Raspberry-Pi base Advanced Safety Helmet for Mine Workers

Rahul G. Maprai
Department of E&TC,
PCCOER,
Ravet, Pune, India
rahul.mapari@pccoer.in

Chanakya Kumar Jha
Department of E&TC,
Siddhant College of Engineering,
Pune, India
erchankya@gmail.com

***Abstract*- Mining is world's most dangerous professions. In some nations, underground miners lack safety and social protection, be left to fend for themselves if injured. Additionally, there are adverse societal repercussions, including displacement and loss of livelihood. Mining has the greatest fatality rate of any industry. The most workplace fatalities poisoning, and electrocution. There are various case studies regarding underground mines; for example, a recent case study in China indicated that underground mining is the world's deadliest business. disasters, we developed a more advanced communication technology that must work in tandem with an intelligent sensing and warning system. The most critical component in every business is safety. are paramount in the mining business. To avoid mishaps, the mining sector takes critical safeguards.**

Keywords:Internet of Things, Global System for Mobile communication, Sewage Gas monitoring system

I. INTRODUCTION

In whatever form of construction, worker safety should always be a primary priority. Undergroundmining operations are a high-risk attempt in terms ofworker safety and health. The diverse procedures utilized to harvest various minerals are to blame for these hazards. The deeper the mine, the higher the risk. These worries about safety are especially severe in the coal business. As a result, worker safety should be a major priority in any sort of mining, whether coal or other minerals. Underground coal mining is more dangerous than open pit mining due to ventilation concerns and the possibility of collapse. The use of heavy machinery and excavation procedures, pose safety dangers in all types of mining. Modern mines routinely adopt a wide range of safety protocols, worker education and training, and health and safety requirements, resulting in substantial modifications and improvements in both opencast and underground mining. Coal India's principal and it has played rapid industrial development. Coal provides for around 70% of power generation, making its significance in the energy sector essential. However, additional byproducts of represent a possible the people involved. Instead, the current effort is a genuine attempt to analyze gravity real-time detection monitoring WIFI technology.

II. LITERATURE SURVEY

Nitin Asthana, 2 RidhimaBahl "IoT Device for Sewage Gas Monitoring and Alert System" [1] This project, which is based on a real-time detection and monitoring system for sewage levels, aims to provide intelligent solutions for monitoring harmful sewage gases. When a predefined threshold is exceeded, an alert is delivered to a remote observer who is monitoring the situation. The data is subsequently transmitted, along with various gas ppm levels indicating whether or not it is safe for the worker to clean or operate in that environment. The proposed system contains remote-monitoring IoT devices as well as an IoT platform. This includes calibrating industrial gas sensors and establishing suitable septic plant and facility threshold levels. If harmful gaseous elements in the system grows over time, the hardware is meant to send a pre-alert to the sewage worker, ensuring their safety. Numerous types of sensors sewage elements such as gas, temperature, and so on. When the threshold value is less than the sensed values, this system notifies the sewage worker/cleaner via SMS and phone call. By analyzing various toxic gases and graphing their results for real-time monitoring, this system aids in the prevention of hazardous diseases and thus serves a social cause. Sensor sample values were gathered the proposed system. Carbon monoxide and methane sensors detected levels exceeding the 2.3 and 60 parts per million (ppm) thresholds, respectively, and a GSM module was used to send an alert to the cell phone entered into the code.

Emmanuel Freeman1, Daniel Ayitey Quaye2, Israel Edem Agbehadji3 and Richard C. Millham4 "Nature-inspired search method for IoT-based waterleakage location detection system" [2] One of the issues that developing-country water distribution businesses encounter is discovering and reporting leaks on time. This study employs a nature-inspired search approach for optimal location search to water leakage sites for Ghana Water and Sewage Services Company. The nature-inspired technology supports in mapping IoT-edge computing devices used by water and sewage employees to discover and locate leaky pipelines, especially in cities and urban areas. When a water and sewage worker receive a trigger from any area indicating leaks, the algorithm generates location data that automatically processes the distance, geographic position, and direction. In this paper, a nature-inspired algorithm based on the performance of a Kestrel bird was used as the mapping function. The system was tested and assessed using pre-defined and randomly generated sites based on latitudes and longitudinal data. was pitted against. According to the data, the suggested KSA, which was applied as a mapping function, was successful in giving the optimal distance after collecting water leaking geographic position data from IoT edge computing devices.

Navin G Haswani "Web-based realtime underground drainage or sewage monitoring system using Wireless Sensor Networks" [3] Drainage is the system or process that removes water, sewage, or other liquids from a location, and its state should be checked on a regular basis to guarantee effective drainage performance. Manually monitoring all regions where a human cannot reach is, however, quite challenging. This contributes to the blocking of underground pipelines, and water overflows are thesource of the health problem. To solve all of these concerns, we designed and built a system based on a wireless sensor network. It is made up of small data- gathering devices. These sensing devices are known as nodes. The suggested system is a low-cost, low- maintenance, long-lasting, web-based real-time system that sends text messages to municipal officers when any manhole reaches a specified threshold value. The health of inhabitants and workers who clean underground drainage is directly impacted by this system. It also reduces mosquito- borne illness transmission, maintains a clean and healthy atmosphere, and regulates diseases such as malaria, dengue fever, and diarrhea. The system reduces the impact of an exposed manhole.

Jingwen Tian1,2Hao Wu2, and Meijuan Gao1,2 "Measurement and Control System of Sewage Treatment Based on Wire-less Sensor Networks" [4] As the global industry grows, sewage treatment is becoming increasingly crucial. The sewage farm's terrible atmosphere, on the other hand, poses a plethora of problems for the wireless system. This research presents a measuring and control system based on a wire-free Mesh network to address the issue. In this control system, we created a sensor node based on the AT89C2051 and nRF2401, which can collect the necessary local information to finish sewage treatment and monitor the machine's power to avoid an accident in the absence of a cable. The findings of the experiments reveal that this measuring and control system can automate the sewage treatment process while also monitoring system performance and worker convenience.

Amirhossein Malakahmad1 , Alan Giffin Downe2 , SitiDhamina Muhamad Fadzil1 "Application of Occupational Health and Safety Management System at Sewage Treatment Plants" [5] During wastewater processing, sewage treatment plant (STP) operators are exposed to a range of dangers. The purpose control these hazards utilizing an in a Malaysian STP (OSHMS). Initially, data on reported dangers were acquired through a study of literature, the distribution of questionnaires, and expert interviews. Based on the conditions of the chosen STP, the most dangerous dangers were identified. The hazards were then ranked in terms of severity and likelihood. The biggest worries of site workers, according to the research, are excessive noise, skin discomfort, and slip and fall. As a result, noise- cancelling devices were deployed to lessen noise. The usage of carpet and cardboard lowered the existing noise level (94.2 dB) to 92.1 dB and 90.6 dB, respectively. It is proposed that an auto-cleaner, self-cleaning bar screen, and scraper blades be installed at the site to limit the danger of skin irritation. Furthermore, cordoning off sections for cleaning and providing ramps at the cleaning area around the clarifier have been deemed to be adequate solutions for the slip and fall risk at the site. A new infectious disease has been discovered in the Chinese region of Wuhan.

III. OBJECTIVES

A. In every business, the most important factor is safety. Safety is of the utmost importance in the mining industry.

B. Security is an important aspect.

C. Our major goal is to prevent any type of mining accident.

IV. PROPOSED METHODOLOGY

- Safety is the most critical part of every industry. The mining business prioritizes safety and security. To avoid any form of accident, the mining sector takes several fundamental safeguards.
- Accidents continue to occur in underground mines as a result of rising temperatures, rising water levels, and methane gas leakage. Here, we ensure worker safety.
- If a worker is in danger, he can call security by pressing the panic button. To increase underground mine safety, a reliable communication system between subterranean mine workers and the fixed ground mining system must be built. At no time or under any circumstances should the communication network be disrupted. This concept proposes a low- cost wireless mine surveillance system based on IOT.

V. EXPECTED MODEL

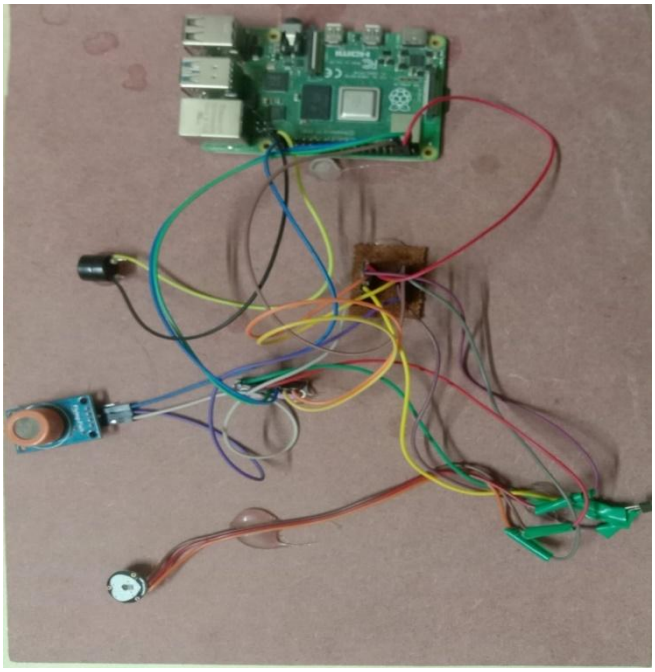

Fig. 1. Expected Models

Firstly, the hazardous gases are detected using gas sensors. Whenever the poisonous gas is detected the solenoid valve gets opened for providing oxygen supplements.

In the project raspberry pi is the main controller . System is able to monitor the health conditions of the worker as well as

surrounding conditions. Also, if the worker health disturbed system will send the alert message.

In the system temperature sensor, heartbeat sensor, smoke sensor , buzzer, WIFI module is used. Sensors will read the values and send it to the controller . If the conditions of environment changes like if smoke at the workers end increases system send alert. Hence our system is helpful for the worker. In future various artificial intelligence based techniques can be employed for improvement of proposed system [8-12].

VI. ADVANTAGES

- Assuring miners safety in case of mining accidents that occurs due to increase in temperature, pressure, force.
- To help the coal miners inside the mines to communicate with the outside world.
- To monitor the conditions inside the mines and intimate the miners in case of emergency.
- GPS is used to track the position of miners.
- Alerting the miners whenever the helmet is removed

VII. DISADVANTAGES

Smart helmets mainly use inexpensive and lightweight sensors. Therefore, there is a possibility that the sensor malfunctions frequently, and a false alarm occurs.

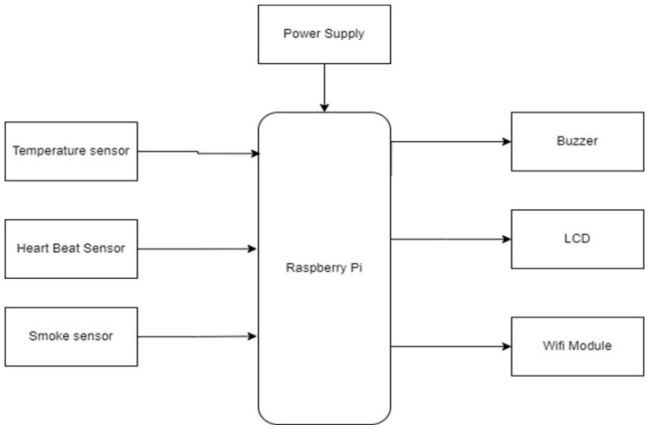

Fig. 2. Block Diagram

VIII. APPLICATIONS

- Mining industries
- Construction sites
- Disaster prevention
- Rescue request
- Police services

IX. FUTURE SCOPE

- To avoid the range issues, we can attach aSignal/network Catcher.
- For better communication Walkie Talky canbeadded.
- To date, there has been in-sufficient researchon the security and privacy of data collectedby smart helmets through sensors. It can beimprovedtomaintaintheprivacyofdatacollection.
- SmallFans Can be added.

X. CONCLUSION

Theproposedmethodologyaidsinboththepreventionofworkplaceaccidentsandthepreservationofsociety'scleanliness.Thesmart safetygadgetislessexpensiveandmorequicklyconnects to the WSN and transmits data to both the concerned department and the emergency department. The proposed device teaches the worker he fundament also the gas level and signal light. The smart device is deployable and used all over the world, and it also aids in the monitoring of sewage overflow. The future work could take the shape of an Android app that is linked to a smart safety device and sends notifications of drainage overflow and gaslevel via the smartphone. Furthermore, the Android application can send a notification with the current worker's position. This deployment has resulted in favourable outcomes.

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