

COAL MINE SAFETY SYSTEM

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Abstract: Now a day's due to global warming and climate changes there are challenging situations in field of coal mine. To lessen the cost and improve the profitability alongside item quality the automation in the field of coal mine-shaft is in reality vital, which will likewise decrease the diggers endeavors. This paper proposes a design of a RTOS with the help of controller which is able to monitor the temperature, Light intensity, gas and status of smoke in an underground mine. This framework additionally controls the ventilation request to excavator's contingent on present atmosphere conditions inside the mine field. This system utilizes low power, cost effective a temperature sensor LM35, LDR, smoke detector, gas sensor for sensing the mine climate parameters and Priority based processing using Real time Operating System. Customary coal mine-shaft checking frameworks will in general be wired system frameworks, which assume a significant job in coal mine-shaft safe creation. With nonstop amplifying of misusing zones and augmentation of profundity in coal mineshaft, numerous path ways become dazzle zones, where in there are loads of concealed threats. In addition, it is badly designed to lay links which are costly and devour time. In order to solve the problems, we will design a coal mine safety monitoring system based on RTOS Robot module, which can improve the level of monitoring production safety what's more, diminish mishap in the coal mineshafts Wireless sensor systems is made out of countless miniaturized scale sensor hubs which have little volume and minimal effort.

Keywords: coal mine safety, RTOS, mine-shaft, LDR, ventilation.

I. INTRODUCTION

Underground mining operations proves to be a adventure as far because the security and health of workers are concerned. These risks are because of different techniques used for extracting different minerals. The deeper the mine, the greater is that the danger. These questions of safety are of grave concern especially just in case of coal industries. Thus, safety of workers should be of major consideration in any kind of mining, whether it's coal or the opposite minerals. Underground coal mining involves a far better risk than open pit mining because of the problems of ventilation and potential for collapse. However, the utilization of heavy machinery and thus the methods performed during excavations result into safety risks altogether kinds of mining. Modern mines often implement several safety procedures, education and training for workers, health and safety standards, which cause substantial changes and enhancements and safety level both in opencast and underground mining.

Coal has always been the primary resource of energy in India, which has significantly contributed to the rapid industrial development of the continents. About 70% of the power generation depends thereon thus; the importance of coal in energy sector is indispensable. But the assembly brings with it the other by products, which proves to be a possible threat to the environment and thus the people associated with it. In lieu of that this work could also be a sincere attempt in analyzing the graveness and designing a real time monitoring system of detection by using the RTOS technology. In underground mine, ventilation systems are critical to supply adequate oxygen, maintaining non-dangerous and non-lethal environments and an efficient working mine. to observe an underground mine, can help killing high hazard environments. Sudden changes within the ventilation are identified by the monitoring system,

permitting quick move to be made. New and creating correspondence and following systems are often used to monitor mines more proficiently and transfer the knowledge to the surface.

The safety problems with coal mines have gradually became a serious concern for the society and nation. The occurrence of disasters in coal mines is mainly due to the harsh environment and variability of working conditions. So, it makes the implementation of mine monitoring systems essential for the security purpose. Wired network systems want to be a trend for traditional coal mines, which have really played a big role in safely production in coal mines. With the continual enlargement of exploiting areas and depth expansion, laneways became blind zones, where numerous unseen dangers are hidden out. Moreover, it's impossible there to get expensive cables, which is additionally time consuming. So, it's essential to possess a wireless sensor network mine monitoring system, which may be disposed in such mines so as to possess a secure production within. This robot has earned a significant worldwide attention in current scenario. It is often useful for medical, environmental, scientific and military applications.

II. LITERATURE SURVEY

A writing overview is a collection of content that plans to survey the basic purposes of current information including substantive discoveries just as hypothetical and methodological commitments to a specific point. Writing audits are auxiliary sources and, for example, don't report any new or unique trial work.

As of late, the incessant coal mineshaft security mishaps have caused genuine setbacks and enormous monetary misfortunes. It is pressing for the worldwide mining industry to increment operational effectiveness and improve generally

mining wellbeing. This paper proposes a lightweight mash up middleware to accomplish remote observing and control mechanization of underground physical sensor gadgets. To begin with, the group tree dependent on ZigBee Wireless Sensor Network (WSN) is conveyed in an underground coal mineshaft, and propose an Open Service Gateway activity (OSGi)- based uniform gadgets get to system. At that point, propose a uniform message space and information dissemination model, and furthermore, a lightweight administration mash up approach is actualized. With the assistance of representation innovation, the graphical UI of various underground physical sensor gadgets could be made, which permits the sensors to consolidate with different assets without any problem. In addition, four sorts of coal mineshaft wellbeing observing and control mechanization situations are delineated, and the presentation has likewise been estimated and dissected.

Checking information in coal mineshaft is basically information stream. With the difference in condition, coal mineshaft observing information stream suggested idea floats. Coal mineshaft wellbeing assessment can be viewed as idea floating information stream arrangement. The technique proposed right now dependent on irregular choice tree model, and it utilizes Hoeffding Bounds imbalance and data entropy rather than arbitrary determination to decide the split point, and it utilizes the edge controlled by Hoeffding Bounds disparity identify idea float. Test results show the strategy can all the more likely recognize idea floats in information stream, and it has better grouping precision for information stream, and it gives another reasonable way to deal with coal mineshaft wellbeing assessment.

It used to be hard to definitely comprehend the circumstance of diggers underground as indicated by the existed excavator wellbeing the board framework. To take care of this issue, we propose an improved security the executive's framework dependent on iris recognizable proof and RFID (Radio Frequency Identification) strategy. It joins a few present-day distinguishing proof and correspondence systems, for example, iris recognizable proof, RFID, PC systems and database strategy. Iris distinguishing proof strategy is utilized to recognize the diggers by the physiological qualities of iris and explicit database for each individual is work to record the exact participation data.

Additionally, RFID is utilized to acknowledge constant following diggers underground. Down to earth results show that the improved excavator wellbeing the board framework can tally the quantity of diggers underground precisely and on schedule, giving the dependable and helpful data for day by day digger the executives and crisis salvage. The improved framework has high caliber of unwavering quality, veracity and security.

So as to ensure the security of the coal creation and viability better, this paper plans a checking framework for coal mineshaft wellbeing dependent on remote sensor systems, and gives the equipment structure of sensor hubs and the flowchart of programming. To meet prerequisites of observing signs, the framework utilizes nRF2401 for short-extend remote interchanges, GPRS for significant distance remote correspondences, ARM9 for focus reassure, and MSP430F149 is picked as the chip. Focus support utilizes Em

GIS (embedded GIS) to show where catastrophes of coal mineshaft break out and utilizes GPRS to transmit SMS to the mine war room. The framework can improve the degree of checking creation wellbeing and decrease mishap in the coal mineshaft.

III. EXISTING SYSTEM

At present, the coal mineshaft gas observing framework is commonly made out of the checking sensor, underground segment, data transmission framework and surface focus. The intersection between the underground substations with the surface place make out of the data transmission framework legitimately impact on the transmission nature of data and venture cost of the framework. The data transmission framework can be divided into 3 sorts as indicated by their structure: spiral, roundabout, tree. The tree framework is generally utilized by the majority of the coal mineshafts at present, simultaneously one substation is gotten together with a few observing signs in order to decrease the framework branches and all the substations undermine join the framework link close by which originates from the surface community with underground substations at the state of equivalent checking limit.

IV. PROPOSED WORK

The way to controlling coal mineshaft mishaps the forecast of upheaval by executing sensors and microcontrollers and to create a caution framework. A nonstop checking is fundamental which again requires some successful and precise detecting framework. A few procedures are embraced to detect the nearness of these toxic gas, among them utilization of semiconductor type gas sensor is particularly powerful. These sensors can be mounted in the coal mineshaft zone however some time these make a few issues in mining as well. Unintentional harm of the sensor gadget frequently occurred. Another method is the utilization of robot. These robots are compelling however cost of robot is high. Be that as it may, there is another method for getting viable and ease arrangement of sensor implantation. it is on the wellbeing head protector of the coalmine laborers. A shrewd security head protector having sensor exhibit to detect information and a remote modem to transmit it. The cap is the main wellbeing gear diggers will in general keep on, this is the place the new wellbeing hardware was included to. This module does all the preparing and furthermore controls the wireless correspondence between discrete head protectors. The entire framework was investigated all through the structure procedure so as to downplay the force utilization as the framework is running on battery power. Various sensors were considered for each different segment so as to keep the force level as low as could be expected under the circumstances. The framework comprises of six components, helmet evacuate sensor, individual fall recognition sensor, air quality sensor, information handling unit, remote transmission and alerting unit.

V. BLOCK DIAGRAM

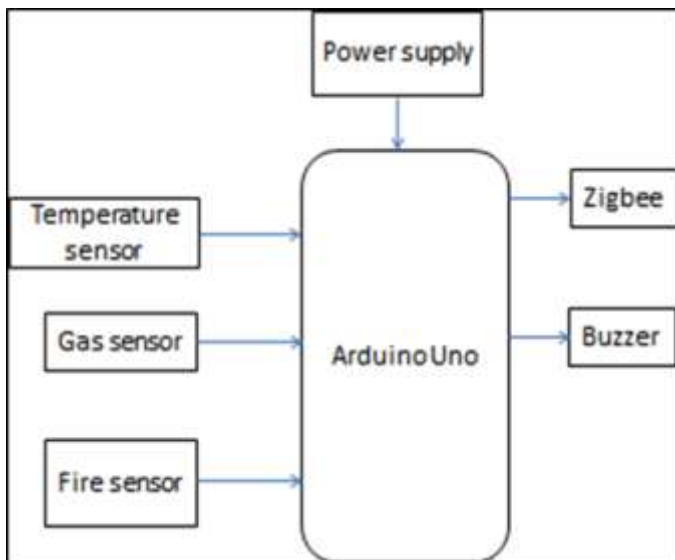


Figure.5 Block diagram of proposed system

VI. HARDWARE REQUIREMENT

ATMEGA 128p (UNO):



Figure.6.1 Atmega 128p(UNO)

A miniaturized scale controller may be a little PC on a solitary coordinated circuit containing a processor centre, memory, and programmable info/yield peripherals. A micro-controller contains the processor (which all PCs have) and memory, and some information/yield sticks that you can control. (regularly called GPIO - General Purpose Input Output Pins). We will utilize the Arduino Uno board. This consolidates a small-scale controller alongside the entirety of the additional items to make it simple for you to fabricate and investigate your activities. The Uno is a micro controller board dependent on the ATmega328P. It has 14 computerized input/yield pins (of which 6 can be utilized as PWM yields), 6 simple data sources, a 16 MHz quartz precious stone, a USB association, a force jack, an ICSP header and a reset button. It contains everything expected to help the micro controller; just associate it to a PC with a USB link or force it with an AC-to-DC connector or battery to begin. You'll tinker together with your UNO without stressing tons over accomplishing something incorrectly, most dire outcome imaginable you'll substitute the chip for a few of dollars and begin once more. "Uno" signifies one in Italian and was picked to check the arrival of Arduino Software (IDE) 1.0. The Uno board and form 1.0 of Arduino

Software (IDE) were the reference variants of Arduino, presently advanced to more up to date discharges. The Uno board is the first in a progression of USB Arduino sheets, and the reference model for the Arduino stage; for a broad rundown of current, past or obsolete sheets see the Arduino list of sheets. This is a moderately simple approach to make circuits rapidly. Breadboards are made for doing brisk trials. They are not known for keeping circuits together for quite a while. At the point when you are prepared to make an undertaking that you need to remain around for some time, you should consider an elective strategy, for example, wire-wrapping or fastening or in any event, making a printed circuit load up (PCB). The principal thing you should see about the breadboard is the entirety of the openings. These are separated into 2 arrangements of segments and a lot of lines (the columns are partitioned in the middle). The sections are named a, b, c, d, e, f, g, h, I, and j (from left to right). The columns are numbered 1 - 30. (through and through). The segments on the edges don't have letters or numbers. The segments on the edges are associated start to finish within the breadboard to make it simple to supply force and ground. (You can consider ground the negative side of a battery and the force as the positive side.) For this book our capacity will be +5 volts. Within the breadboard, the openings in each line are associated up to the break in the board. For Example: a1, b1, c1, d1, e1 all have a wire within the breadboard to associate them. At that point f1, g1, h1, i1, and j1 are completely associated. however, a1 can't to f1. This may sound confounding now; however, it will immediately come to bode well as we wire up circuits.

TEMPERATURE SENSOR:

When all is said in done, a temperature sensor is a gadget which is planned explicitly to quantify the hotness or frugidity of an item. LM35 is an exactness IC temperature sensor with its yield corresponding to the temperature (in °C). With LM35, the temperature can be estimated more precisely than with a thermistor. It likewise has low self-warming and doesn't cause more than 0.1 °C temperature ascend in still air. The working temperature go is from - 55°C to 150°C. The LM35's low yield impedence, straight yield, and exact natural adjustment make interfacing to readout or control hardware particularly simple. It has discovered its applications on power supplies, battery the executives, machines, and so on.

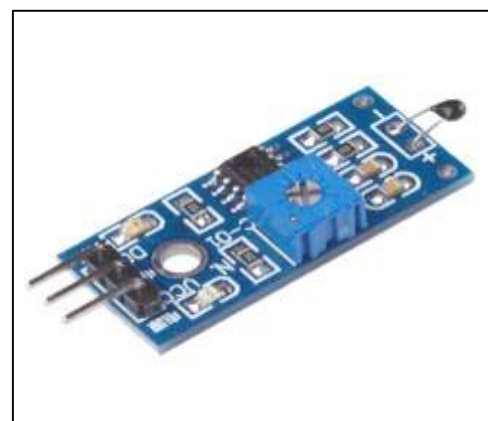


Figure.6.2 Temperature sensor

GAS SENSOR:**Figure.6.3 Camera**

A gas finder is a gadget that recognizes the nearness of gases in a territory, frequently as a major aspect of a wellbeing framework. This kind of hardware is utilized to recognize a gas spill or different outflows and can interface with a control framework so a procedure can be consequently closed down. A gas identifier can sound a caution to administrators in the region where the hole is happening, allowing them the chance to leave. This kind of gadget is significant in light of the fact that there are numerous gases that can be destructive to natural life, for example, people or creatures.

Gas locators can be utilized to distinguish ignitable, combustible and lethal gases, and oxygen exhaustion. This sort of gadget is utilized broadly in industry and can be found in areas, for example, on oil rigs, to screen fabricate forms and rising advances, for example, photovoltaic. They might be utilized in firefighting.

Gas spill location is the way toward distinguishing conceivably unsafe gas spills by sensors. Furthermore, a visual recognizable proof should be possible utilizing a warm camera. These sensors as a rule utilize a perceptible caution to alarm individuals when a perilous gas has been identified. Presentation to lethal gases can likewise happen in tasks, for example, painting, fumigation, fuel filling, development, exhuming of debased soils, landfill activities, entering bound spaces, and so forth. Regular sensors incorporate burnable gas sensors, photoionization locators, infrared point sensors, ultrasonic sensors, electrochemical gas sensors, and metal-oxide-semiconductor sensors (MOS sensors). Infrared imaging sensors have come into utilization. These sensors are utilized for a wide scope of uses and can be found in mechanical plants, processing plants, pharmaceutical assembling, fumigation offices, paper mash factories, airplane and shipbuilding offices, hazardous materials activities, squander water treatment offices, vehicles, indoor air quality testing and homes.

FIRE SENSOR:**Figure.6.4 Switch**

A fire indicator is a sensor intended to identify and react to the nearness of a fire or fire, permitting fire region. Reactions to a recognized fire rely upon the establishment, yet can incorporate sounding a caution, deactivating a fuel line, (for example, a propane or a petroleum gas line), and initiating a fire concealment framework. At the point when utilized in applications, for example, mechanical heaters, their job is to give affirmation that the heater is working appropriately; in these cases, they make no immediate move past informing the administrator or control framework. A fire identifier can regularly react quicker and more precisely than a smoke or warmth locator because of the components it uses to distinguish the fire.

ZIGBEE:**Figure.6.5 Zigbee**

ZigBee is an IEEE 802.15.4-based detail for a suite of significant level correspondence conventions used to make individual zone systems with little, low-power advanced radios, for example, for home computerization, clinical gadget information assortment, and other low-power low-transmission capacity needs, intended for little scope ventures which need remote association. Henceforth, ZigBee is a low-power, low information rate, and nearness (i.e., individual zone) remote specially appointed system.

The innovation characterized by the ZigBee particular is proposed to be less complex and more affordable than different remote individual zone systems (WPANs, for example, Bluetooth or progressively broad remote systems administration, for example, Wi-Fi). Applications incorporate remote light switches, home vitality screens, traffic the board frameworks, and other purchaser and modern gear that require short-go low-rate remote information move.

ZigBee gadgets can transmit information over significant distances by going information through a work system of middle of the road gadgets to arrive at increasingly inaccessible ones. ZigBee has a characterized pace of 250 Kbit/s, most appropriate for discontinuous information transmissions from a sensor or information gadget.

VII. SOFTWARE REQUIREMENT**EMBEDDED C:**

Embedded C is a lot of language augmentations for the C programming language by the C Standards Committee to address shared characteristic issues that exist between C

expansions for various inserted frameworks.

Embedded C programming normally requires nonstandard expansions to the C language so as to help improved chip highlights, for example, fixed-point number juggling, numerous unmistakable memory banks, and fundamental I/O activities. In 2008, the C Standards Committee stretched out the C language to address such capacities by giving a typical standard to all usage to hold fast to. It incorporates various highlights not accessible in typical C, for example, fixed-point number-crunching, named address spaces and essential I/O equipment tending to. Installed C utilizes the vast majority of the grammar and semantics of standard C, e.g., primary work, variable definition, datatype announcement, restrictive articulations (if, switch case), circles (while, for), capacities, exhibits and strings, structures and association, bit tasks, macros, and so on.

VIII. ACKNOWLEDGEMENT

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IX. RESULT

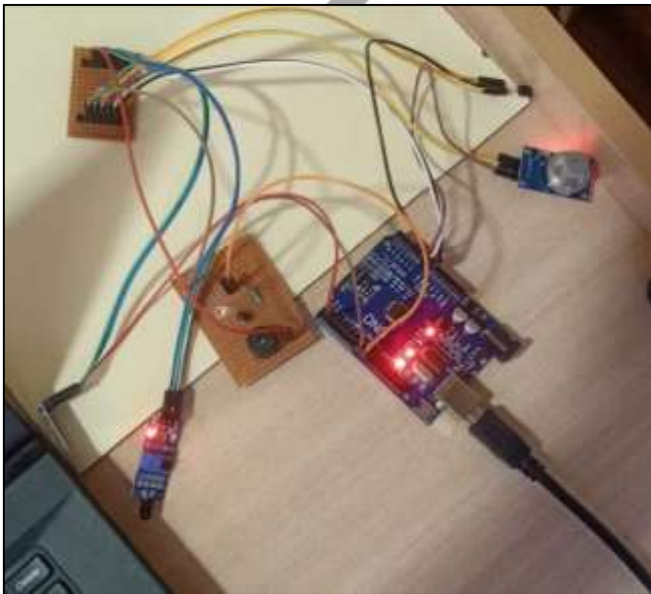


Figure.8 Result

X. CONCLUSION

The fundamental reason to plan this undertaking is well being of individual who work in coal mineshaft. We can give affirmation that about the security of the individual who are largely working in coal mineshaft. In future this individual who work in different coal mineshafts can recognize the different gases and temperature. Or on the other hand about unexpected inadequacy normal mishaps which happens by and large in coal mineshaft. So, we defeat this utilizing "coal mine safety system" framework. This is only for coal diggers and any place the underground works are finished by the laborers.

REFERENCES

- [1] Ye Yalin, Zhang Lin, Song Xiaofeng, Xin Dan, Huang He, "A Novel Coal Mine Security Monitoring System Based on ZigBee". IEEE-2016, DOI - 10.1109/ICITBS.2015.16.
- [2] Bo Cheng, Shuai Zhao, Shangguang Wang, and Junliang Chen, "Lightweight Mashup Middleware for Coal Mine Safety Monitoring and Control Automation", IEEE TRANSACTIONS ON AUTOMATION SCIENCE AND ENGINEERING-2016.
- [3] Zeshan Aslam Khan, Edison Pignaton de Freitas, Tony Larsson, Haider Abbas, "A Multi-agent Model for Fire Detection in Coal Mines using Wireless Sensor Networks", IEEE-2013 12th International Conference.
- [4] Zhao Liqiang, Yin Shouyi, Liu Leibo, Zhang Zhen, Wei Shaojun, "A Crop Monitoring System Based on Wireless Sensor". Elsevier, Procedia Environmental Sciences 11 (2011) Page no.558 – 565.
- [5] Qutaiba I. Ali, "Simulation Framework of Wireless Sensor Network (WSN) Using MATLAB/SIMULINK Software", Chapter-12 from the book MATLAB - A Fundamental Tool for Scientific Computing and Engineering Applications - Volume 2.
- [6] ArunKatara, AnandDandale, Abhilash Chore and Anurag Bhandarwar, "Zig-Bee based Intelligent Helmet for Coal Miners", IEEE-2015, Fifth International Conference on Communication Systems and Network Technologies.
- [7] Yongping Wu and Guo Feng, "The study on coal mine monitoring using the Bluetooth wireless transmission system", 2014 IEEE Workshop on Electronics, Computer and Applications, pp. 1016-1018, 2014.
- [8] Xiaolong Feng, Jiansheng Qian, Zhenzhen Sun, Xing Wang, "Wireless Mobile Monitoring System for Tram Rail Transport in Underground Coal Mine Based on WMN," cason, pp.452-455, 2010 International Conference on Computational Aspects of Social Networks, 2010.
- [9] Jingjiang Song, Yingli Zhu and Fuzhou DongK, "automatic monitoring system for coal mine safety based on wireless sensor network", IEEE Radio Science and Wireless Technology Conference, pp.933-936, 2011.
- [10] Yogendra S Dohare and Tanmoy Maity, "surveillance and safety system for underground coal mines based on Low Power WSN", IEEE, pp.116-119, 2014.
- [11] Valdo Henriques and Reza Malekian, "Mine safety system using wireless sensor network", IEEE, pp. 1-12, 2016.
- [12] Pranjal Hazarika, "implementation of safety helmet for coal mine workers", 1st IEEE International Conference on Power Electronics Intelligent Control and Energy Systems, pp. 1-3, 2016.
- [13] Tanmoy Maity and Partha Sarathi, "A wireless surveillance and safety system for mine workers based on Zigbee", 1st Int'l Conf. on Recent Advances in Information Technology RAIT-2012.