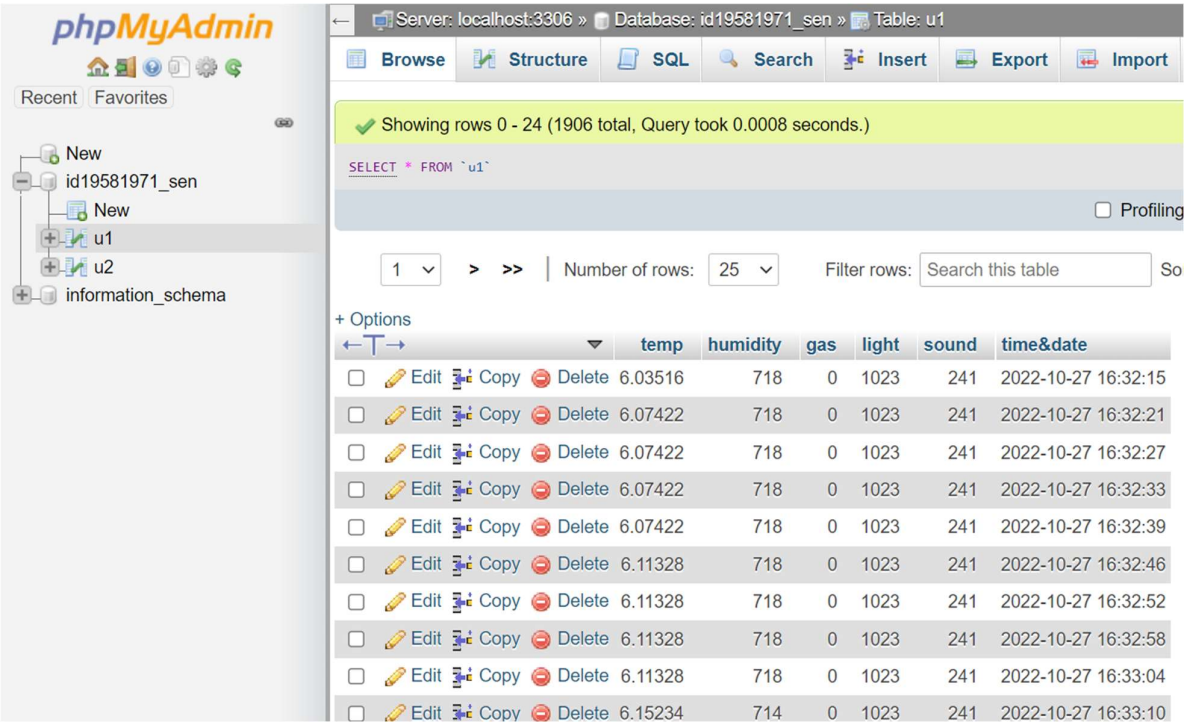
```php
<?php
$UNAME =$_GET["UNAME"];
$d1 =$_GET["d1"];
$d2 =$_GET["d2"];
$d3 =$_GET["d3"];
$d4 =$_GET["d4"];
$d5 =$_GET["d5"];

$servername = "localhost";
$username = "id19581971_coal";
$password = "U1user1@1234";
$dbname = "id19581971_sen";


// Create connection
$conn = mysqli_connect($servername, $username, $password, $dbname);

// Check connection
if (!$conn) {
  die("Connection failed: " . mysqli_connect_error());
}
echo "Connected successfully <br>";
$sql = "INSERT INTO u1 (temp,humidity,gas,light,sound) VALUES ($d1,$d2,$d3,$d4,$d5)";
if($UNAME == "U1"){
    if (mysqli_query($conn, $sql)) {
  echo "<br>New record created successfully";
}
}

if($UNAME == "U2"){
    $sql1 = "INSERT INTO u2 (temp,humidity,gas,light,sound) VALUES ($d1,$d2,$d3,$d4,$d5)";
    if (mysqli_query($conn, $sql1)) {
  echo "<br>New record created successfully";
} else {
  echo "Error: " . $sql . "<br>" . mysqli_error($conn);
}
}


mysqli_close($conn);
?>
```

Output after connecting to the database

4.3 Dataset Description

DataBase phpMyAdmin:

- First we create a database in phpMyAdmin.
- We next create two tables to store the sensor data of user 1 and 2 respectively inside this database.
- For each of the tables we create attributes Temperature, Humidity, Gas Light, Sound, Timestamp to populate the data coming from sensors.



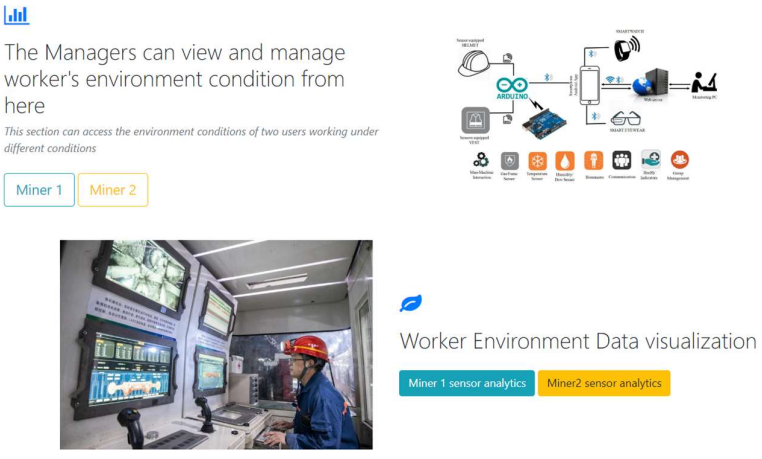
5. Results/ Outputs and Discussions

Website:

URL : https://drytadpole.000webhostapp.com/

HomePage:

Services for Manager:

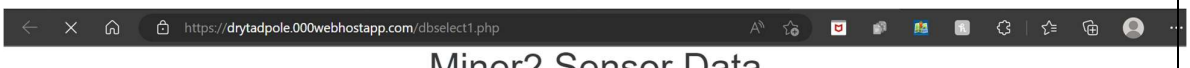


Sensor Data of Miner1:

Miner1 Sensor Data

Timedate	temp	humidity	gas	light	sound
2022-10-27 16:32:15	6.03516	718	0	1023	241
2022-10-27 16:32:21	6.07422	718	0	1023	241
2022-10-27 16:32:27	6.07422	718	0	1023	241
2022-10-27 16:32:33	6.07422	718	0	1023	241
2022-10-27 16:32:39	6.07422	718	0	1023	241
2022-10-27 16:32:46	6.11328	718	0	1023	241
2022-10-27 16:32:52	6.11328	718	0	1023	241
2022-10-27 16:32:58	6.11328	718	0	1023	241
2022-10-27 16:33:04	6.11328	718	0	1023	241
2022-10-27 16:33:10	6.15234	714	0	1023	241

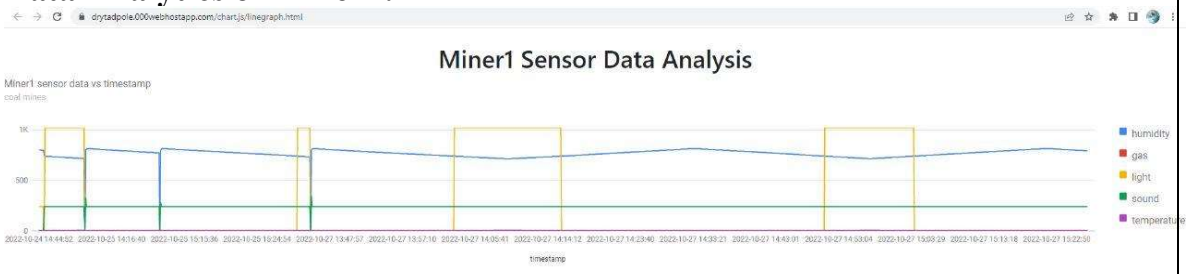
Sensor Data of Miner2:



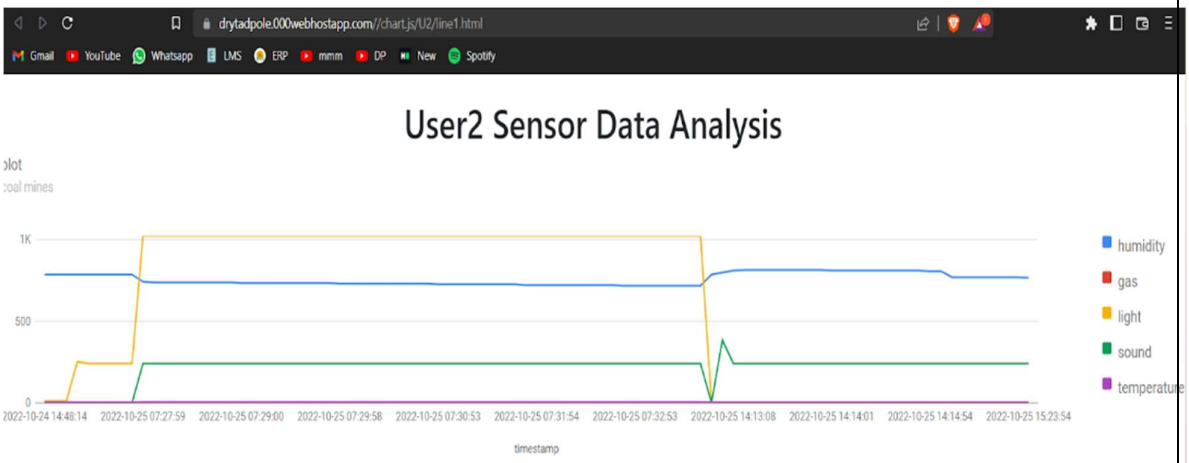
Miner2 Sensor Data

Timedate	temp	humidity	gas	light	sound
2022-10-28 15:28:33	6.03516	722	0	1023	12
2022-10-28 15:32:19	5.95703	722	0	1023	12
2022-10-28 15:32:26	5.95703	726	0	1023	12
2022-10-28 15:32:32	5.91797	726	0	1023	12
2022-10-28 15:32:38	5.91797	726	0	1023	12
2022-10-28 15:32:44	5.91797	726	0	1023	12
2022-10-28 15:32:50	5.91797	726	0	1023	12
2022-10-28 15:32:56	5.87891	726	0	1023	12
2022-10-28 15:33:02	5.87891	726	0	1023	12

Data Analytics of Miner1:



Data Analytics of Miner2:



6. Conclusions/Recommendations:

When working in mines,, especially in coal mines, there are a lot of factors that affect the human health conditions. These effects involve the presence of hazardous gas, temperature, oxygen level depth of mine, etc. a lot of accidents have already been reported in such work. Rescue teams spend a lot of money and time to recover the affected person from the accidental site. To overcome this problem, a system has been introduced which collects and monitors gases in realtime and sends data to the authorities for further use. Hence proposed embedded system dully designed for coal miners providing the essential parameters in order to be in contact with all miners & get to know about their environmental conditions i.e. availability of hazardous gas, and various life threatening issues inside the mine.

6.1. Limitations

1. The data analytics are not real time but are updated when reloaded
2. The administrator cant notify the miner
3. Health parameters of the miner are cannot be measured using the system

6.2. Future Scope

1. The system should track the health parameters of the workers such as the heart rate , blood oxygen levels.
2. The system should be able to predict the dangers in advance using ML algorithms and notify the manager.
3. The proposed system can be extended to other areas of application such as sewage monitoring ,construction sites,industrial corridors etc

References

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