

SAFETY MONITORING SYSTEM IN COAL MINE USING IOT TECHNOLOGY

¹N.V.D.P.Murthy, ²Y.Bhuvana, ³Y.Aruna Devi, ⁴T.Reshma, ⁵V.Lokeshwari Devi

^[1] Assistant Professor, Dept of ECE, Ramachandra College of Engineering, Uluru, Andhra Pradesh, India

^[2] ^[3] ^[4] ^[5] B.Tech scholar, Dept of ECE, Ramachandra College of Engineering, Eluru, Andhra Pradesh, India

ABSTRACT

The key abstract is to use IoT to incorporate a coal mine safety monitoring system. The extraction of coal from the field is known as coal mining. Coal is used as a fuel in the steel and cement industry to extract iron from ore and to manufacture cement. Every parameter in the underground mining industry must be controlled on a regular basis, including methane gas, high temperatures, fire incidents, and the level of safety in coal mines is still poor. In this paper, a coal mine safety system is implemented using a Thingspeak as a medium to transmit the data. The system is implemented to monitor and control various parameters in the coal mines such as leakage of gas, temperature and humidity conditions and Fire detection in the coal mine. These all sensors are together considered as one unit and are placed in the coal mines. All the recordings of the sensors are continuously uploaded to the Thingspeak for analysis. Here the gas is continuously monitored if any uncertainties in the level of gas arise, then buzzer is used to alert the workers. Temperature and humidity values are also continuously monitored and displayed on the LCD display and in the Thingspeak server. This safety system is mainly implemented to improve the working condition inside the coal mines and to ensure the workers safety.

Keywords:

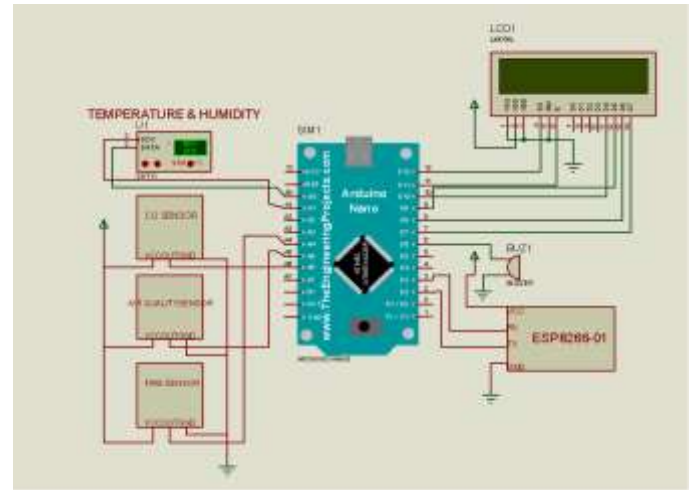
Coal mine safety system, Sensor, Thingspeak, Buzzer, IOT.

1. INTRODUCTION

Internet of Things (IoT) is nothing but the devices communicating with each other by using the internet. IoT applications vary on a large scale. European Research Cluster on the Internet of Things classifies major IoT applications as smart buildings, smart transportation, smart industry, smart health and the smart city as major areas. IoT is a trend-setting innovation in which all the data from sensors is stored in the cloud where it can be easily accessed from the cloud. Sensors for gathering the data and sending across the internet are also included in this advancement. We use cloud not only to store data but also for data analysis, gathering, visualization. Such an emerging technology can be used in various IoT applications like agriculture, health, smart home etc, to make the already existing systems more efficient.

In India, we have 493 coalmines present. Coal is the most vital asset in the world. These petroleum products are natural assets of the earth which help create power and coal is a non-sustainable source. There are numerous coalmine mischance's happening in the mines, and the diggers are putting their lives in hazard by working in the coal mines, even occasionally they wind up losing

their lives in the coal mines which is an unfortunate part. If any kind of explosion occurs, the wired network will get damaged and it is very difficult to replace it. It will take high time consumption to repair those networks. In order to overcome this, the coal mine safety measurement system using Internet of Things was designed and implemented. This improves production safety control and reduces coal mine accidents. Wireless sensor networks are made up of many micro-sensor nodes that have a small volume and low cost can be deployed anywhere and the model is made up of a gas sensor, a temperature sensor, Humidity sensor, fire sensor, CO sensor, Air quality sensor, LED display and Buzzer.



ARDUINONANO:

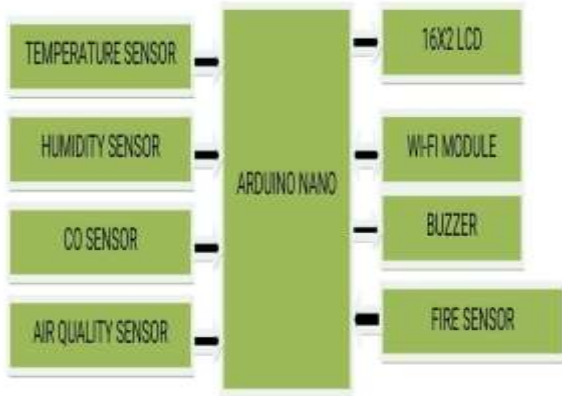


Arduino Nano is one type of microcontroller board. It can be built with a microcontroller like Atmega328p. This microcontroller is a small size board and also flexible with a wide variety of applications. ATmega328p is commonly used in many projects and autonomous system where a simple, low-powered, low-cost micro controller is needed.

NODEMCU:



II. PROPOSED SYSTEM



Block diagram

CIRCUIT DIAGRAM:

The ESP8266 is designed and manufactured by Espressif Systems. NodeMCU contains all crucial elements of the modern computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system. The features like establishing a Wi-Fi connection with just a few lines of code, Plug and play mode, Programmable Wi-Fi module and Arduino like software and hardware I/O made NodeMCU an IoT Tool that is best suitable for various applications based on IOT.

LCD DISPLAY:



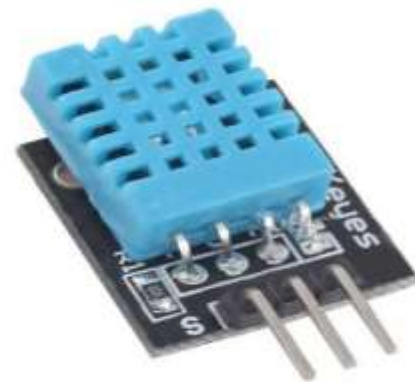
LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LCDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

FIRE SENSOR:



Here Fire sensor is used to detect the fire in the coal mines. Fire sensor mainly comprises of four pins, where three pins are used A0, GND, VCC, A0 is analog pin that is connected to analog pin of NodeMCU, GND is connected to GND, VCC supply is 3.3v.

DHT11 SENSOR:



The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data.

CO SENSOR:

A silicon microchip, housed in a plastic shell, sends an electrical charge to a small detection chamber that contains a CO sensor. This sensor can detect and measure CO concentration in the atmosphere. If the sensor detects high levels of CO, the microchip will trigger an alarm.



BUZZER:

The buzzer is a sounding device that can convert audio signals into sound signals. It is usually powered by DC voltage. It is widely used in alarms, computers, printers and other electronic products as sound devices.



AIR QUALITY SENSOR:



The air quality sensor is part of the air conditioning system. It measures pollutants, in the form of oxidisable or reducible gases, in the air outside your car. Oxidisable gases include carbon monoxide, hydrocarbons (vapours from benzene or petrol) and other partially burnt fuel components.

CONCLUSION:

Implementation of Coal mine safety system is implemented using Fire sensor, Gas sensor, CO sensor, DHT11 sensor, Air quality sensor to increase the safety of the workers in the coal mine and to prevent them from danger, By using this system constant checking of the coalmine and alerting the worker is done by using Thingspeak. The system is cost-effective and efficient

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