IOT BASED COAL MINE SAFETY MONITORING AND ALERTING SYSTEM

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Abstract

Safety must come first in all sectors of business. The safety and security of everyone is extremely important to the mining industry. The mining sector follows a few straightforward procedures to avoid accidents of all kinds. Nonetheless, accidents in underground mines are caused by a variety of factors, including methane gas escapes, high water levels, and temperature spikes. Here, we provide workplace safety. A worker can press the panic button to alert security when they are in danger. To improve safety in underground mines, a reliable communication system must be established between workers there and the fixed ground mining system. The communication network must never, under any circumstances, go down. This study suggests a low-cost ZigBee-based wireless mine supervision system with AI for early warning.

Keywords: Cloud Server, Safety system, Sensors, Blynk IOT.

I.   Introduction

A mine is the riskiest place to work in the world because explosions there routinely result in thousands of fatalities. At the mines, there are a lot of coal mine accidents that happen, and the miners are risking their lives by working there. Nevertheless, fatal accidents do occur periodically in coal mines, making coal an unreliable energy source that cannot be widely substituted by people. The majority of the time, these mishaps are the direct result of antiquated equipment and wiring devices, which put coal mine excavators in great danger by leading to improper handling and the release of toxic gases. As a result, we developed the system to safeguard coal mines. Coal is the most valuable resource on the earth. These petroleum products are made from resources found on Earth and are utilised for power production and other things. Because coal is a finite resource that cannot be continuously supplied by humans, it is dreadful that occasionally miners perish in the coal mines. The lives of the miners are at danger because of the frequent coalmine accidents that take place there. Most of these mishaps result in fatalities as a direct result of outmoded gear and electrical systems.

In India, we have 493 coalmines present. Coal is the most vital asset in the world. These petroleum products are natural assets of the earth which help create power and for some, purposes. Coal is a non-sustainable source which can't be supplanted commonly by humans, there are numerous coalmine mischance's happening in the mines, and the diggers are putting their lives in hazard by working in the coal mines, even once in a while they wind up losing their lives in the coal mines which is an unfortunate part. Mainly these mishaps are happening as a direct result of the old hardware and the wired systems, resulting in the terminate mischance's, spillage of the noxious gases in the coal mines are presenting immense dangers to the excavators inside the coalmines.

II.   Literature

The design proposed by Kumar et al [1] is based on MSP430, A variety of factors, including temperature Many variables, including temperature, humidity, gas, and smoke, are tracked in coal

mines. The climate of the nation is managed by the motor, which is positioned in the centre together with a Zigbee transmitter.

In a system created by Lihui et al [2], sensor nodes measure the temperature, humidity, and methane values of the coal mine. An ARM controller then collects the data and processes it. Zigbee is used for communication. To preserve the workers' safety, an SMS is delivered if any esteems rise.

A device based on an ARM controller and various sensors, including a temperature sensor, a humidity sensor, and a gasoline sensor, was defined by Ashish et al. in [3]. Inside the mine, an IR sensor is placed to monitor the circumstances.

Wakode et al. proposed a method that is mostly used to monitor the concentration of harmful gases in coal mines. [4]. The alerts that the devices provide for safety will enhance the mine miners' chances of survival. An alarm switch for usage in an emergency is present on both the transceiver and receiver sides.

Aarti et al. [5] created a system that measures temperature, humidity, and methane levels in coal mines. All of the numbers are relayed to the ARM9 processor, which updates the webpage with the most recent readings via a Wi-Fi module.

Dheerajet al [6] suggested a framework where the values of all monitored parameters are recorded, visualised, and configurable through smartphone in the cloud in order to maintain the safety of coal mine workers.

A coal mine safety monitoring framework reliant on Zigbee and GPRS remote transmission was proposed by Dong et al. [7]. With the of genuine accidents and ongoing treatment, ultimately increasing the security of coal mining.

A coal mine safety monitoring system was created by Madhu et al [9] by using a temperature, humidity, and carbon dioxide level checker. If any uncertain condition occur then message is sent with the help of GSM to the forest and fire departments.

III.   Promblem Statement
The coal mining industry is known for its high-risk working environment, with numerous hazards that can endanger the lives of miners. Accidents such as gas explosions, cave-ins, fires, and harmful gas emissions are common in coal mines, making safety monitoring a critical concern. Traditional safety systems in coal mines often rely on manual inspections and monitoring, which can be time-consuming, inefficient, and prone to human error.
              To address these challenges, the problem at hand is to develop an IoT-based coal mine safety monitoring and alerting system. This system aims to leverage the power of Internet of Things (IoT) technologies to monitor various parameters within the coal mine, detect potential hazards in real-time, and alert the relevant personnel to take immediate action. The system should provide continuous monitoring, data collection, analysis, and real-time alerts to ensure the safety of miners and prevent accidents.
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IV.   Methodology
A.   Block Diagram
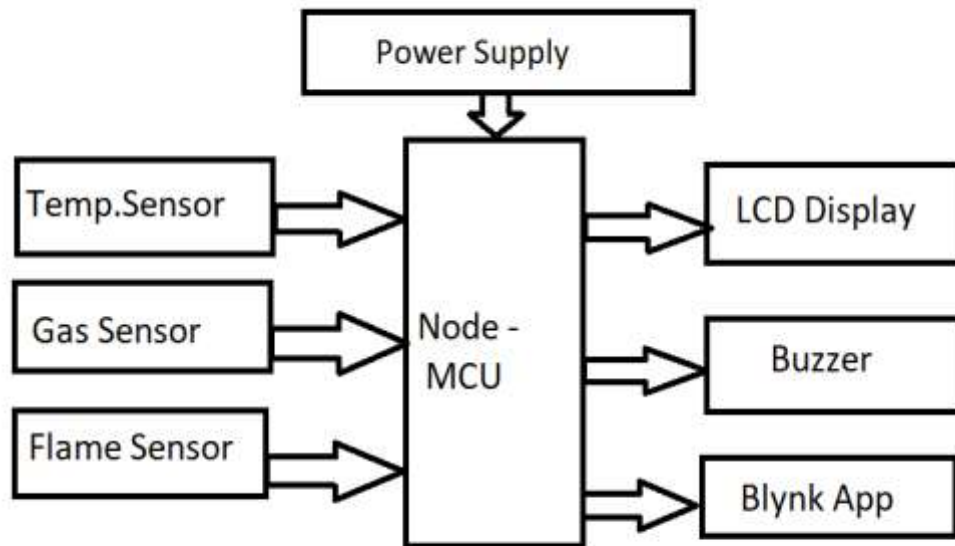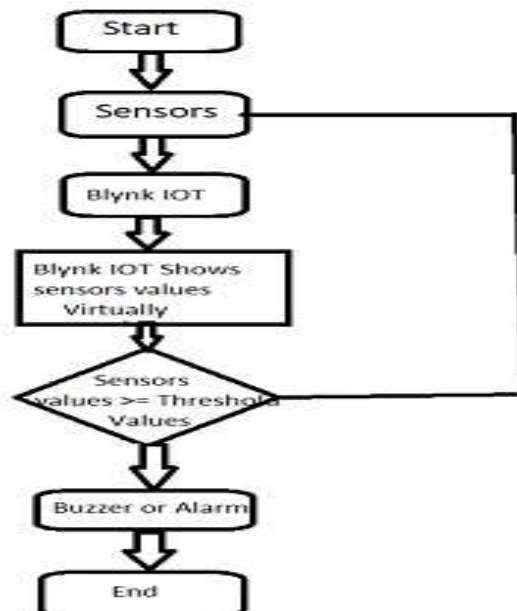

Fig. 1 System Block Diagram.

B. Flowchart

Fig. 2 Flow chart of IOT Based Coal Mine Safety Monitoring And Alerting System

C. Working Principle

The temperature/humidity sensor, fire sensor, buzzer, LCD display, and gas sensor modules are fixed elements of the coal mine safety systems. The Node MCU incorporates all of the sensors. Initially, we must register for a Blynk IoT account. We primarily use monitoring and controlling systems in this system to keep track of all the data coming from various sensors. In the coal mine environment, a gas sensor detects gas; if the level of gas exceeds the typical threshold, the buzzer activates to warn the mine staff.

Continuous uploads of these sensor readings are made to the cloud (Blynk IoT) for analysis and later use. Inside the coalmine, the temperature and humidity levels are also measured. Fire alert signals are quickly provided to the appropriate people if any fire mishaps take place. Blynk IoT has completed the control of the system. By combining the widgets we control with buzzer, we can construct widgets in the Blynk IoT. The sensor's value is shown on an LCD screen.

V. Result

VI. Scope Of Project

With the developing developments future work of this experimentation may incorporate, greater improvement of the framework by utilizing other progressed sensors for checking the underground. Dangers. Likewise, every one of the underground tasks can be completed from the beginning. New

creating correspondence advancements can be utilized for fast information move in mix with keen sensors for detecting the mine conditions. Additionally, more IOT empowered frameworks can be created for further developed uses.

VII.   Conclusion

To boost worker safety and keep them out of harm's way, a coal mine safety system is being deployed employing fire, gas, and DHT11 sensors. Blynk IOT is being used for this system's ongoing monitoring of the coal mine and worker alerting.

References

[1] (2008) October. Li-min, Y., Anqi, L., Zheng, S., & Hui. design of a wireless sensor network-based monitoring system for coal mine security. Mechatronic and Embedded Systems and Applications 2008 IEEE/ASME International Conference (pp. 409–414). IEEE

[2] Manoj, A. M., Muniraj, K., Naveenkumar, M., & Praveen, C. (2021, May). IoT-based safety monitoring solution for coal mines. p. 012196 in Journal of Physics: Conference Series, Volume 1916, No. 1. Publishing IOP

[3] In March 2018, Singh, A., Singh, U. K., and Kumar, D. Internet of Things in mining for roof support sensing, monitoring, and forecast. In the 2018 RAIT (p. 1–5), the 4th International Conference on Recent Advances in Information Technology. IEEE.

[4] Deokar, S. R., & Wakode, J. S. (2017). Coal mine safety monitoring and alerting system. International Research Journal of Engineering and Technology, 4(3), 2146-2149.

[5] Gao, D. W., Wang, J. F., and Wen, D. G. (2013). Cheng, J. GPRS and ZigBee-based system for monitoring the safety of coal mines. on pages 215-220 of Applied Mechanics and Materials, volume 422. Trans Tech Publishing Ltd.

[6] Aarthi "Coal Mine safety Monitoring system using ARM 9", International Journal of Science and Research (IJSR), Volume3, Issue-11, November 2014.