

AUTOMATIC MONITORING SYSTEM FOR COAL MINE SAFETY BASED ON WIRELESS SENSOR NETWORK

DR.P.Chinimay,N.TulasiKumar,D.Jeevani,L.VinodKumar,G.Kumar babu

ABSTRACT

ABSTRACT-

The environment of mine exploitation is special and dangerous, how to real-time monitor and collect information on the various nodes, how to master the location of miner and the environment at any time, it is a difficult problem for Coal mine enterprise to urgently solve. This paper presents the system design of monitoring system for coal mine safety constructed by zig bee and esp8266 (Wi-Fi), and gives the hardware design of sensor nodes and the flowchart of software. The sensor groups of the system intensively monitor temperature, humidity and other parameters in the underground mine, parameters measured are sent to wireless communication module by the micro-controller. The system can be used to confirm the position of miners and monitor environmental conditions in the underground mine, which will improve the level of monitoring production safety and reduce accident in the coal mine.

Keywords: Zigbee technology, HumiditySensor, Temperature sensor, RTOS,ESP8266(WIFI),Flame Sensor and Gas Sensor

* Correspondence Author

DR.P.Chinimay

Assistant Professor, Dept. of ECE, CIET, Andhra Pradesh, India

N.TulasiKumar,D.Jeevani,L.VinodKumar,G.Kumar babu

Department of ECE, Chalapathi Institute of Engineering and Technology, India,

AUTOMATIC MONITORING SYSTEM FOR COAL MINE SAFETY BASED ON WIRELESS SENSOR NETWORK

INTRODUCTION

Coal mining is the process of extracting coal from the ground. Steel and cement industries use coal as a fuel for extraction of iron from iron ore and cement production underground mining industry comes to the category, where each and every parameter such as dangerous gas, high temperature, humidity and the flame sensor for fire accidents and soon has to be monitored regularly. Safe production level of coal mine is still low, disasters in coal mine occur frequently, which lead to great loss of possession and life. The disasters happening in coal mine are due to the complexity of mine environment and the variety of work carried out in all tunnels and also raise message to the monitoring system by using different technology.

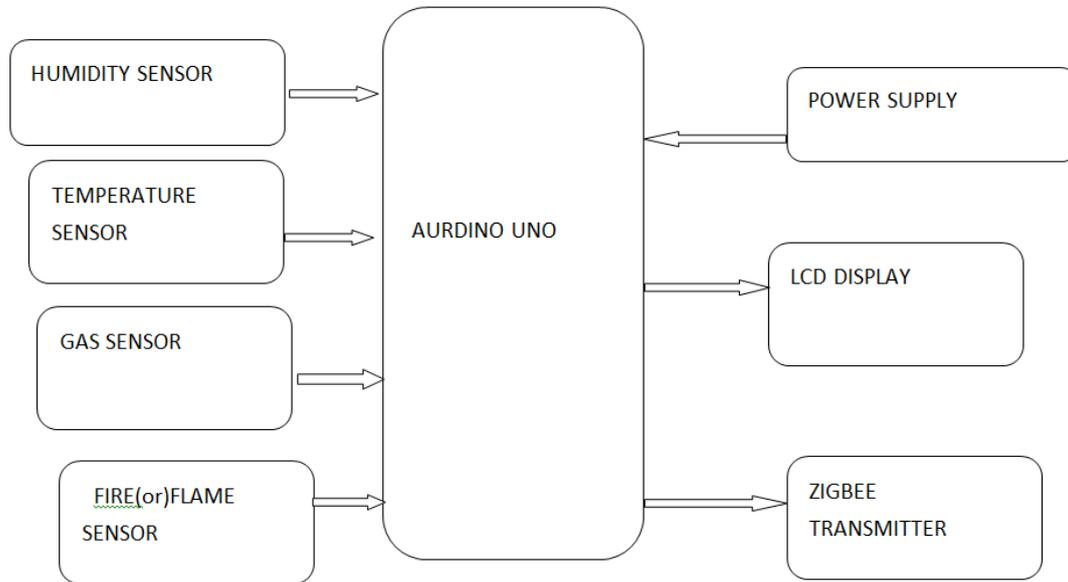
EXISTING SYSTEM

The hardware design of sensor nodes Sensor nodes are the basis unit of wireless sensor network, node stable running ensures the reliability of the whole network. Sensor node is comprised of data acquisition module, data processing module, wireless communication module, alarm module and the power module. Node hardware connection. The data acquisition module is used for sensing, collecting information and converting to digital signals. According to the need for monitoring parameters of coal mine, the processor module is connected to gas sensor, pressure sensor, temperature sensor, and other kinds of sensor module, which is in charge of processing the data and coordinating the whole system. The wireless communication module is mainly responsible for communicating with other nodes. In addition, the energy problem is the key problem, because once nodes exhaust the energy of the battery, which will drop out of the wireless sensor network, so power consumption of the wireless sensor network should be low as far as possible.

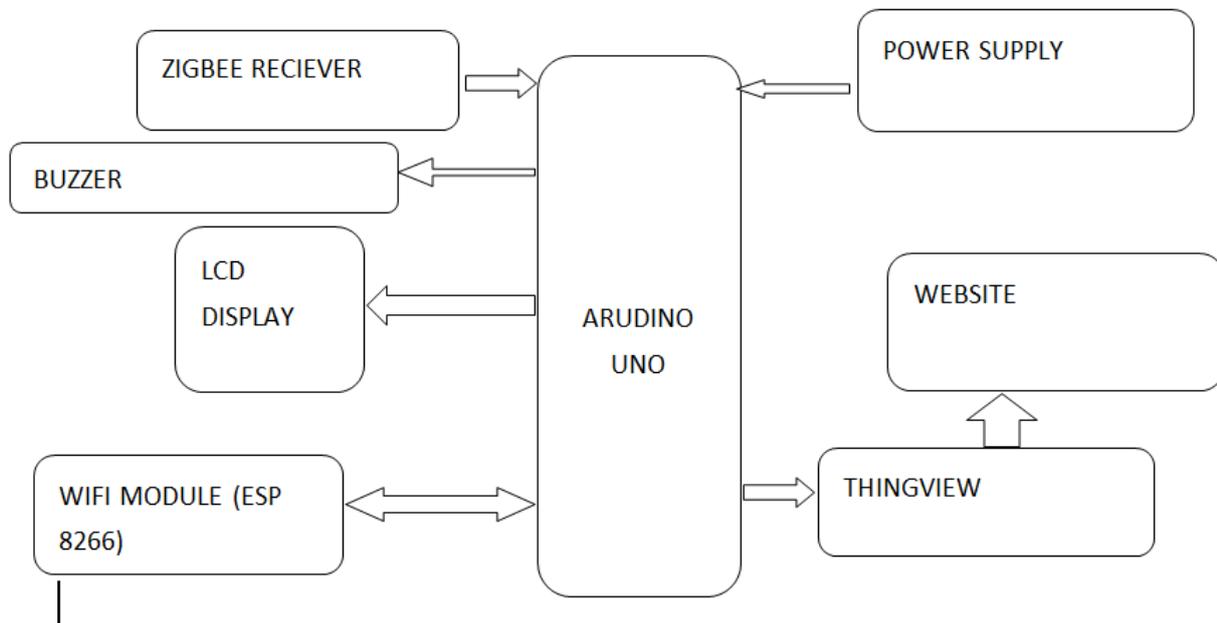
PROPOSED SYSTEM

In proposed system we designed collecting the data at different nodes in coal mining ...in master node data send will send at master node and also send collecting data through Wi-Fi module (esp8266) by cloud like thing speak and mobile app.

Block diagram:
 Node 1(Coal Mining):



Master Node



ARDUINO UNO: The Arduino UNO is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not

AUTOMATIC MONITORING SYSTEM FOR COAL MINE SAFETY BASED ON WIRELESS SENSOR NETWORK

use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

LCD(Liquid Cristal Display): A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

Power Supply: Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

Temperature and Humidity Sensor: The DHT11 (Temperature and humidity sensor) is a commonly used temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit micro controller to output the values of temperature and humidity from 20% to 90% with an accuracy of $\pm 1^\circ\text{C}$ and $\pm 1\%$.

Flame Sensor: A Flame sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire (or) flame. The response of these sensors is faster as well as more accurate compare with a heat/smoke detector. This sensor/detector can be built with an electronic circuit using a receiver like EM radiation. This sensor uses the infrared flame flash method, which allows the sensor to work through a coating of oil, dust, water vapor and otherwise ice. Wavelength range: 760nm-110nm and distance is 100cm.

Gas Sensor: Sensitive material of MQ-6 gas sensor is SnO_2 , which with lower conductivity in clean air. When the target combustible is higher along with the gas concentration rising. MQ-6 gas sensor has high sensitivity to propane, butane and LPG also response to natural gas. Especially methane gas.

- ✓ .Good sensitivity to combustible gas in wide range.
- ✓ .High sensitivity, long life and low cost.

11.ESP8266(WIFI MODULE)

In this ESP8266 tutorial, we are using an ESP-01 module to control an LED over the internet. The ESP8266 is cheap for communicating over the internet. Arduino IDE to develop the web server to control an LED remotely. The ESP8266 can be controlled from your local wifi network (or) from the internet. The ESP-01 module has GPIO pins that can be programmed to turn an LED (or) a relay ON/OFF through the internet.

Zigbee Technology: Zigbee is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power wireless IOT networks. Support for multiple network topology such as point-to-point

- ✓ .Low duty cycle-provides long battery life
- ✓ .low latency
- ✓ .point-to-point-multipoint and mesh networks
- ✓ .Less expensive than other wireless personal area network (WPANS)
- ✓ .Security services are present in ZIGBEE which was introduced by IEEE 802.15.4

Buzzer: A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to buzz. Often these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made.

The description of Thing View-Thing Speak viewer App Thing View enables you to visualize your Thing Speak channels in an easy way, just enter the channel ID and you are ready to go. For public channels the application will respect your windows settings: color, timescale, chart type and number of results. The current version supports line and column charts, the spline charts are displayed as line charts. For private channels, the data will be displayed using the default settings, as there is no way to read the private windows settings with the API key only.

Thing Speak is an open source "Internet of Things" platform to store and retrieve data from things using HTTP over internet. With Thing Speak you can create sensor logging applications, location tracking applications, and a social network of things with status updates. For more info please visit <https://thingspeak.com>. If you like Thing View and you find it useful, please make a positive review, on the contrary if you find an error contact us and we'll fix it in no time.

AUTOMATIC MONITORING SYSTEM FOR COAL MINE SAFETY BASED ON WIRELESS SENSOR NETWORK

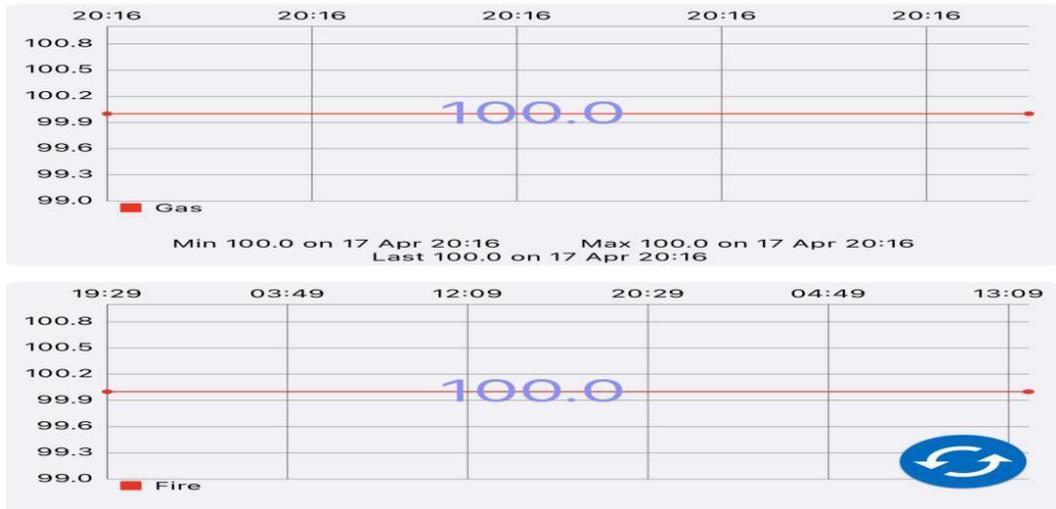


Figure 1



Figure 2

CONCLUSION

Wireless sensor network has great impact on industry and our daily life, this article presents a coal mine safety monitoring system based on wireless sensor networks, and hardware and software design of wireless sensor network are described in detail, this system can detect concentration of the gas, temperature, humidity, wind speed and trace the location of miners in underground mine tunnels. Wireless sensor networks applied in monitoring coal mine security breaks through the traditional methods and ideas, which improves the practical ability and flexibility of monitoring system. This system not only can monitor all kinds of parameters under the coal mine, but also can alarm automatically when environment parameters are abnormal to exceed the limitation, which help improve the level of monitoring safety production and reduce accident in the coal mine. Therefore, the coal mine Safety Monitoring system put forward in this article quite meets the need of coal mine safety monitoring.

REFERENCES

- [1] Rong Yan. Design of Mine Safety Monitoring System Based on the Wireless Network [0]. Ji'nan: Shandong University, 2007.
- [2] Yu Hai-bin, Zeng Pengo Intelligent Wireless Sensor Network Systems [M]. Beijing: Science Press, 2006.
- [3] "AQ6209-2007 Digital methane detecting and alarm miner's lamp," Industry standards for Safety production of P.R. China, January, 2007.
- [4] Qiao Ying-xu, Design of Wireless Sensor Networks Node Based On Tiny OS Operating System. The 3th International Conference on Computer Science and Education[C] 2008.7 1201-1204
- [5] Nordic Semiconductor ASA Tuning the nRF24xx matching network [EB/OL]. <http://www.nordicsemi.com>.2006-07.
- [6] Nordic VLSI ASA.nRF240x Shock Burst TM technology [EB/OL]. www.nordicsemi.com. 2003-02.
- [7] Jilin Li, "Status and Development Trend of Coal Mine Safety Monitoring System", Journal, Coal Technology, Harbin, 2008(11),pp. 4-5.