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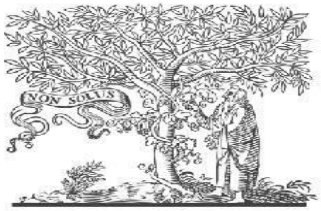

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Title **SAFETY HELMET FOR COAL MINERS USING ZIGBEE & ARDUINO UNO**

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SAFETY HELMET FOR COAL MINERS USING ZIGBEE & ARDUINO UNO .

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Abstract: Nowadays every system is automated in order to face new challenges. In the present days Automated systems have less manual operations, flexibility, reliability and accuracy. Due to this demand every field prefers automated control systems. Especially in the field of electronics automated systems are giving good performance. The system also provides audible alerts using a buzzer. The project aims in designing a coal mine safety system which is capable of detecting CO gas, temperature, humidity, LPG gas leakage, air quality and also Obstacle Detection. It also alerts the respected authorities at the control station through wireless Zigbee technology. And also this system gives the auto alarm through Buzzer if the sensor data exceeds threshold value. Zigbee is a PAN technology based on the IEEE 802.15.4 standard. Unlike Bluetooth or wireless USB devices, Zigbee devices have the ability to form a mesh network between nodes. Meshing is a type of daisy chaining from one device to another. This technique allows the short range of an individual node to be expanded and multiplied, covering a much larger area.

Helmet: The main controlling device of the project is ARDUINO UNO microcontroller.

- Methane sensor, DHT11sensor, MQ6, MQ135, zigbee transmitter, buzzer and three LEDs are interfaced to the arduino microcontroller. All these components are placed to the helmet which operated by 3.7 V battery.

- Arduino continuously read the data from sensors and it will send this data to the control room through wireless zigbee. If the sensor data exceed threshold value it will active the buzzer and LED for alerts.

Receiver Section Working:

- The main controlling device of the project is PIC microcontroller.

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- Zigbee receiver, buzzer and LCD display are interfaced to the microcontroller.

- Sensor data is received by ZIGBEE receiver module and fed as same to the microcontroller. Microcontroller will display the sensor data on LCD module and also active the buzzer if the sensor data exceed threshold value.

Index Terms: Arduino, Zigbee, Buzzer, LCD, MQ6, MQ135

1. INTRODUCTION

The project aims in designing a coal mine safety monitoring system which is capable of detecting CO gas, temperature, humidity, LPG gas leakage, air quality and also Obstacle Detection. It also alerts the respected authorities at the control station through wireless Zigbee, Bluetooth technology. And also this system gives the auto alarm through Buzzer if the sensor data exceed threshold value. Now a day's every system is automated in order to face new challenges. In the present days Automated systems have less manual operations, flexibility, reliability and accurate. Due to this demand every field prefers automated control systems. Especially in the field of electronics automated systems are giving good performance. The system also provides audible alerts using voice module for alerting messages announcements to the coal mine workers. Zigbee is a PAN technology based on the IEEE 802.15.4 standard. Unlike Bluetooth or wireless USB devices, Zigbee devices have the ability to form a mesh network between nodes. Meshing is a type of daisy chaining from one device to another. This technique allows the short range of an individual node to be expanded and multiplied, covering a much larger area. The device consists of an arduino, which is interfaced with the input and output modules, the controller acts as an intermediate medium between both of them. So the controller can be termed as a control unit. By this way we can take the prevention steps before occurrence of the major fire accidents and we can avoid the human losses and financial losses .The application program for the microcontroller will be written in embedded 'C' and will be stored in the flash memory of the microcontroller.

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. The project "Safety Helmet" using Arduino UNO and PIC Microcontroller is an exclusive project which makes capable of detecting methane gas, temperature, humidity, MQ6, MQ135 and alerting the control room if the sensor data exceed threshold value using Buzzer and LED through zigbee.

The major features of this project are:

1. Provides Industrial security.

2. Highly sensitive

3. Low cost

4. Simple and Reliable.

5. User friendly.

2. LITERATURE REVIEW

Coal and economic development in Pakistan: A necessity of energy source

In this research, the logarithmic mean Divisia index (LMDI) and the Input-Output (I–O) models were used to explore the determinants of coal consumption change during 1999–2018 in Pakistan. Some novel factors industrial structure, energy intensity (EI), economic scale, energy mix, and personified coal consumption were chosen and added to the LMDI and I–O models. The aim is to estimate the factors' effects of various sectors that might provide a new way for policy-makers. The results show: (1) the variations in the driving factors industrial, cement, Brick-kilns, and power sectors are growing. (2) The industrial structure effect increasing coal consumption significantly, while energy mix and EI are growing energy efficiency from 2014 to 2018. The economic scale effects played a major role in coal consumption during 1999–2018, while EI, industrial, and energy mix have mixed effects. (3) The economic scale is the only factor which is stable and increasing Pakistan's coal consumption. (4) From the LMDI, the economic scale effect is stable while I–O expresses that EI, energy mix and a trend in the industrial structure effects are key motives in boosting in coal consumption. It is suggested coal reserve of 185.175 billion tons can significantly improve social, economic, and energy in Pakistan.

Development and Application of the Smart Helmet for Disaster and Safety

This paper introduces the development of the smart helmet needed to respond to accidents of rescue workers in the event of a disaster. With the emergence of many IoT-based devices and applications, many of the services that use them are active. However, each service was developed in a specific field, making it difficult to apply new devices, modify application and make changes to services. With the advent of a variety of IoT-based devices and services, we need middleware that can easily integrate them. Our researchers have developed the new software framework enable to integrate a wide range of devices and services and efficiently manage resources. In addition, based on this, we develop the smart helmet to respond the disaster safety accidents. The smart helmet collects, generates, and converts information on sensors (infrared camera, electro optical camera, drone camera, oxygen residual sensor, 6-axis inertial sensor, and smart watch) and it can be monitored through head mounted display(HMD) and the Command Center. Finally, we developed a simulator and generated data based on scenarios, and also tested all devices and service outdoors.

Prototyping IOT Based Smart Wearable Jacket Design for Securing the Life of Coal Miners

Engineer is the person who is always keen interested in providing best alternative solution to any social problem to meet the scarcity. Keeping this mindset and visualizing social problems in Pakistan and other several countries; it is observed that annually several people die working inside coal mines. By identifying this problem, this paper suggests a wearable smart jacket design for securing the life of coal miners in Pakistan. This Prototype senses the various health

related parameters i.e. the presence of hazardous gas, pulse rate of miner, updated temperature/humidity, exact depth location & global positioning of miner. These all parameters will be then transmitted through a Wi-Fi shield to a dynamic internet protocol. In this way, one may monitor all labors working inside the mines and moreover in case of disaster the life of miner can be secured immediately. This proposed wearable embedded system will not only send the last GPS location to a specific IP but will also send continuous update of pulse rate of miner which is sensed by pulse sensor; to base camp hence if someone dig the coal mine in case of disaster, they may set the priority to retain maximum life back from a coal mine.

Positioning system for miners based on RFID

Mine accidents occur frequently recently. The situation under mine is very complicated. So it is very difficult to rescue the miners when accident happens. If we can determine the accurate position of miners under mine, the casualty rate will be decreased greatly. So the positioning problem of miners is an urgent task during the coal mining processing. Many schemes are proposed, but ineffectively. Our system use advanced Radio Frequency Identification (RFID) to tracking and positioning the miners. Once the accident occurs, we can find the miners with the fastest speed. So we can limit the casualties at the lowest line.

The development and application of electronic technology to increase health, safety, and productivity in the South African coal mining industry

South Africa's coal mining industry is of vital economic importance. This paper describes some of the major electronic achievements within that industry over the past ten to 15 years. Basic design criteria formulated for systems to be used underground is discussed. The experience gained with the implementation of the systems, especially the human factor, is examined. Future directions to be followed by some of the research programs are presented.

ZigBee Based Intelligent Helmet for Coal Miners

A cost effective ZigBee-based wireless mine supervising system is presented in this article. This scheme used intelligent helmets as voice terminal and ultra-low-power nodes of wireless sensor network.The programme adopted ZigBee wireless technology to build wireless sensor networks, realized real-time surveillance with early-warning intelligence on methane, temperature, humidity in mining area, and used speech communication to reduce potential safety problems in coal production.

3. METHODOLOGY

Advantages:

- This system alerts the person through BUZZER and LED.
- Wireless communication using zigbee technology.
- Sensor based coal mine monitoring system.
- Efficient and low cost design.
- Low power consumption.

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- Real time monitoring of all sensors.
- Easy to operate.
- By using this project we can prevent the coal accidents and save the persons.

Disadvantages:

1. Monitoring the data is not stored.
2. Zigbee wireless communication is limited distance.

Components Used

- Power Supply.
- PIC microcontroller.
- LCD display.
- Zigbee receiver modules.
- Buzzer.
- Battery Supply
- Arduino UNO.
- Zigbee transmitter module.
- METHANE SENSOR
- DHT11(Temperature &Humidity)sensor
- LED indicators.
- Buzzer.
- MQ6
- MQ135

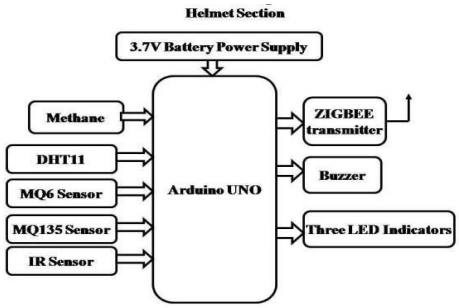

Fig 1 Helmet Section diagram For Proposed System

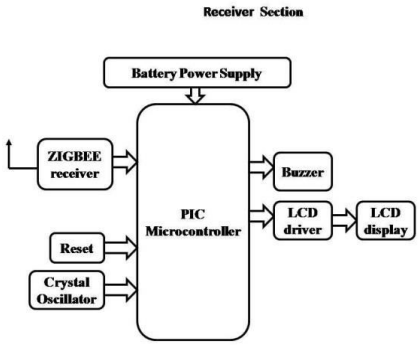

Fig 2 Receiver Section Diagram

4. IMPLEMENTATION

The item for the proposed system is executed utilizing the Arduino IDE.

Integrated Development Environment (IDE) for Arduino: A substance chief for composing code, a message region, a message terminal, a toolbar with buttons for normal undertakings, and a progression of menus are totally expected for the Arduino IDE. It talks with the Arduino equipment and sends dares to it.

File

New creates a new supervisor instance with all of the essential features of the drawing present.

allows you to browse the envelopes and papers on your PC to create a sketch record.

At the point when you open Later, a rundown of the latest drawings that might be gotten to is shown.

Within the envelope structure of Sketchbook, the corresponding representation is displayed in a different proofreading case whenever any name is mentioned.

Models All models provided by the Arduino Programming (IDE) or library are displayed when this menu option is selected. The models are arranged in a tree, making it simple to search by library or subject.

closes the Arduino Programming instance clicked.

Save The current name is used to save the artwork. A name will be proposed for the record in a "Save as..." exchange on the off chance that it has not as of now been named.

You can save the current drawing under a different name by selecting "Save as..."

It shows the printing-explicit Page Setting window.

In accordance with the Page Arrangement limits, Print sends the ongoing drawing to the printer.

By clicking Inclinations, you can change many IDE settings, like the language of the IDE interface.

All IDE windows are closed by Stop. The next time you start the IDE, the open drawings that were open when Stopped was selected will be restored immediately.

Edit

- Record at least one stage of modification as a fix or retry; You can use retry again when you come back.
- Cut The chose text is replicated to the clipboard and eliminated from the editor.
- After reproducing the text from the proofreader, duplicate copies the selected text and copies it to the clipboard.
- Copy the code for your sketch to the clipboard in a format that is suitable for presenting on the discussion with punctuation shading. Duplicate for Collection
- Duplicate as HTML recovers the code from your sketch and copies it to the clipboard as HTML, ready for use on websites.
- Glue the contents of the clipboard into the supervisor by copying them there from the clipboard.
- The entire selection made by the manager is included in Select All.
- Remark/Uncomment Inserts the /remark tag at the beginning of each line or removes it altogether.
- Indent adds or subtracts a space at the beginning of each selected line, moving the text one space to the side or removing a space.
- When you click "Find," the "Find and Supplement" window opens. Here, you can use a few models to figure out the text you need to look for in the ongoing plan.

- Depending on where the cursor is, Find Next will highlight the following event, if any, of the string that was entered in the Find window as the pursuit object.

- Based on where the cursor is, Find Earlier highlights the preceding event of the string in the Track down window.

Sketch

Verify or arrange your drawing after checking for errors while it was being made. In the control center section, it will show the factors and the amount of memory used by your code.

Transfer stacks the parallel record onto the designated board via the predefined Port after aggregation.

Using a software engineer to transfer This will replace the board's bootloader; Go to Devices > Consume Bootloader to reactivate the option to transfer to the USB sequential port. Nevertheless, it enables you to make use of the entire Blaze RAM for your artwork. Keep in mind that following this advice will not result in the wires lighting up, assuming it isn't too much work. Navigate to Apparatuses > Consume Bootloader to accomplish this.

Send Out Completed Double produces a.hex file that can be filed or sent to the board using a variety of tools.

In the ongoing representation organizer, open the Presentation the Sketch Envelope order.

Add a library to your drawing by using the #include instruction at the beginning of your code. For more details, see the libraries listed below. From this menu item, you can also import new libraries from.zip files and launch the Library Director.

A new document is added to the drawing using Embed Document... it will be duplicated from its current location). As is customary for assets like documentation, the record is saved in the sketch's data subfolder. The sketch programming excludes the objects in the information envelope because they have not been gathered.

Tools

Your code is precisely arranged by Auto Arrangement by indenting it so that the declarations contained within the wavy supports are also indented and the opening and closing wavy supports line up.

The current drawing is saved as a.zip file using Document Sketch. The chronicle and the artwork are kept in the same envelope.

Reload the page and resolve the encoding issue. The proofreader's single map encoding and the roast guides of other functioning frameworks are unaffected by this.

Screen for Successive beginnings the information exchange with any connected board on the at present chosen Port and opens the comparing screen window. On the off chance that the board upholds it, this for the most part resets it. Perform a reset to prevent the sequential port from opening.

Board Select your preferred board. The various sheets are depicted in the following image.

All of your PC's real and simulated sequential devices are stored in this menu. You should feel immediately energized as soon as you enter the high level gadgets menu.

Software developer: Programming a board or chip without using the USB-sequential connection that is already installed is done with a hardware developer. In any case, if you want to modify a brand-new microcontroller, you will require this.

Consume Bootloader You can embed a bootloader into the microcontroller of an Arduino board by utilizing the options in this menu. This is useful if you buy a different ATmega microcontroller, which sometimes doesn't have a bootloader, but it doesn't affect how the Arduino board works on its own. Make sure that the appropriate board has been selected from the Sheets selection before eating the bootloader on the goal board. The necessary wiring was also installed as a result of this direction.

5. RESULTS AND DISCUSSION

The project “Safety Helmet” was designed a continuously monitoring system for coal mine using sensors and wireless zigbee, technology.

Helmet:

- The main controlling device of the project is ARDUINO UNO microcontroller.
- Methane sensor, DHT11sensor, MQ6, MQ135, zigbee transmitter, buzzer and three LEDs are interfaced to the arduino microcontroller. All these components are placed to the helmet which operated by 3.7 V battery.
- Arduino continuously read the data from sensors and it will send this data to the control room through wireless zigbee. If the sensor data exceed threshold value it will active the buzzer and LED for alerts.

Receiver Section Working:

- The main controlling device of the project is PIC microcontroller.
- Zigbee receiver, buzzer and LCD display are interfaced to the microcontroller.
- Sensor data is received by ZIGBEE receiver module and fed as same to the microcontroller. Microcontroller will display the sensor data on LCD module and also active the buzzer if the sensor data exceed threshold value.

6. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC’s with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

7. FUTURE SCOPE

We can extend this project by adding AWS.

AWS is a cloud storage we can check the data from anywhere in the world.

Enhanced Communication Systems

Robotics and Automation

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