

**Special Edition**NCASIT 2023, 29<sup>th</sup> April 2023

Department of Computer Engineering,

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**TO DESIGN SENSOR ARCHITECTURE WITH CLOUD ANALYTICS IN MINING INDUSTRY**

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*Abstract--* In this world of technology and innovation, we see that the mining industry is lacking in this area, and due to infrastructural limitations in communication, data management, storage and information exchange, the mining industry is somewhat traditional and slow to adapt. Surface mining and deep mining are two broad categories of mining operations. Surface mining is the removal of overlying soil and rock to gain access to mineral deposits, while underground mining is the digging of tunnels deep below the earth's surface to gain access to mineral deposits.

**Keywords:-** Automation, wireless sensor network, personnel safety, Mining Technology.

**I. Introduction**

The Internet of Things (IoT), a technological concept, proposes a global network where machines or items may talk to one another. The Internet of Things is having an impact on all application sectors, including smart homes, smart cities, agriculture, vehicles, health care, industrial production, and transportation (IoT). When extracting minerals and ores from mines, the mining industry must contend with issues like health and safety, access to energy, access to capital, environmental footprints, etc. As a result, we are

focusing on the health and safety of the workforce. Our sensor architecture will detect the gases present inside mines, collect all the necessary data, and then upload that data to the cloud through wi-fi using an Arduino D1 ESP8266 wi-fi module. This gadget is not only useful for the mining industry; it can also be installed in laboratories, colleges, and the chemical industry etc. The Internet of Things (IoT)

is a network of actual things, or physical things, that are embedded with electronics, sensors, and connections to enable the network to exchange data with the manufacturer, operator, and/or other connected devices in order to increase value and service.

**II. Literature Survey**

A)Muna Al-Razgan et.al, “Wireless Sensor Network Architecture Based on Mobile Edge Computing” In order to reduce assaults, it is essential to ensure the security of

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transmitted data and the manner in which it is transferred securely. The simulation tool's framework produces positive results and demonstrates how well the MEC and WSN interact.

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B). Chen Gao “The Human-in-the-Loop Data Sensing Architecture Based on Edge Cloud Computing” Results demonstrate that owing to the capacity of VMs, the system structure based on edge cloud terms lowers the server failure rate and overall usage. Additionally, it performs significantly.

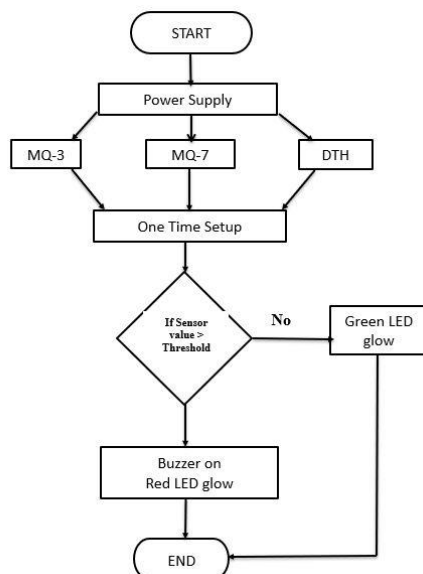
C). Xiaohua Tie et.al,” Informatization of Accounting System of Electric Power Enterprises Based on Sensor Monitoring

and Cloud Computing” Results indicate that there are 480 concurrent users using the accounting information management system, and that the average response time for a data query is 4.3 seconds and for a data access is 5.1 seconds.

D). Shanshan Wang et.al,” Optimization of Wireless Sensor Network Architecture with Security System” The experimental findings demonstrate that the wireless sensor network model developed in this research addresses the challenge of a high-efficiency and energy-saving design, and

Fig.1 Flow Chart

the trust management system performs satisfactorily in terms of thwarting assaults.



### III. Objective

- To Improve safety during mining operations.



- To take accurate decision during the mining operation
- Predictive analysis for a proactive approach.
- More time saving.
- Raise awareness of the technology at our disposal to solve the issue.

In any industry, a person's safety is of the utmost importance. Since mining activities must be conducted in remote and inhospitable areas, the risks involved are greater. Imagine the life of a miner who risks their life to accomplish the company's goal, and you can get a sense of the severity. Implementing recognized hazard controls and/or lowering mining-related hazards to levels that are morally, legally, and socially acceptable are all parts of mining safety practice.

This project's major goal is to detect the dangerous gases that are released during mining. At the remote location, sensors are installed so they can track down any environmental changes and alert the user to them. The cloud server is then pushed with these updates. This system has the potential to save lives.

### IV. Proposed System

When extracting minerals

Fig.2 Block Diagram

and ores from mines, the mining industry must contend with issues like health and safety, access to energy, access to capital, environmental footprints, etc. As a result, we are focusing on the health and safety of the workforce. So, We will detect the dangerous gases from the mine and alert to the workers.

The Flow of the device will be Power Supply > One time setup for sensors > If the sensor value is greater than threshold > yes , Buzzer On and red LED glow > No, Continuing glowing green LED.

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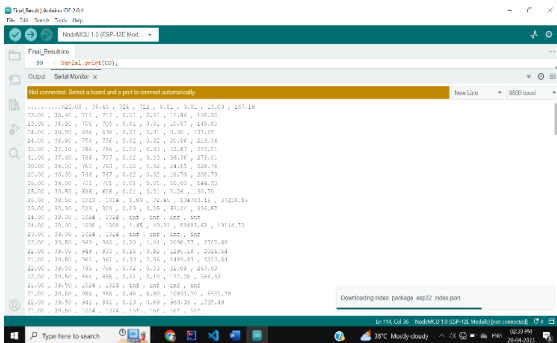
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V. Proposed Methods

Several sensors, a microcontroller, a power source, and a cloud service may all be used in our project to upload sensor data to a dashboard for monitoring. Depending on the situation, we can switch out the sensor.

Overall, in brief of these project is that by using the Arduino D1 ESP8266 Wi-fi module the data is sent to the cloud platform through the Wi-fi. We will collect the data from the underground mining and we will detect various factors like dangerous gases,



temperature and humidity. After collecting the data we will analyse the data in cloud and take the decisions according to the data we will be getting this is how we will contribute towards the technology used in mining industry and also preventing labours from affecting their health and also focusing on their safety.

VI. Result

The software and cloud are the two components that make up the system. Users can get results from both, and both are crucial to the system. The project aids the mining sector in maintaining worker safety and recording and preserving data. Automation in the mining industry eliminates risks and protects people from injury. Data collection and processing are assisted by automated analytical systems. The final results are then given to the planning commission. The problem is that the exploration department exports data to an excel sheet to share with the planning department, but the information can only

be loaded from the excel sheet because there is no

established connection between these systems. In a same manner, additional processes including rock mechanics, drilling and blasting, loading and hauling, crushing, stockpiling, treatment mills, and concentrate all run separately from one another. Finally, the sales department is in charge of making sales and maintaining records while the inventory is held in the warehouse.

Fig.3 PCB testing

The fig.3 is from the chemical laboratory we have successfully tested our device. So in this we take the alcohol as a test for detection of gas and we found out various results also

Fig. 4 Serial Monitor

Now above fig.4 shows the serial monitor of Arduino IDE were we successfully got the connection between the Arduino D1 ESP8266 and the ThingSpeak Cloud. Now the resultant data will be shown in the Cloud Dashboard.

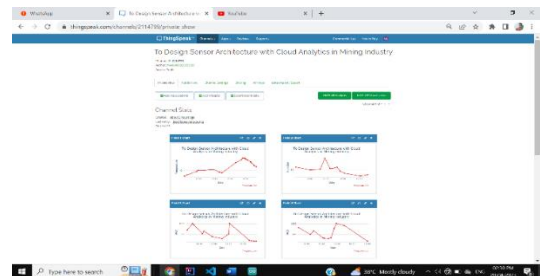


Fig.5 ThingSpeak

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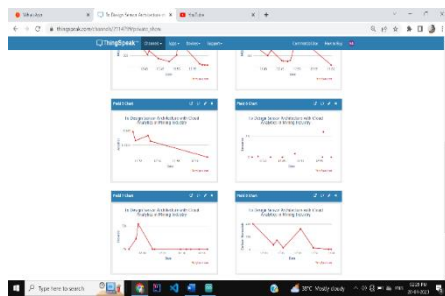
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Fig.6 ThingSpeak

Here in the ThingSpeak Cloud we got the various results and parameters like temperature, humidity, Alcohol, Benzene, Hexane and Carbon Monoxide.



Conclusion

The study offered a systematic and thorough examination of data mining techniques, such as classification, segmentation, and pattern matching mining, from the perspective of IoT systems. The article also listed the unanswered research questions and provided a tabular breakdown of them. There were descriptions and evaluations of applications such as Smart Home, Ambient Assistant Living, Smart Healthcare, Smart Grid, Industrial IoT, and Smart Factory. Smart farming and transportation are conceivable based on the information tools and approaches used for the conversion of data to understand. The current, highly information-rich IoT environment is now more complex and sophisticated as a result of this transformation.

In the mining industry, sensor utilization is already pervasive and used in applications including automation, remote operation, and data analytics for control and optimization. The goal of this effort is to find and present sensing technologies that, within the next ten years, will be financially viable to use. It gives a brief overview of the existing sensing infrastructure and outlines the anticipated sensing services for the mining industry. The next step is to evaluate new and developing sensing technologies in light of the existing difficulties facing the mining industry.

Mining safety refers to any measures taken to promote a mining team's wellbeing and ensure they

can work as safely, responsibly and efficiently as possible

Health, Safety and Environment (HSE) factors are potentially the most important measures to focus on

VII.

at a mine site. Through this Project the above mentioned conditions are fulfilled.

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