Secure Mining Monitoring System Using Li-Fi

L.K.Hema, Chandan, Ram Bharadwaj, Vishwas Gowda

Abstract: *In the paper we would like to propose a mining monitoring system using li-fi. This system defines the safety of employee working in mining area under stimulated conditions. In any mining, establishment of strong and continuous communication between workers and sever is essential to alert them during unpredictable condition. There are many parameters like water level, emission of poisonous gases, vibration like cracks of earth core, changes in temperature, humidity changes, noise and dust, air-flow should be monitored continuously for the safety of the life working inside mining area.*

Keyword: Microcontroller, Internet of Things , Transmitter and Receiver Section.

I.   INTRODUCTION

Mining is a process of getting the essential raw materials From the earth crust and transforming them to Requirement there is a vast demand for raw materials Obtained from mining due to excess need of these hence Mining activities Have simultaneous increased in deed People in mining Activities have also increased. These Activities have high risk and danger involved in it causing Inquiry and life risk because of changes that places in Earth core.Huge mass are involved in mining activities therefore Continuous monitoring of them is major factor since They are exposed to hazardous environmental parameters Previously there was humanoid monitoring that is Sending individual for checking the environmental Parameters and report back but this was long and Dangerous process since there was risk of monitor Life too. The prime focus of this paper to develop a system to monitor the people working in mines without any human intervention.

II. PROPOSED SYSTEM

The human death mortality ratio is increasing due to mine explosion and other unexpected casualties during the mining operation and to overcome this currently Wireless sensor Network based systems are deployed to monitor the physical condition of the miners and to monitor the environmental condition. The mine working people are equipped with the sensors based equipment to prevent themselves from the hazardous condition.[1] [8]

During the abnormal condition like explosion or poisonous gas emission occurs, it will indicate to the miners and to the control room about the status of the mine workers in order to avoid major accident.[4],[5] This paper focuses on developing a wireless module that senses various physical parameters in the mining environment and they are transmitted to the control centre for better monitoring and accordingly preventive measures will be carried out. The sensor data processing and actuation will be carried out by PIC microcontroller.[2]

III. PROPOSED SYSTEM DESIGN

The hardware module consists of Transmitting section. Receiver section and the processed information from the receiver module will be transmitted to the control centre via IoT module.

1. Receiving section

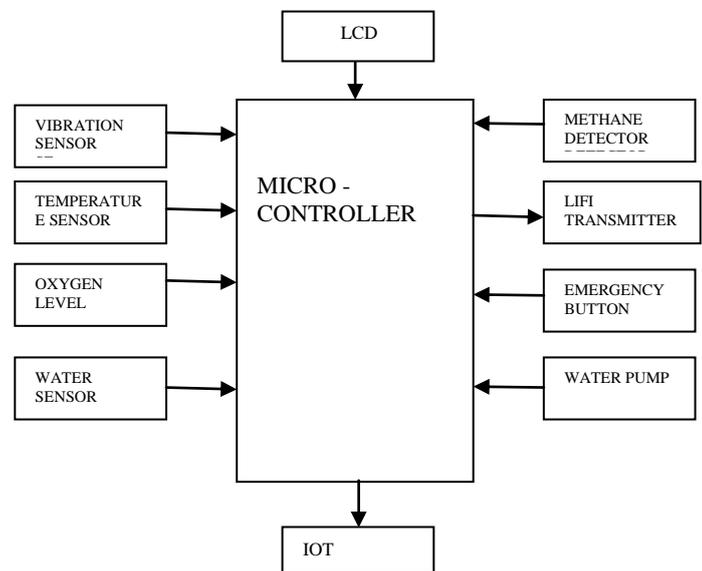
2. Transmitting section

Fig 1. System design diagram

IV. BLOCK DIAGRAM DESCRIPTION

The system consists a transmitting and receiving section. The transmitter Section consisting of vibration sensor, temperature sensor, water level sensor, oxygen sensor, methane detector, water pump, Emergency buzzer, LCD, LED and PIC16F877A.

The Receiver section consisting of IOT and server is nothing but PC. In this paper, it is proposed to design an IOT which is used for Mining Environment Monitoring System using Li-Fi.

A. MicrocontrollerAtmega 308

This device is used for memory storage and data storage. It functions as server room for receiving and transmitting data from the monitoring device chain.

B. IOT

To overcome the challenges and shortcomings of traditional system in mining monitoring such as flexibility to the mine workers, adaptation to the system to the real time variations in mining environment, and less coverage. The latest technology called Internet of Things (IoT) where sensors deployed with systems interact lively will provided a network of sensors with the integration of RFID and wireless communication for safety to the miners. This will improvise the exchange of information among the system without any human intervention. The monitored data shall be stored in cloud for future processing. Thereby this IoT based system assures the following features of automation, self-reliance and smart control.[6]

C. Sensors

Different types of sensor for oxygen monitoring, vibration sensing and temperature variation are integrated wit the Li-Fi based system to monitor the respective parameters.

V. LI-FI

Light-fidelity (Li-Fi) is a wireless communication technology where data transmission is happening at high speeds via the visible light spectrum, UV and infra-red radtions.This technology of data transmission is more advantageous in terms of wider bandwidth, less interference due to electromagnetic waves.

VI. OUTPUT ANALYSIS

The overall system module with the transceiver modules incorporated with the IoT module is shown in Fir. 3. The sensors deployed in the system senses the environmental conditions such as temperature, vibrations if any, oxygen level, poisonous gases namely methane and they are transmitted to the receiver module and through IoT module these information are stored in the server for future course of action. The module is tested for various conditions and locations and the setup gave accurate measured values.
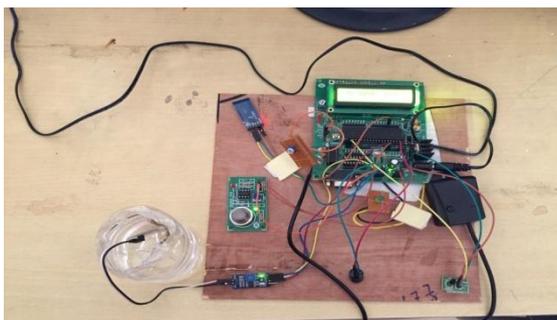

Fig 2. Snapshot of the prototype

VII. CONCLUSION

This Li-Fi based wireless sensor network ensures 100 % safetyto the workers in coal mine environment. The light based wireless communication ensures more flexible and can avoid of rewiring thereby greatly improving the system efficiency, functionality and yields The system is tested for various environment conditions and the proper actuation is also carried out. In the system designed the information collected from the mining environments are stored in the personal computer and they can be used to prevent the hazards by properly analysing the vital information thereby mishap can be totally avoided.

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