

A Technical Review on IoT Based Mining Tracking and Safety Helmet

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ABSTRACT- In the mining field IOT has a great importance with varying applications drawing attention to its construction. To the contrary side the main objective of this research is to design smart helmet system for mining industry application which would be monitored by the system on the grounds of hazardous events such as temperature, humidity, gas, removal helmet of the miner and obstacle damage to the helmet. IOT based mining tracking and safety helmet made the working of the workers in the mining field much easier as compared that to the past decades. Detecting the upcoming challenges in the surrounding areas of the mines under suitable circumstances over the past few decades it helped the workers working in the mining field to come up with various solutions in a matter of time which caused a huge advantage during the work.

KEYWORDS- Smart helmet, industrial application, detection system, wireless communication.

I. INTRODUCTION

Mining now a days has been a necessary task to the extraction as well as creation of various goods, infrastructure and a huge number of services thus enhancing the quality of their lives. Frequently the underground environment is a bit unpleasant though shaky as well. As a result, a mining tracking and a safety system has been proposed by our team to the industry using atmega microcontroller based circuit on each of the worker helmet. The type of circuitry system which has been used to detect the workers displacing through the different parts of the whole mining site is the rf based circuitry system. The helmet is been linked and processed via a rf based tracking system which in the coordination with the tracker rf systems; help provide data over IoT [1]. System makes the use of atmega microcontroller based rf tracker circuitry in order to receive the various kinds of the data transmissions by worker's helmet nodes thereby mapping current location of the workers throughout the mining field. The worker's helmet has been advanced via the help of emergency/panic buttons which is developed well with the help of an emergency sign been designated over the whole IOT web platform about the particular emergencies such as the toxic

gas inhalation, physical injuries etc.. In the underground mining systems, ventilators play the crucial role in providing sufficient oxygen maintaining a suitable environment without any hazardous events taking place. Use of canaries and other animals to alert miners for monitoring mining atmosphere are the primitive techniques which can be traced back to prevent the mining atmosphere from becoming much more toxic or uncomfortable for the workers to work than as before [2]. To be more précised safety on side is all about removing the risk from the job, and the miner from unnecessarily hazardous operations. New, creation of correspondence and the above followed systems which can be used to monitor mines more efficiently and for transferring the information to the ground(surface). At last the progression and advancements of technology has been allowing the mine monitoring techniques to become more précised, understandable and easy to get the use of it yet explosions may still occur in the mines which are located underground, so the preventive measures needs to be taken in order to handle the emergency situations in the mining fields [3]-[4].

II. PROPOSED METHODOLOGY

Figure 1 depicts the proposed methodology for safety helmet. A mining tracking as well as safety system for the mining industry using microcontroller based circuit on the work helmet has been shown above in the form of a block diagram which has been displayed by using rf based circuitry specially to detect worker's movement in mining field site from one place to another. The integration of the helmet with the rf based tracking system makes use of atmega microcontroller to receive the data through the helmet nodes. Each helmet is also designated by the panic/emergency buttons which can prevent the workers from the unsuitable atmosphere in the mining site which includes many risk factors such as harmful gas inhalation, cave ins, physical injuries etc. Tracking systems which are used for tracking in this project have a huge compatible capacity to track and prevent the mining site from the various hazardous events which may take place thereby causing harm to the workers working in the mining site.

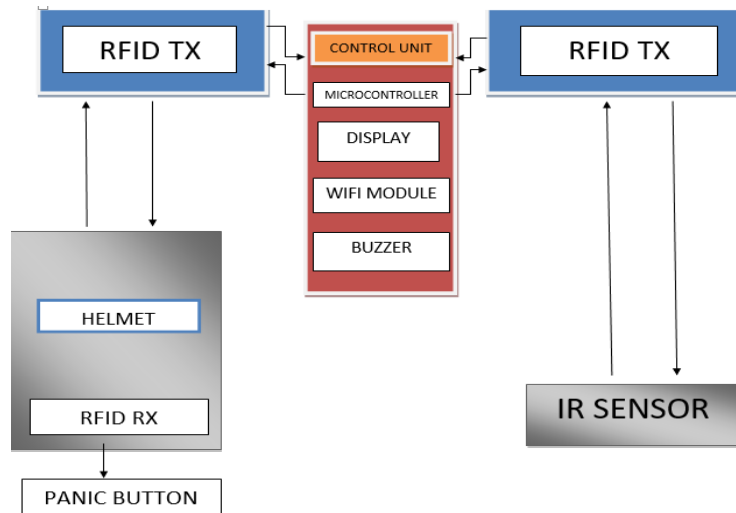


Fig. 1: Proposed Methodology for Safety Helmet

III. RESULTS & DISCUSSION

To start with the comparison, the following points may be jotted down stating the advantages and disadvantages of the mining tracking system being used previously and that of the mining tracking system being used by the workers in the mining industries. Table 1 highlights the comparison of proposed and existing systems.

Through the above comparison it can be clearly stated that there was a huge difference between the previously mining tracking system to that of the advanced mining tracking system in the terms of tools, technical advancements, circuitry systems as well as the communication techniques for the establishment of the advanced database through the helmet nodes.

Table 1: Comparison of Proposed and Existing Systems

S.No.	Existing System	Proposed System
1	No sensors have been used back then in the mining industries thereby not assuring about any of the upcoming unstable circumstances to the workers working in the mining industry [5].	IR sensors are been used in the mining industries now a days thereby assuring all the upcoming unstable circumstances to the workers working in the mining industry.
2	There was no use of any kind of the microcontroller back then in the mining industries [6].	With the help of advancements been introduced currently use of atmega microcontrollers has become a common task to receive the database from the helmet

		nodes.
3	The worker helmet circuit were not integrated with an emergency/panic button [7].	Currently each worker helmet circuit is been linked via panic/emergency buttons.
4	Option of wireless communication was not available in the previously based mining tracking systems [8].	Option of wireless communication is available with a lot of advancements in the techniques now a days.
5	This type of mining tracking system made the work of the workers in the mining industries much more difficult and harder thereby not giving any clue about the upcoming hazardous situations which can be faced by the workers during mining [9]-[10].	To the contrary side it made the work of the workers working in the mining industries much easier with the technical advancements thereby giving each and every clue about the upcoming hazardous situations which can be faced by the workers during mining.

IV. CONCLUSION

To finally conclude, we can state that in this following project a smart helmet has been developed which was designed to help workers get out of the various hazardous risk factors while they are working in the mining industries. The integrated features of the hardware components have been kept in accordance and series while making this project. In today's generation mines are using IoT for specific tasks in various stages of mining such as detection, positioning equipment, locating personnel and real-time tailing dam monitoring. Also, to be more precised significance of each block has been resonated out and placed carefully, thereby making sure the perfect and tremendous working of the whole unit. There has been no use of the integrated infrastructure for the use of recording and storing the unorganized database. With the help of this way the data can be easily processed by assigned professionals and the results will be really easily to gasp the format such as graphs or tables for the use of managers and in-filed employees. High- coverage network, high-capacity data storage, a user-friendly data management platform and training operation crews are the various challenges which have been faced while working on this project.

The result is that the mines can be safer for workers, more cost-effective and efficient to operate using IoT. For the time being IoT is being used to make energy consumption more efficient, making a smart environment in the mining sites, optimizing risk management and mitigation plans etc. which are a handful of applications of IoT in the mining industry. At last it can be stated that the system is reliable with the simple and easily available components making this project very light weight, portable and compatible for use.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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