



Coal Mine Safety Monitoring and Alerting System

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ABSTRACT

The process of obtaining coal from the earth is known as coal mining. Coal is used as a fuel in the steel and cement industries to extract iron from iron ore and to make cement. Because of the complexity of the mining environment and the variety of activities carried out in coal mines, it is critical to monitor the working environment. A wireless sensor network application in a coal mining safety system is offered as a solution to this challenge. There will be master controllers and slave controllers in this wsn application system. Slave controllers will identify a threat and send an RF alert to the master controller, as well as raising an alarm in the tunnel, allowing for quick action. This system displays the parameters on the monitoring device, which will aid all miners inside the mine in saving their lives before any casualties occur.

1.Introduction

Coal is a vital commodity and raw ingredient for a variety of businesses. It is used to generate electricity as well as extract a variety of by-product chemicals and minerals. However, extracting coal from a coal mine is a difficult and dangerous procedure. Many accidents occur in coal mines around the world, resulting in fatalities and financial damage.

The use of cutting-edge smart technologies can greatly lessen the dangers and hazards. Miner safety is currently a big issue. Miners' health and lives are jeopardized by a number of serious difficulties, including not just the working environment, but also its consequences. An new method is necessary to boost mining output and lower costs while still taking worker safety into account. The wireless sensor network-based coal mine safety monitoring system can precisely and immediately reflect the dynamic status of employees in the underground regions to the ground computer system and mobile unit.

Particulate matter (PM) and gases such as sulphur dioxide (SO₂), nitrogen dioxide (NO₂), and carbon monoxide (CO) are among the pollutants released by coal mines. Semi conductive gas sensors are used to measure the concentration levels of hazardous gases. Miner's fall down and lose consciousness for many reasons, and necessary treatment is not offered to them at the time, resulting in the death of a large number of miners.

2.Literature Review

A Low Power WSN-based surveillance and safety system for underground coal mines.

-A study on the use of Bluetooth wireless transmission in a coal mine.

-A Zigbee-based safety system for mine employees

2.1 Yogendra S Dohare, Google Scholar, Indian School Of Mines, Dhanbad

• This paper examines recent technical advances in the field of communication and environmental monitoring in underground coal mines. It emphasizes the suitability of using a recently established wireless sensor network for this purpose, as recommended by several academics from around the world

2.2 Yongping Wu, Jasmine Kavitha ,Sundar, Rajesh

• A Bluetooth-based underground mine monitoring system monitors and transmits real-time changes in gas concentration over a wireless communication network. In order for the person to be able to deal with the risk.

2.3 Tanmoy Maity and Partha Sarathi Das

A microcontroller is utilized to collect data and make decisions, after which mine workers are notified via alarm and voice system. The voice system, which includes both a microphone and a speaker, converts to a digital signal and communicates with the ground control center computer wirelessly.

3. Advantages and Disadvantages

Advantages

- It is crucial for the health and safety of mine workers in the coal mining industry.
- Using the remote IOT platform, supervisors and managers can monitor critical parameters from inside the mine from anywhere in the world.
- The price is modest, and upkeep is simple.

Disadvantages

Requires stable internet connection

4. Objectives

- Provide more safety for the mine workers.
- Used in coal mines.
- Nuclear industries
- Used in underground floor safety

5. Methodology

5.1. The project comprises of two modules: a receiver and a transmitter. The receiver and transmitter modules will raise an alarm in the tunnel, allowing for quick action and saving the person's life.

5.2 There will be master and slave controllers in this wsn application system. Slave controllers will identify a threat and send an RF alert to the master controller, as well as raising an alarm in the tunnel, allowing for quick action.

5.3 This system displays the parameters on the monitoring unit; it will aid all miners inside the mine in saving their lives before any casualties occur.

6. System Configuration

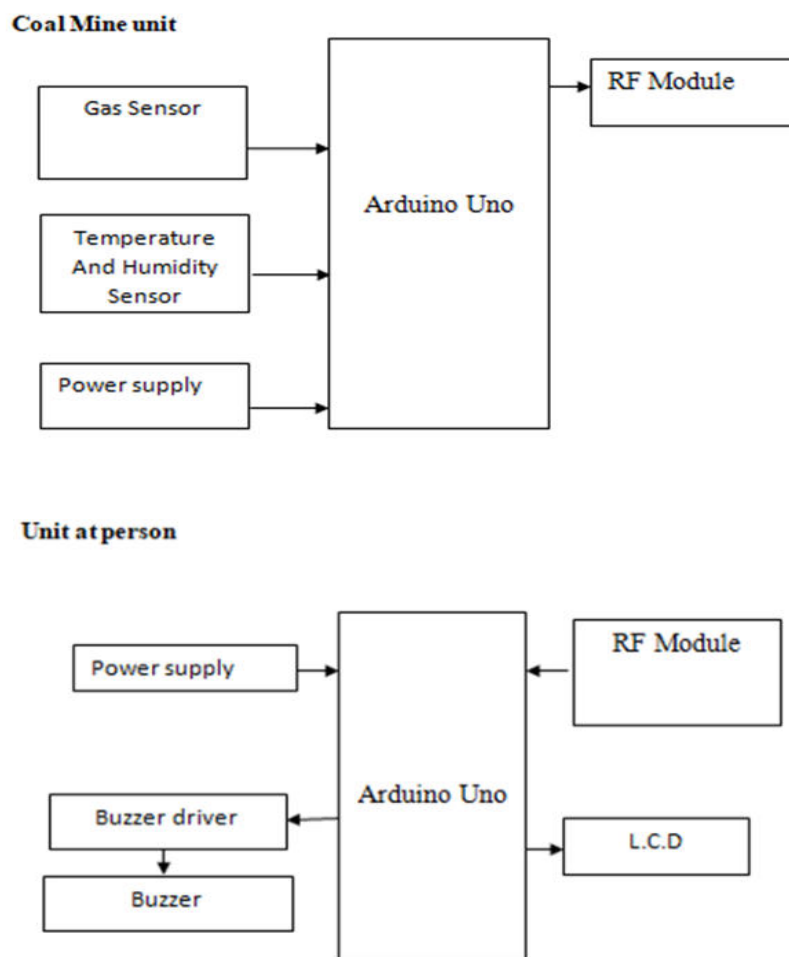
Hardware Requirement

- Power supply
- Arduino Uno (Atmega Microcontroller)
- RF Module (HC-12)
- Temperature and humidity Sensor
- Gas Sensors
- LCD Display
- Buzzer

Software Requirement

- Arduino Ide
- Embedded C

7. Block Diagram



8.Scope of Project

With the advancement of technology, future work on this experiment could entail further enhancement of the system by incorporating other advanced sensors for subsurface monitoring. There are dangers. All of the below-ground procedures can also be carried out from the surface. New communication technologies are being developed that can be utilized for high-speed data transport in conjunction with smart sensors to monitor mining conditions. More IoT-enabled systems can also be created to provide more advanced capabilities.

9. Conclusion

A real time monitoring system is developed to provide clearer and more point to point perspective of the underground mine. This system is displaying the parameters on the monitoring unit; it will be helpful to all miners present inside them in to save their life before any casualty occurs. Alarm triggers when sensor values crosses the threshold level. This system also stores all the data in the computer for future inspection.

Reference

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