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A RESEARCH PAPER ON IOT BASED MINING AND WORKER SAFETY HELMET

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Abstract- **IoT has been recently expanded across the different application which brought a huge attention to its construction. In the mining field, where a noisy industrial environment can take place in. The main objective of this research is to design and develop a smart helmet system for mining industry application. Where the provided system will keep on monitoring the hazardous events such as temperature, humidity sensor , pressure sensor and IR sensor, removal helmet of the miner and obstacle damage to the helmet. In this Helmet we uses a LCD Display to see the current status of underground mines. In this Helmet Temperature and Pressure sensor are used to monitor the surrounding environment of underground mines. IR sensor is used compact device for protection against fire. all the sensor values compared with the received data from the sensor with safety limits and if any hazards detected. It shows values like temperature and pressure etc on LCD display. And these same values sent to the receiver end over cloud server.**

Key words **: Arduino, Temperature sensor, Pressure sensor, Humidity sensor, IR sensor, LCD Display.**

I. INTRODUCTION

The Internet of Things (IoT) is nothing more than machines that communicate with each other via the Internet. On a large scale, IoT applications vary. The European Research Cluster on the Internet of Things classifies key IoT technologies as major areas such as smart buildings, smart transport, smart power, smart business, smart health and smart environment. IoT is a trend-setting technology which stores all sensor data in the cloud where it is easily accessible from the web. This technology also involves sensors and actuators for data collection and internet distribution. We use cloud not only to store data, but also to analyse, capture and visualize data. Such an emerging technology can be used to make existing systems more efficient in various IoT applications such as agriculture, health, smart home, etc. . Internet of Things is an information and Communication Technology (ICT) used to represent Wireless Sensor Network (WSN) communications, using the defined protocol IEEE 802.14.5 that enables Low Rate- Wide Area Network (LR-WAN) to communicate using specific modulation technique India is a country, which is renowned for its extensive and distinct mineral reserves and big mining businesses. India produces about eighty eight minerals, out of which it has four minerals related to fuel, ten minerals that is of kind metals, fifty minerals that is of non-metallic in nature and remaining twenty four includes minor minerals. We have 493 coal mines in India. Coal is the worlds most important commodity. Such petroleum products are the Earths natural resources which help create energy and needs for some. Coal is a non sustainable origin that cannot be widely replaced by humans, there are several mishaps of coalmines occurring in the mines, and the diggers are putting their lives at risky, by working in the coal mines, even once in a while they end up losing their lives in the coal mines that are an unfortunate part of lives. This Helmet is made with advanced sensors and smart technology that are very useful to the workers that are work underground mines. This project is very useful mines workers.

II. LITERATURE SURVEY

Bo Tan ;Yimeng Song ; Wendong Shi, The importance of the Coal Mine Production Safety Supervision and the specific issues that might occur under the concept of safety supervision function is proposed to create the Coal Mine Safety Production Supervision Program. The results, show that the addition of independent third parties to the coal mine production process implementation services in compliance with applicable guidelines, laws, rules and regulations and technical standards and the conduct of coal mining companies to establish an effective restriction framework can compensate for the government's macroscopic control and its own limitations. The

establishment of the system to provide a reliable guarantee for coal mine safety production.

T. Machappa, M. Sasikala, and M. V. N. Ambika Prasad exhibited a framework that electrical obstruction WeinanDeng and Huaxing Zhang, the building of highways in China has led to an increasingly serious problem leaving more and more coal under highways. Having as much as possible the unexploited coal and maintaining highway safety at the same time becomes a problem that must be addressed as a matter of urgency. The paper addressed the characteristics of road deformations caused by underground mining, suggesting the rules to be followed while mining under highway protective coal pillar. Methods for the security mining of protective coal pillar under highway were put forward in the study on the basis of improving and integrating the existing methods for mining protective coal pillar.

Liu Xianglan,Big data has infiltrated various industries and their functions, has become important development factors in the global economy. Big data processing is the cornerstone of the big data development process. Big data technology should concentrate on processing, analyzing, combining and visualizing unstructured data and semi-structured data. Big data will no longer be the core of traditional structured data. Based on the theory of the life cycle, new digital technologies such as collection, processing, storage, organization and copyright protection, clusters of highly competitive retrieval and flexible scheduling, smart digital display, coal mine industry information data can be collected and incorporated,

We will use zig-bee software and three sensors such as temperature, humidity and gas sensor. Three sensors will detect the change in parameters of the environment and will give the information to the microcontroller. Then the microcontroller can check these values up to date, if any of the value exceeds the approved value, it will warn the person through the buzzer. This information is passed through the zigbee module to the base station. Then the base station department must take safe measures to safeguard the people who work in coal mining.

The following are the components used in this system
Microcontroller: A microcontroller (MCU for microcontroller unit, or UC for µ-controller) may be a tiny laptop on one microcircuit. It's a compact microcircuit designed to control a selected operation in associate embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on

centralized management, coordinated retrieval, and joint information resource exhibition Lab VIEW programming environment is developed to connect large area. The leakage level of a gas concentration.

III. EXISTING SYSTING

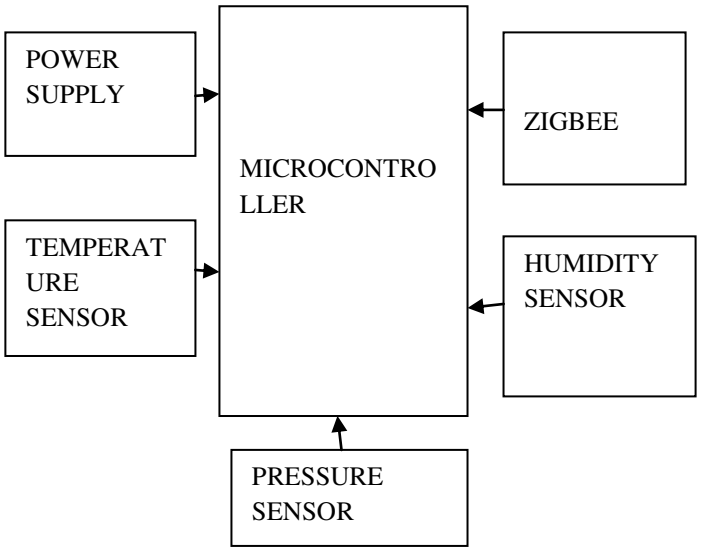
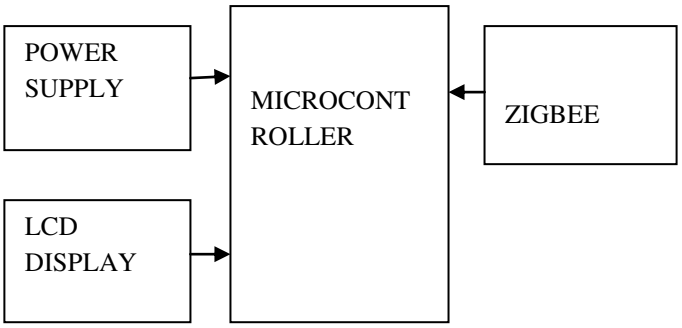


Fig 1



one chip. It contains one or a lot of CPUs (processor cores) beside memory and programmable input/output peripherals. Program memory within the type of ferroelectric RAM is additionally typically enclosed on chip, furthermore as a tiny low quantity of RAM.

Zigbee Module: It is a lightweight, low-power radio specification based on IEEE 802.15.4. It is a wireless protocol designed as data communi cation sensors for lightweight, low-power devices. The specification defines the lower layers of the protocol— the physical layer (PHY) and the portion of the data link layer (DLL) of the medium access control (MAC). In the unlicensed 2.4 GHz, 915 MHz and 868 MHz ISM bands, this standard defines operation. There are 16 Zigbee channels in the 2.4 GHz

band, with 5 MHz of bandwidth available for each channel.

Temperature Sensor: The LM35 series integrated circuit temperature controls, the output voltage of which is linearly proportional to the temperature of Celsius. The LM35 therefore has a more flexible sensor compared to the Kelvincalibrated linear temperature sensors as there is no need for the user to subtract substantial constant voltage from their output to achieve convenient Centigrade scaling. The LM35 does not require external calibration or trimming to provide standard precision of ±1/4 ° C at room temperature and ±3/4 ° C at-55 to+ 150 ° C.

Pressure Sensor: A pressure sensor is a device for pressure and for pressure measurement of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area. A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed. For the purposes of this article, such a signal is electrical.

Humidity Sensor: A humidity sensor is an electronic device that measures the humidity in its environment and converts its findings into a corresponding electrical signal. Humidity sensors vary widely in size and functionality; some humidity sensors can be found in handheld devices (such as smartphones), while others are integrated into larger embedded systems (such as air quality monitoring systems). Humidity sensors are commonly used in the meteorology, medical, automobile, HVAC and manufacturing industries.

IV. PROPOSED SYSTEM

In this proposed system the coal mine safety Helmet are fixed with Pressure Sensor, Temperature Sensor, Humidity Sensor , IR Sensor and LCD Display. We integrate all the sensors to the Arduino Uno using IoT. led. We integrate all the sensors to the Arduino Uno using IoT. In this system we mainly have monitoring and controlling systems monitoring system we monitor all the data from different sensors. Humidity Sensor monitor the moisture in the coal mine environment. If the gas level is increase then buzzer alert mining workers. These sensor values are continuously uploaded to the cloud for analysis and also for further use. The temperature and humidity values are also he monitored inside the coalmine.

IR Sensor are used to protect against the fire accident. All data are shown on the LCD Display that are placed on the helmet and same data are sent to the receiver side over cloud sever through the Internet of Things.

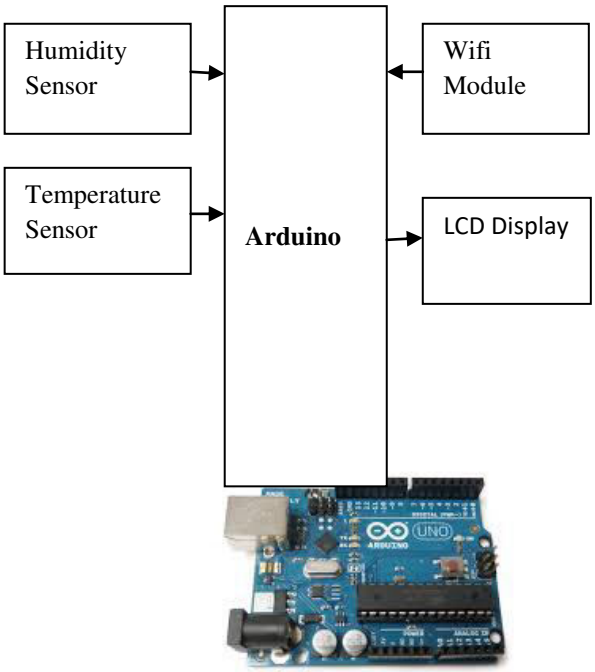


Fig.4:Arduino

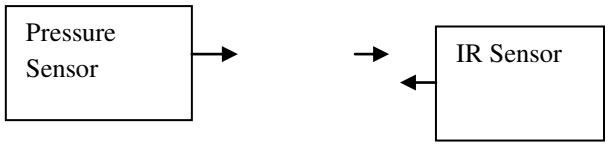
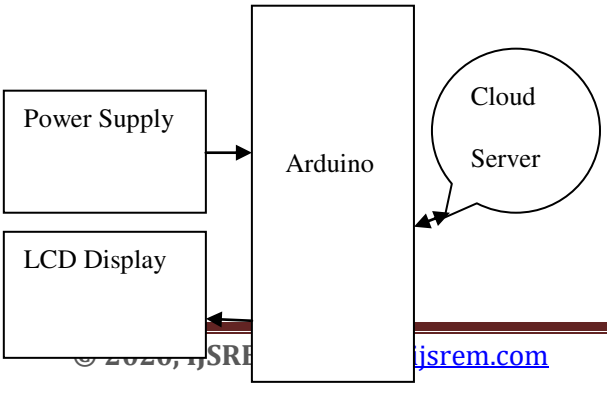


Fig. 2: Helmet Section



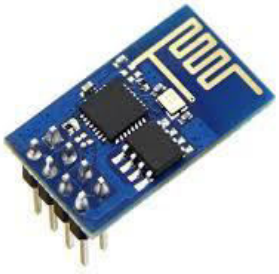


Fig.3: Receiving End

This system consists of the following blocks:

Arduino: Arduino is a processor basically uses the architecture of Harvard where there is separate memory for the program code and program data. It consists of two memories program memory and data memory. The code is stored in the memory of the flash program while the data is stored in the memory of data. The Atmega328 includes 32 KB of flash memory to store code for the boot loader it uses 1.5 KB, 2 KB of SRAM and 1 KB of EEPROM and runs at 16MHz clock speed. The Arduino Uno is a microcontroller board manufactured under ATmega328. It has 14 digital input and output pins and 5 analog input and output pins. Which also have few pins for PWM. 1.0 Added SDA and SCL pins near the AREF pin and two additional pins near the RESET pin, the IOREF pin made it possible for the shields to conform to the voltage generated by the board.

Wifi Module: SP8266 WIFI Module comes with an integrated firmware that supports serial interface and can be managed with AT commands. Although we can use this module to provide WiFi connectivity from another microcontroller, this module is not just a simple serial for WiFi transceiver. It consists of a 32Bit (80MHz) processor, 512 KB SPI FLASH, 64 KB SRAM, 96 KB DRAM, GPIO Pins & WIFI Transceiver. In this article, I will direct you through how to update new Firmware to the ESP device.

V. RESULT

This is the the setup of IoT based mining and worker safety Helmet

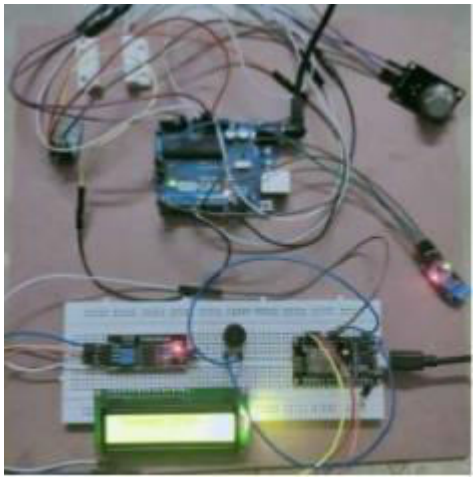


Fig. 6: Project Setup

Initially every helmet will be given a helmet ID (in our case helmet ID is 123) which is a fixed value. Since any of the miners can take up and wear any of the helmets from the store room, every working day while miner picks up a helmet, his ID (miner ID) will be attached to the helmet. Now the helmet will be configured to work according to the range specified in his user ID (see Figure 6).

Fig. 7: IR Sensor Reading to detects Helmet

An IR Sensor is used to protect against fire accident. The reading of IR Sensor is shown in fig. 7. This graph constructed between Time versus IR value.

Fig. 7: Pressure Sensor Reading

Fig. 7 shows the sensed data by pressure sensor with respect to time, the pressure sensor is used in our project to detect the Pressure on the miners head. If the pressure sensor records a value greater than 234.6Kpa (or 34psi), then it indicates that miner has experienced an life threatening injury.

Fig. 8: Humidity Sensor Reading

Figure 8 show the humidity values of an environment in which a miner is working. The optimum range of humidity is considered to be in between 40 and 60 percentage. This graph is plotted between time and Humidity.

VI . CONCLUSION

The development of coal mining protection for employees using Arduino, Pressure Sensor, IR , Temperature and Humidity Sensor continues to track the safety of mining and update information to the IoT site. By using this tool, we guarantee the safety of workers. And also a LCD Display show the values that detected by the different Sensors.

VII . REFERENCES

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