International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 07 | July 2022 www.irjet.net p-ISSN: 2395-0072

WORKER SAFETY HELMET and MINING TRACKING

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Abstract - Mining provides work to millions of population, but the working conditions of the mining people are very poor. The workers travel deep into the mine andstay till evening in the place where the oxygen levels are low. Large explosives are used everywhere which complicates the workers duty both physically and mentally. IOT has a great importance with varying applications drawing attention to its construction [1]. To the contrary side the main objective of this research is to make the workers safe for mining industry applications which would be monitored by the system on the grounds of hazardous events such as temperature, humidity, gas. Once, there is a hazardous situation the workers press the panic button and the people on the other side would nowthat there might be some danger in the mine and thus the people are saved.

Key Words: **micro controller, temperature sensor, LCD display, mining, wireless network, panic button.**

1. INTRODUCTION

Mining has become a necessary task to the extraction as well as creation of various goods, infrastructure and many services which enhances the quality of life. As a result, a mining trackingand a safety helmet is proposed by our team to the mining industry using Atmega microcontroller based circuit. This makes use of RF circuit[2]. RF stands for radio signals and particularly these signals are being used for this project as they can only sustain and suit the conditions of a mining site. Blynk application is used to get the notifications and cloud is also provided by the same platform. The notification is received to the targeted mobile phone or aweb page. However, the utilization of heavy machinery and the methods performed during excavations result in risks in all types of mining [3]. The Chasnala mining disaster that took place near Dhanbad in the Indian state of Jharkhand almost killed 372 miners. This was considered as one of the worst disasters in the mining industry. Once, a person enters the mine, they would not be aware of external environmental conditions that takes place inside and outside the mine and this would result in discovering such devices for the safety of the mine workers.

LITERATURE REVIEW

The advancements in the technology made the detection of mines much more practical. The well-being of coal miners had moderately the key element of the world. According to statistics, in the recent years, there were many mine accidents occurred. In some countries like China, we observe that the production level is up to 35% but the accident cases account up to 80% of the world[4]. This causes a great damage to the economy and human lives. Thus, prevention should be taken to avoid dangers in mines. Most of the disasters in mines occur due to the environmental conditions. As mines are very deeper into the earth, the dangerous situations in the exploited areas would not come into limelight.

Laying large cables through the mine would not be an easy task and may consume much time. Therefore, mine monitoring systems comes into existence and they play a vital role in caring for the mining workers.

The implementation of mine monitoring systems are made with the use of wireless sensor networks becomes important and it is a necessary task because it uses modern technology and gets rid of the limitations caused by the traditional approaches. Tracking with humans takes much time and constitutes many consequences. The location of the miner may be within the mine but we could not find his exact location. It may rarely happen that the miner would go to a different place forgetfully without any intimation[5]. Thus, to overcome such situations wireless networks have come into usage. Wireless Sensor Networks are an essential source for any device making at present. WSN is basically a collection of data using no wires. A WSN is an infrastructure which has no wired connections and has only less number of wires in an adhoc manner used physically in systematic environmental conditions. This miniature sensors are a bit expensive in contrast to the old sensors which were originally in use and are more advanced.

- Laying of cables is not required and is easy to install, reduces the machinery and cost of the monitoring system.

• The concentrated nodes make sure that the data is transferred with great precision and optimal data transmission which is further suitable for mine's environment.

SYSTEM OVERVIEW:

The workers would be allowed only when the RFID tag is scanned. Once the RFID tag is scanned, the authorized worker gets the access to enter the mine. They would enter the mine andcomplete their work and then they would ask for exit entry[6] . Then they would be permitted to come out of the mine. This seems to be happy as there is no hazardous situation in the mine.

What if there would be a hazardous situation? Here, our system come into usage. The worker's helmet has a panic button which is technically an RF transmitter and passes RF signals and communicates with the RF receiver at the base station [7]. RF stands for radio signals and particularly RF signals are been used for this project as they can only sustain and suit the conditions of a mining site. Blynk application is used to get the notifications and cloud is also provided by the same platform. When the panic button is activated, the signal is transmitted from the transmitter to the receiver and then it receives the signal and then displays an emergency notification on the LCD display of the monitoring system. The onboard controller is connected to an IOT board, which is our system's node MCU. It sends an SMS alert to the programmed person and displays an emergency text. When the work is completed and the worker uses the button, the LCD displays a message "WORK IS DONE PICK UP REQUEST", but when there is a hazardous situation and the worker uses the button, we will hear a buzzer sound and there would be a message on the LCD display like "WORKERS AREAT DANGER". Therefore, the workers are tracked based on which mine they are sent to onthe basis of RFID tags. Thus, the person's safety is ensured on a condition that he wears thehelmet [8]. The helmet is been linked and processed via a rf based tracking system which in the coordination with the tracker rf systems

Reader-based tracking systems merely detect when a tag and a reader are within RF range of eachother. When a tag is recognized by a reader, the miner's position becomes associated with the location of the fixed component (tag or reader)[9]. The resolution or distance within which the miner is located is determined by the spacing between fixed-position components. In this way an RFID tag is scanned [10].

In the existing system, mining helmet ensures the protection, but being aware of the conditions of the environment such as high humidity and temperature, the workers may sometimes take off the helmet which causes high injuries to the person under any hazardous situations[11]. In other cases where mine does not have proper facilities, it is impossible to have a seamless conversation between the

EXISTING SYSTEMS:

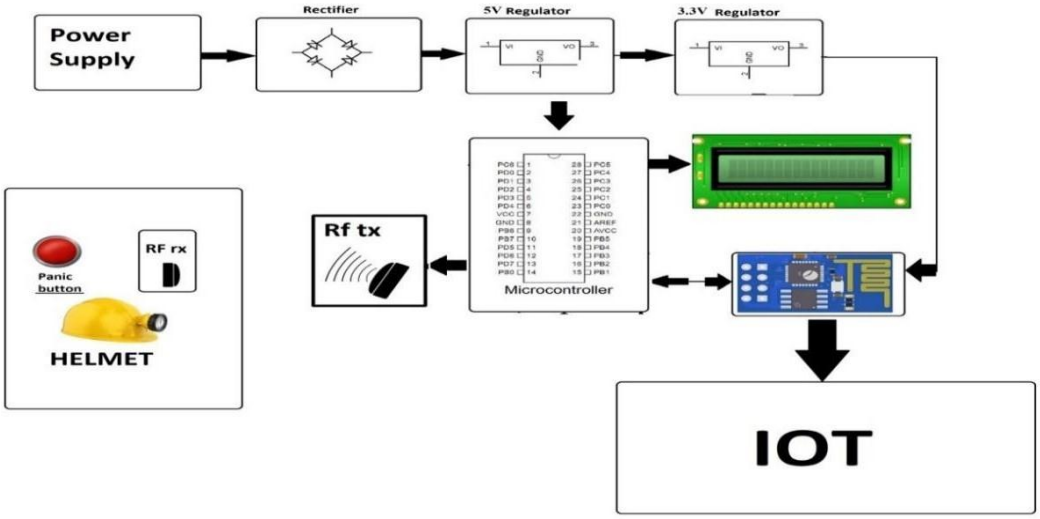
Many systems are being used for the transmission of data inside the mines. These data transmission systems include GSM, GPS, RFID, Zigbee etc. Such approaches are being established to maintain the data transfer through the mines [12]. All these systems are better in its way but it works more efficiently when integrated with other techniques. Each of these have its own limitations.

GPS: GPS is abbreviated as Global Positioning System and is the most prevalent communication system. It is a satellite communication system [13]. It is used for large coverage area communication, but it could not be efficient for underground mines. GPS do not need a user to transmit the data. It operates independently without any internet or telephone [14]. Such technology helps us to find the location of a person. It is mostly used in military, civil and commercialized services all over the world. The government of US created a system and maintains it and makes it accessible for the users [15] . With the help of satellites, GPS helps us to know the fastness of the motion of the object and its direction of motion and the height it travels etc.

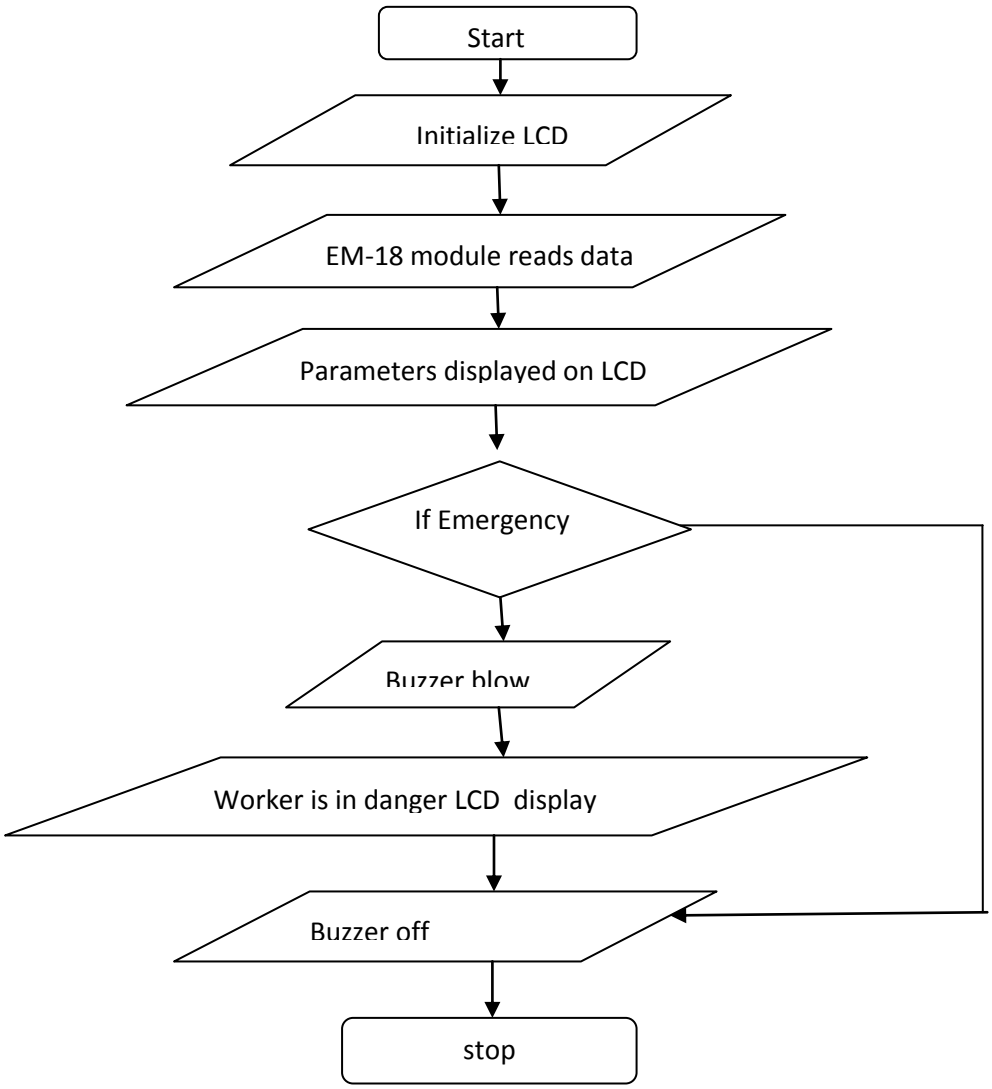
GSM: Global System for Mobile Communication can be used for wide coverage area but when used for underground mines, these would be delay in communication and this leads to be a disaster [16]. GSM is accepted all over the globe for standard digital cellular communications systems. It uses TDMA and provides speech and message services along with roaming services. Roaming is the capacity of using our GSM mobile number in other GSM network [17]. GSM manages the customers and the device in many ways. Mobile numbers, customers and equipment identifiers are some of the known ones.

RFID: This mechanism is very much better to locate the underground miners. It does not need the line of sight to transmit or receive data. This system is highly sophisticated but has a limitation. RFID tag consists of two components namely reader and tag [18]. Reader is a system which consists of one or more antennas and it emits radio waves and then receives signals back from RFID tags. The reader of RFID is connected to network and is movable or fixed. It makes use of radio waves to send the signals that enables the tag.

BLOCK DIAGRAM



FLOW CHART



COMPARISON TABLE:

Table 1: Comparison of Proposed and Existing Systems

S.NO	EXISTING SYSTEMS	PROPOSED SYSTEM
1.	No sensors were used back then in mining industries.	IR sensors are been used in the miningindustries at present
2.	No microcontrollers were used in thepast in mining industries.	Now, a wide variety of micro controllers have been used with the advancements inthe technology.
3.	The worker might have used a helmet for safety but it was not integrated with a panic button.	The worker helmet is equipped with apanic button right now.
4.	Wireless network was not used backthen.	Wireless network is being used right nowwith the advancement in technology.
5.	Existing helmets were just the basichelmets.	These helmets are the smart helmets which ensures the safety of the worker.

CONCLUSION

To finally conclude, a smart helmet has been designed in order to help the worker from the dangerous situations if any. This system provides us a clear and point-to-point perspective of the underground mine system and provides reliable communication using IOT. Hence, it would be beneficial to the miners present inside the mine and ensures the safety of the workers.

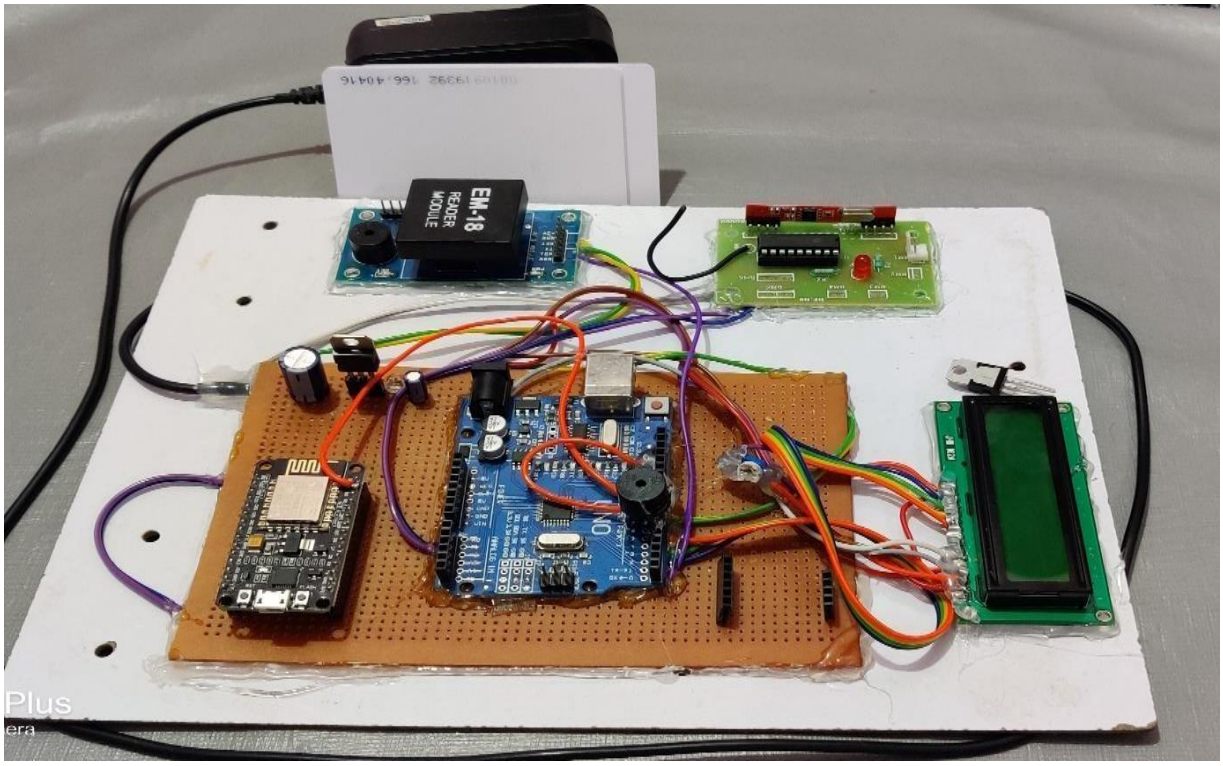


FIGURE 1

FIGURE 2.

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