ISSN (Online): 2456-0448
International Journal Of Innovative Research In Management, Engineering And Technology
Vol. 9, Issue 3, April 2024

IoT-Based Coal Mine Safety Monitoring and Alerting System

[1] Sarmitha K, [2] Dr. G. Sasikala,
[1] Student,School Of CSA, REVA University, Bengaluru
[2] [3] [4] [5] Associate Professor,School Of CSA REVA University, Bengaluru.
sarmithakumar@gmail.com, sasikala.g@reva.edu.in

Abstract: ***Safety is the most important aspect of any industry. Security and safety are absolutely essential in the mining industry. The mining industry follows a few fundamental safety measures to prevent any accidents. Underground mines still have accidents because of rising temperatures, rising position levels, and methane heart leaks. Here, we provide worker safety. He can call security by pressing the panic button when a worker is in danger. A reliable communication system between workers in underground mines and the fixed ground mine system is required to improve safety in underground mines. There must be no interruptions to the communication network at any time or under any circumstance. In this project, a low-cost, early-warning intelligence-based wireless mine supervision system is proposed. IoT allows for monitoring of worker status.***

Coal mines are one of the most important and industries in the country, as they are used as fuel in the steel and cement industries to extract iron from the stone and create cement. Every parameter, such as methane heart, high temperature, fire incidents, etc., should be regularly checked in the underground mining business. Due to the complexity of the mining environment and the variety of activities performed in coal mines, it is important to monitor the working environment. To address this issue, there is a system that monitors basic safety measures and regulates many restrictions on coal mines, such as heart leaks, temperature and position conditions, and fire sensor. All the sensors are assembled into a single unit and then placed in a coal mine.

The most crucial component of every industry is security. The only factor in the mining business is safety and security. The mining industry takes many safeguards to prevent accidents of any kind, including steel accidents. Temperature increases cause methane heart leaks and an increase in position levels in underground mines. Here, we give workers protection. When the danger can be suppressed by the worker, we alert the panic switch protection. To improve safety between employees in underground mines and 10 between the stationary landmine system, a dependable communication system should be implemented. There should never be a break in the communication network.

I. INTRODUCTION

Mines are the world's most dangerous place to work because in the mines, explosion often happens and thousand people are dying. And a recent report state that in such mine accidents an average of around 12,000 people have died. Coal is a no sustainable origin that cannot be widely replaced by humans, there are severalmishaps of coalmines occurring in the mines, and the diggers are putting their lives atrisk, by working in the coal mines, even once in a while they end up losing their lives in the coal mines that are an unfortunate part. Mainly such mishaps happen as a directresult of the old equipment and wired devices, resulting in the end, mishandling, spillage of the noxious heartes in the coal mines, pose tremendous hazards to the excavators inside the coal mines. So we've designed the coalmine protection system to stay away from this problem. We tackled the issues in our research by testing eachof the information collected by the sensors, we use and finishing the analysis using theThinker system. Controlling can be done automatically or manually.

II. Existing System

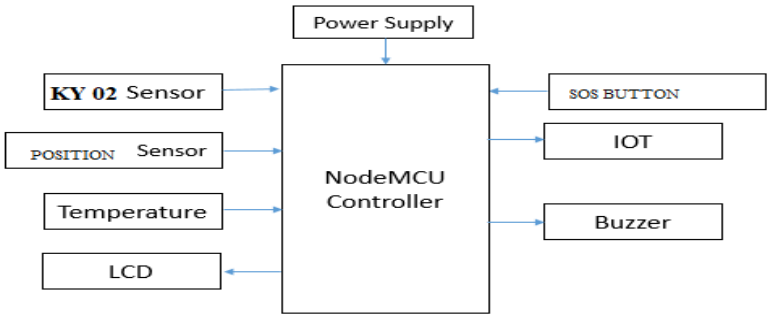
In the underground mining area, the methane heart level present in the mine is detect by Electronic Heart Sensor. The climatic conditions in underground mine including temperature and position is measures by the Temperature sensor. The vibrations occurring in the mines while mining is detect using the Vibration sensor. This senses the vibration level and occurrence of earthquake can be known easily. With a power supply given, the data which the various sensors collects are fed to the Arduino UNO ,the numbers are displayed in the LCD display module. The numbers also checks with the maximum level each parameters like heart, pressure, temperature, vibration etc., using the Zigbee module. If the number crosses the predefined level, the buffer buffers and gives alert to the miners. The machine collects data in a coal mine using a sensor network based on (MEMS) Micro Electrical Mechanical Systems. The sensor module is made up of MEMS sensors that range in size from 1 to 100 micrometres.

ISSN (Online): 2456-0448
International Journal Of Innovative Research In Management, Engineering And Technology
Vol. 9, Issue 3, April 2024

Proposed System

In this proposed system the coal mine safety systems are fixed with heart sensor modules, temperature sensor, position level sensor and relays. We integrate all the sensors to the controller. First we need to create an account in the ThingSpeak platform. In this system we mainly have monitoring and controlling systems. In monitoring system we monitor all the data from different sensors. Heart sensor detects the heart in the coal mine environment. If the heart level exceeds the normal level then the buzzer gets high so that the mine workers get notified. These sensor values are continuously uploaded to the cloud for analysis and also for further use. The temperature and position level values are also monitored inside the coalmine and send data control unit and stored in IOT.

Block Diagram



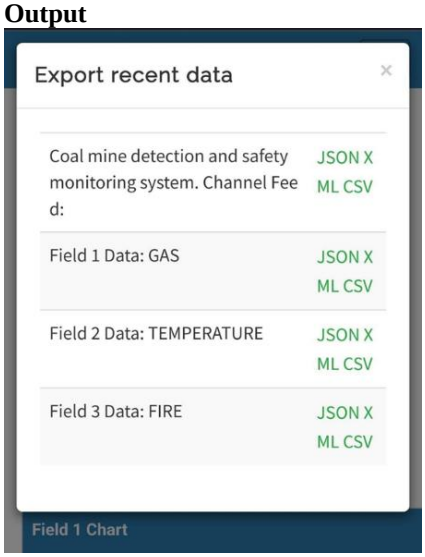
III. Result

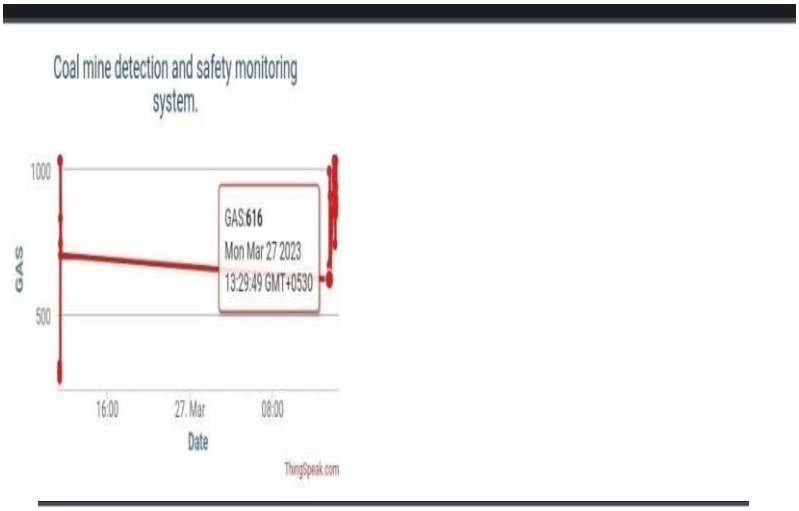
The physical traits of temperature and position, light depth value, and heart molecule attention are detected within the mining surroundings and saved on the cloud those outcomes may be plotted at the blink net site or app, and that they may be stored for later exam. If there any doubt, swift movement can be taken. Blynk is an open- supply net of gadgets utility and API for storing and retrieving data from matters over the net or via a local area community utilizing the HTTP and MQTT protocols. Blynk offers channels for storing statistics retrieved using IOT technologies. Every channel has eight information fields, 3 location fields, and one status field. The data is stored within the blink channel as soon as it is allotted.

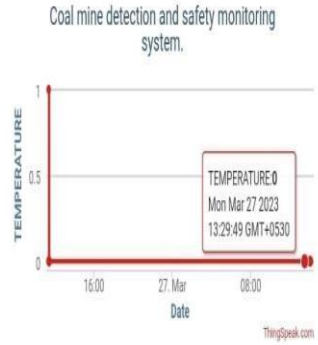
The outcomes of the coal mine safety system as seen through the Blynk app are shown in the figures above. In this programme, we can see two units, each with a set of sensors, with only one temperature in the range of 30,40, and so on, while the remaining data are all between 1 and 0. When the value is 1, there is no problem; however, when the value is 0, flames, falls, toxic fumes, and other hazards are recognised. When the value of the sensors reaches a certain threshold, an alarm message will be delivered to Blynk app users. It will supply the values displayed on the LCD display in each unit before sending the alarm message, as well as the buzzer sound for the alert message.**t**based totally programme consists of signals and a database in which readings from sensors are presented and inserted the usage of hardware. The use of the wireless community to growth mine safety is a solution for reaching each protection and development in mining initiatives. This look at objectives to automate the method of mining unit monitoring and handing over updates via cell networks. This gadgets hardware components talk with all the sensors. This project is used to optimise the utilisation of the mining subject without the intervention of human beings with the aid of using sensors that screen the environment and a microcontroller that switches on/off the buzzer routinely in the event of unstable condition maintaining mining operation these days necessitates ensuring the protection and well-being of employees and property. The employment of arduino, heartoline sensors, Temperature sensors, and position sensors inside sensors inside the improvement of coal mine security for employees maintains to screen mining protection and replace data at the IOT websites.

ISSN (Online): 2456-0448
International Journal Of Innovative Research In Management, Engineering And Technology
Vol. 9, Issue 3, April 2024

Output







Conclusion

The Arduino microcontroller is used to create a prototype for a mine safety system in this proposed method. This device is made from each hardware and software program factors. The hardware is made from several sensors, while the software program is

made of an Android software that connects to the Arduino board and other hardware additives via the internet of things. The android-based totally programme consists of signals and a database in which readings from sensors are presented and inserted the usage of hardware. The use of the wireless community to growth mine safety is a solution for reaching each protection and development in mining initiatives. This look at objectives to automate the method of mining unit monitoring and handing over updates via cell networks. This gadgets hardware components talk with all the sensors. This project is used to optimise the utilisation of the mining subject without the intervention of human beings with the aid of using sensors that screen the environment and a microcontroller that switches on/off the buzzer routinely in the event of unstable condition maintaining mining operation these days necessitates ensuring the protection and well-being of employees and property. The employment of arduino, heartoline sensors, Temperature sensors, and position sensors inside sensors inside the improvement of coal mine security for employees maintains to screen mining protection and replace data at the IOT websites

Reference

[1] Geetha, A.. (2014). Intelligent helmet for coal miners with voice over ZigBee and environmental monitoring. World Applied Sciences Journal. 20. 2328-2330. 10.5829/idosi.mejsr.2014.20.12.332.
[2] R. K. Kodali and B. S. Sarjerao, ”A low cost smart irrigation system using MQTT protocol,” 2017 IEEE Region 10 Symposium (TENSYMP), Cochin, India, 2017, pp. 1-5, doi: 10.1109/TENCONSpring.2017.8070095.
[3] R. K. Kodali and A. Sahu, ”An IoT based soil moisture monitoring on Losant platform,” 2016 2nd International Conference on Contemporary Computing and Informatics (IC3I), Greater Noida, India, 2016, pp. 764- 768, doi: 10.1109/IC3I.2016.7918063.
[4] R. K. Kodali and K. S. Mahesh, ”Low cost ambient monitoring using GSM,” 2016 2nd International Conference on Contemporary Computing and Informatics (IC3I), Greater Noida, India, 2016, pp. 779-782, doi: 10.1109/IC3I.2016.7918788.
[5] P. Vamsikrishna, Sonti Dinesh Kumar, Shaik Riyaz Hussain and K. Rama Naidu, ”Raspberry PI controlled SMS-Update-Notification (Sun) system,” 2015 IEEE International Conference on Electrical, Computer and Communication Technologies (ICECCT), Coimbatore, India, 2015, pp. 1-4, doi: 10.1109/ICECCT.2015.7226113.
[6] Salankar, Pranoti Anandrao and S. Suresh. “Zigbee Based Underground Mines Parameter Monitoring System for Rescue and Protection.” IOSR journal of VLSI and Signal Processing 4 (2014): 32-36.
[7] M. Ali, J. H. Alfonsus Vlaskamp, N. N. Eddin, B. Falconer and C. Oram, ”Technical development and socioeconomic implications of the Raspberry Pi as a learning tool in developing countries,” 2013 5th Computer Science and Electronic Engineering Conference (CEEC), Colchester, UK, 2013, pp. 103-108, doi: 10.1109/CEEC.2013.6659454.
[8] H. Li, ”Research on safety monitoring system of workers in dangerous operation area of port,” 2017 4th International Conference on Transportation Information and Safety (ICTIS), Banff, AB, Canada, 2017, pp. 400-408, doi: 10.1109/ICTIS.2017.8047796.
[9] A. Mishra, S. Malhotra, Ruchira, P. choudekar and H. P. Singh, ”Real Time Monitoring & Analyzation Of Hazardous Parameters In Underground Coal Mines Using Intelligent Helmet System,” 2018 4th International Conference on Computational Intelligence & Communication Technology (CICT), Ghaziabad, India, 2018, pp. 1-5, doi: 10.1109/CIACT.2018.8480177.
[10] V. Thirumala, T. Verma and S. Gupta, ”Injury analysis of mine workers: A case study,” 2017 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), Singapore, 2017, pp. 269-273, doi: 10.1109/IEEM.2017.8289894.