



“IOT BASED COAL MINE SAFETY MONITORING AND ALERTING SYSTEM”

Abhishek H

*Dept. Of Electronics and
Communication*

SJC Institute of Technology

Chickballapur, Karnataka, India

Savitha M M, Assistant Professor

*Dept. Of Electronics and
Communication*

SJC Institute of Technology

Chickballapur, Karnataka, India

Diwakara C K

*Dept. Of Electronics and
Communication*

SJC Institute of Technology

Chickballapur, Karnataka, India

Chandan Kumar A V

*Dept. Of Electronics and
Communication*

SJC Institute of Technology

Chickballapur, Karnataka, India

ABSTRACT

These days, the coal field faces challenges due to increased heating and changing climate. Atomization in the coal pit field is crucial to reduce the value and enhance production and product quality. This can also reduce the workload of mine personnel. Thus, here we suggest a type of wireless detection network (WSN) that can monitor the humidity, temperature, gas, and water levels in a subterranean mine using ESP32 controller. This technique makes use of ESP32, an LM35 temperature sensor, a smoke detector, and low power, efficient ESP32, a humidity detector DHT-11, the gas detector for sensing the mine methane gases and Wi-Fi for collect the information at a location of management office regulate to manage the climate condition with the assistance of motor and valve control electronic equipment.

Coal pit safety is greatly aided by wired network systems, which are the norm for traditional coal pit watching systems. A coal pit's ongoing expansion of its exploitation regions and depth causes various

laneways to become blind zones with countless concealed hazards.

Keywords: IOT, Node MCU, WSN, DHT-11 sensor

INTRODUCTION

Mining of coal is the process of removing coal reserves from both the earth's surface and its subsurface. The most plentiful fossil fuel on planet is coal. It has always been primarily used to produce thermal energy. Since the mid-20th century, coal

has lost ground to petroleum and natural gas as the world's main energy suppliers. Coal was the fundamental energy source that drove the industrial revolution of the 18 and 19th centuries, and the industrial growth of that period in turn supported the large-scale exploitation of coal deposits. Today, the extraction of coal from both surface and subterranean reserves is a highly efficient, mechanical process.

For the security and well-being of employees, underground mining operations are dangerous. These hazards result from the various methods utilized to extract various minerals. These safety concerns are quite concerning, particularly with regard to the coal industry. Therefore, whether mining for any kind of mineral, be it coal or another, worker safety should always come first. The risk associated with underground coal mining is higher than that of open pit mining tanks due to probable collapse and ventilation problems. However, there are safety hazards associated with all forms of mining due to the use of heavy machinery and the techniques used during excavation.

Modern mines often implement survival safety procedures, education, and training for workers, health and safety standards, which lead to substantial changes and improvements and safety levels both in open cast and underground mining. Moreover, it's inconvenient to put cables in that area unit costly and consume time. So as to resolve the issues, we will style a coal pit safety watching system supported wireless detector network, which may improve the extant of watching production safety and scale back accident within the coal mines. Wireless detector networks composed of an oversized variety of micro-sensor nodes have tiny volume and low price.

PROPOSED SYSTEM ARCHITECTURE

The intended system is made up of device modules that gather all the data related to the mine environment and upload it to an IOT module that is managed by a cloud server. The IOT module maintains the severe page. Every entry's common values are created by processing the logged data on an associate interval basis.

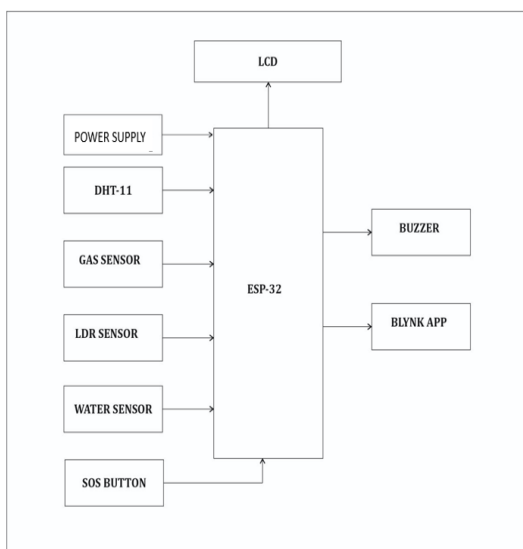


Fig. 1: Block Diagram

This prices area unit mechanically processed employing a predefined value maintained by the server page. Once there's associate absolute modification within the values of the perceived information alert is slipped to the IOT MODULE and also the involved authorities.

The IOT module detects the alert single and glows the intrinsic device and alert messages to the authorities could take precaution steps. The most advantage of this project is that IOT detects the uncertainty within the setting beforehand victimization information analysis reports things to the involved authority and also miners. The system conjointly considers the emergency things in hand to alert the miners as quickly as attainable.

HARDWARE REQUIREMENTS

1. Node MCU

Based on the low-cost ESP32 system-on-chip, the Node MCU is an open-source platform for developing hardware and also software. The most essential components of a computer are present in the Espressif Systems-designed, assembled, and manufactured ESP32 CPU, even a contemporary operating system and SDK. This makes it a best option for all kinds of Internet of Things (IoT) projects.

2. Photoelectric LDR Sensor

An output signal that represents the intensity of light is produced by a light sensor by sensing the radiant energy that exists in a vast, highly precise range of frequencies known as "Light," which spans the frequency range from "Infrared" to "Visible" to "Ultraviolet" light spectrum. Light sensors convert "light energy" into an electrical signal output passively, whether in the visible or infrared portions of the spectrum. Light sensors are more usually called "photoelectric devices" or "photo sensors" since they convert light energy into the form of electricity.

3. DHT-11 sensor

A humidity sensor called the DHT-11 is used to gauge the amount of water vapor in the atmosphere. The level of humidity in air effects various physical, chemical and biological processes. In industrial applications humidity affects the health and safety of the employees.

4. Gas sensor

A sensing module called MQ7 is used to gauge the amount of methane gas in the atmosphere. The gas sensing layer, composed of SnO_2 , is present in it. SnO_2 is susceptible to several gases, including smoke, alcohol, LPG, CH_4 , H_2 , and CO . You may also look at our MQ125 sensor interfacing project, where we measured PPM in the air using a comparable gas sensor.

5. Water sensor

When installed in areas where water shouldn't be, water sensors can identify the water presence and

leaks. The sensor has the ability is to notify the owner via a smartphone app when Wi-Fi is enabled.

6. LCD

Using polarizers and liquid crystals ability to control light, an LCD is a type of electrically modulated optical device that is similar to a flat-panel display. An LCD is a flat panel display that runs primarily on liquid crystals.

CONCLUSION

This project proves to be a significant advancement in ensuring miner well-being. Continuous monitoring, early hazard detection, prompt alerts, improved response times, overall safety standards are the contributions of this project. This project presents a valuable solution for coal pits. By leveraging IOT technology, it offers a powerful tool to safeguard miners lives and significantly reduces the uncertainty. In future the integration of additional sensors for monitoring air quality, dust levels, and seismic activity. Advanced data analysis for real-time risk prediction and preventive actions. Incorporation of wearable health monitors for individual miner safety. Exploring alternative communication protocols for reliable underground connectivity. Further development in these areas can make this IOT-based system an even more robust and

Fig. 2: Project Model

Fig. 3: Output

comprehensive solution for ensuring coal mine safety.

RESULT ANALYSIS

The goal of this project is to automate the process of monitoring mining units and transmitting information over cellular networks. The hardware of this device communicates with every sensor. With the help of sensors that monitor the surroundings and a microcontroller that regularly turns on and off the buzzer in such bad condition.

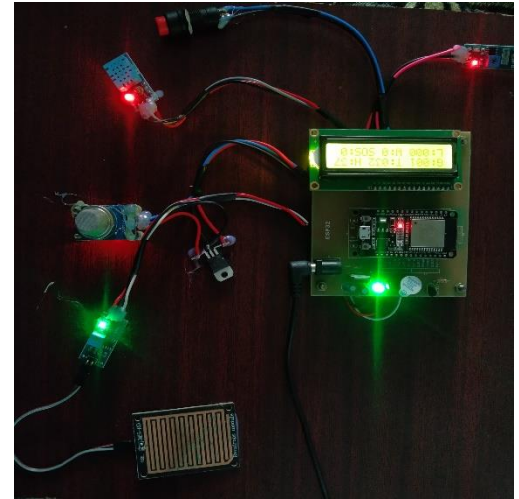
Maintaining mining operations these days requires ensuring the protection and well-being of employees and property. Utilizing ESP32, gas, LDR, and humidity sensors helps to maintain screen mining protection and replace data at IOT websites while also improving employee security in coal mines.

OUTPUT

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