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System for Monitoring and Alerting Coal Mine Safety Using IOT

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Abstract:

All sectors of industry should priorities safety, welfare and protection. The safety and security of everyone is extremely important to the mining industry. The mining sector follows a few straightforward procedures to avoid all kinds of mishaps. Accidents in underground mines are caused by high water levels, methane gas leaks and rising temperatures. We provide workplace safety here. An employee or worker can use the security alert button on the panic button when they are in danger. Establishing an effective communication system between workers in underground mines and the fixed ground mining system is necessary to increase safety there. The network for communication must never, regardless of the situation, go down. The presented paper proposes a low cost wireless mine supervision system based on Zigbee with early-warning intelligence. IOT can be utilized to keep track of employee status. The establishment of a trustworthy communication channel between mine employees and a stationary base station is necessary to boost both output and safety. The wired communication system performs worse within mines because wires can be broken. To safeguard the safety of the workforce, we will monitor certain factors in this project, such as anomalous gas, temperature, and fire sensors. It uses cameras for video monitoring as well as a text-to-voice converter to provide ongoing information about the employees.

Keywords — **Temperature sensor, gas sensor, water level sensor, zigbee, WIFI/GSM module, PIC Microcontroller.**

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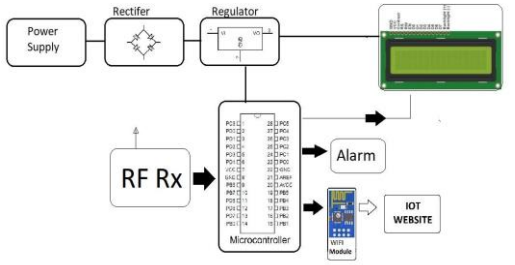
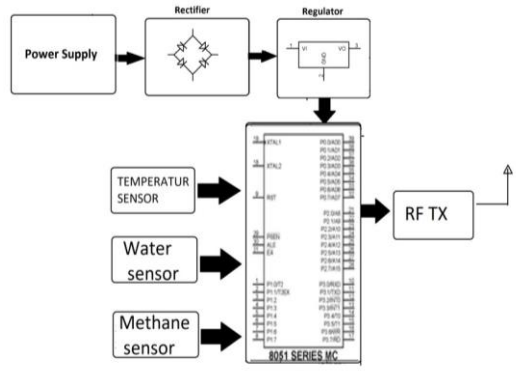
I. INTRODUCTION

A mine is the riskiest place to work in the world because there are many blast/explosion routinely cause tens of thousands of deaths. Also, a recent analysis claims that such mine accidents have killed an ordinary of 12,000 people. Due to the frequent coal mine accidents, the miners risk their lives at jeopardy by executing place there. Unluckily/ Sadly, miners do periodically perish in the coal mines, making it impossible for humans to extensively replace them as a source of energy. Most often, these accidents are the direct result of outdated machinery and wired gadgets, which puts excavators within coal mines in grave danger by causing mishandling and the spillage of poisonous gases. We developed the coalmine prevention technology to get around this problem. By putting the sensor data to the test allows us to use, and finish the analysis using the Thinker system, the issues were resolved in our study. Controlling may be carried out manually or automatically.

This monitoring system is composed of a number of components, such as boards (such as a PIC board, LCDs (liquid crystal displays), and a Zigbee (USB interface board), an Xbee module, a many sensors, as well as other small electronic components. Each of these parts is thoroughly discussed in this chapter, along with how it functions. The suggested system fixes the modules for measuring the amount of gas, the temperature, the amount of water, and relays for the coal mine safety systems. We connect the controller to every sensor. To begin, we must register for a ThingSpeak account. We mostly have monitoring and regulating mechanisms in this system. All of the data from various sensors is monitored by the monitoring system. The environment of the coal mine is gas sensing. The buzzer will sound loudly to alert the mine workers if the gas level rises above the normal level. Continuous cloud uploads of these sensor data are made for investigation and other purposes. Additionally, Inside the coalmine, the values for temperature and water level measured and sent to a control unit for data through zigbee. Figure 1 depicts the suggested system block diagram.





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II. LITERATURE SUREVEY

Coal mine surveillance is carried out by Yongping Wu and Guo Feng using Bluetooth wireless transmission technology. The purpose of Bluetooth technology is to provide a single worldwide short-range wireless communication standard by developing a typical low-power, inexpensive wireless air interface and operating system for controlling software. This essay/ paper examines the technological characteristics, development history, and protocol stack of the Bluetooth technology in order to address the complexity of Bluetooth network adapter wireless communication interface (HCI). [1].

The suggested Zhenzhen Sun's System for Monitoring Coal Mines (DCS) the RS485 structure, it is built upon the RS485 Bus, communication that is simultaneously two-way and multi-point. So, 8-bit microcontrollers, which are widely available, can be used to build a system for monitoring like this. It has advantages from a straightforward circuit design and affordable price. It is challenging to ensure the network structure's dependability due to the use of master-slave networks. Furthermore, with low real-time performance, the data transmission distance is constrained. [2-3].

An electronic sensor (one that is wireless) network-based autonomous safety surveillance system for mining areas was proposed by Jingjiang Song and Yingli Zhu. This MSP430F and nRF2401 system is built to monitor coal mine safety. In the subterranean mine, the sensor groups of The programme keep a constant observe the humidity and other influences include the temperature. The microcontroller transmits measurements to the module for wireless communication. The obtained

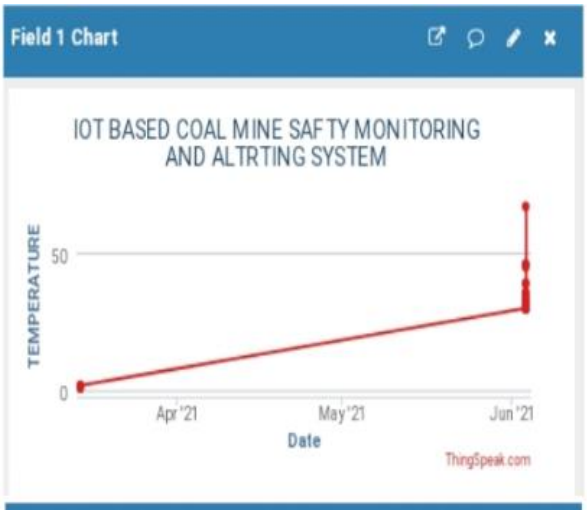
data is sent to a remote monitoring centre via cable. [4].

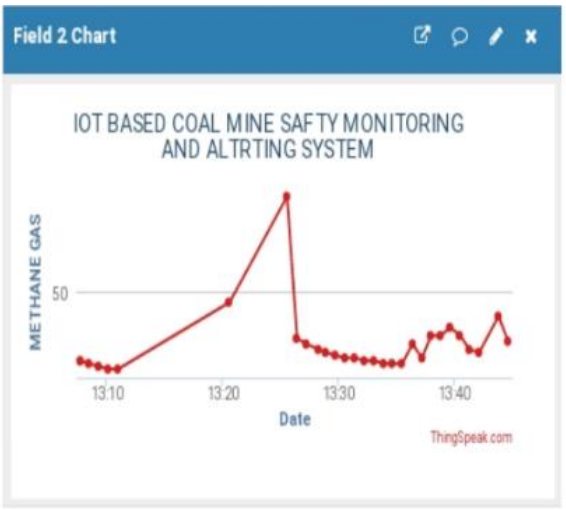
The issue with this solution is that because the hardware is located inside coal mines, it is vulnerable to harm in the event of a roof collapsing or a natural calamity. Therefore, the longevity and dependability of conventional communication systems are inadequate. The technology requires extensive installation and maintenance because of the hostile conditions inside the coal mine area. There's still the matter of the noise level during mining of coal operations is extremely high, making it difficult for miners to hear proper messages if they are far from the system. Based on Low Power WSN, Tanmoy Maity and Yogendra S. Dohare develop monitoring and security subterranean coal mine systems. An economical based on the Zigbee protocol, a wireless sensor network is used in this system to deliver an underground system for smart surveillance and coal mine safety. Multiple nodes are connected wirelessly as part of the system. This network works well as a security and safety system for miners and is simple to establish in underground coal mines. In particular, it enables highly secure, trustworthy wireless sensor nodes for live information exchange between the surface control room and the miners. [5]

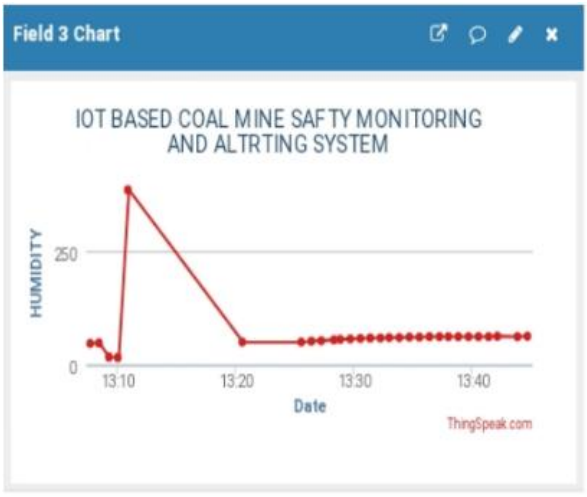
Since this equipment is installed inside a mine, an issue arises when a miner is outside its viewing area. This device does not track the health of the miners; it just monitors the ambient conditions of the underground mine.

III. COMPARATIVE STUDY AND RESULTS

In this section we observe the performance of different sensor used for this learning models, adopted by researchers in their studies which are as follows:







IV. CONCLUSION

In this paper, we have successfully understood the need for IOT and the significant role it plays in the safety surveillance system in a coal mine in this paper. The papers discussed above proposed a monitoring and alerting system for coal mine safety, as well as the use of IOT-based models, from which a successful system was developed. After reviewing these papers, we discovered that Zigbee was the best proposed model because it took the parameter of IOT coding into account, which aided in correctly alerting the system via IOT site.

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