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WIRELESS SURVEILLANCE AND SAFETY SYSTEM FOR MINE WORKERS BASED ON ZIGBEE

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ABSTRACT

Agriculture plays a vital role in the economic development of our country. Crop yield primarily depends on soil fertility. Fertilizers are normally recommended based on the nutrient present in the soil. To recommend a suitable fertilizer level, the soil nutrient analysis is essential which is done mostly using laboratory techniques. Manual methods of measuring soil nutrients are time consuming. Many farmers refrain to perform soil testing in the laboratoryand grow the same crop in the land continuously, hence soil loses its fertility. A system has been proposed to adopt precision agriculture using Wireless Sensor Networks, which enables remote monitoring of soil fertility. For endurable development in the agricultural field continuous cropping is necessary along with the constant check of soil fertility. Agricultural yield primarily depends on soil fertility. Soil nutrient measurement is very important for properplant growth and effective fertilization. The current approach of measuring the soil nutrients istime-consuming because soil samples are to be collected from the field and it is measured in alaboratory situated in cities away from the farms. Due to more time consuming, There is a needto create a system that will generate similar results within less time. In this paper, a system is proposed that measures Soil nutrients (N, P, K) for crops using NPK sensor with the help of arduino. Results will be generated in a short time and precise. It will also suggest the farmers which organic fertilizers they can use to get better yield and maintain soil fertility.

1. INTRODUCTION

China's primary energy source is coal. Since the year 2000, coal has accounted for 73% of China's energy output and 61% of its energy consumption. Human exploitation accounts for 92 percent of coal production in our country. Several factors, such as substandard coal mining, have contributed to this situation. High mining depths, methane, coal dust, flood and fire, bump, and geothermal energy are some of the hazards. The coal industry's health development has been disrupted. Coal is an important part of the economy. In China, national energy is a high-risk business in industrial andmining firms. The safety of coal mines in China hasgradually improved in recent years. There is still a disparity when compared to other major coal- producing countries. How to effectively prevent accidents and boost productivity has become a pressing issue in coal mine safety production and management. We can effectively solve the presentcoal mine safety production monitoring system's deficiency that can cause man-made accidents by implementing artificial intelligence theory and expert system technology to accident diagnosis andtreatment. The design is separated into three levels, namely the perceptive layer, network layer, and application layer, with unified planning, deployment, management, interface, and unified standards for design. Sensors detect data supplied via communication module to control thecomputer, detection, and data gathering in the perceptive layer. 1) Data collecting devices such assensors, such as surface wellheads, coal, videosurveillance, and sensor equipment installed underthe well site; 2) Data access to the gateway before the sensor network, including mine data access, transmission, and total.

2. RELATED WORK

The research presents a two-fold logarithmic curve-based early warning system for the threat ofsand plugging. To visualise the oil weight and bundling pressure characteristics in the twofold logarithmic curve slant sand plug risk recommended, the coupled time region assessment and GRNN figuring are applied right away. A short time later, the inclination change is used to perceive and condemn the sand plug, allowing the early warning of a sand connection breaking to be understood. Finally, improved AP gathering estimation is employed to segment the oil weight and weight twist, followed by twist fitting, while simultaneously determining the inclination of the fitted curve. The following are the standard responsibilities of the paper: (1) In this research, an early reprimand model for the twofold logarithmic curve of separating sand is developed. (2) In the early notification model, a time game plan inspection computation is proposed, which can predict the oil weight and bundling pressure. As well as the GRNN predictionis utilised to keep the demand for the time regionassessment up to date. (3) To improve the precision of danger notification, improved AP gathering computation is employed to bundle thechecking data. The remainder of the paper is laid out as follows: The twofold logarithmic twist model, time plan model, GRNN, and better AP clustering are all included in Region 2. Fragment 3 displays a perceptual model for using GRNN to examine time plan time space. The revised APgathering early advice model is outlined in Section (4) The fifth segment examines the buildingapplication.

3. LITERATURE SURVEY

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Coal mine production and safety monitoring canbenefit from the use of intelligent mobile phones

The intelligent mobile phone coal mine productionand safety monitoring system is based on several existing safety-monitoring systems, such as the coal mine gas-monitoring system and the coal mine production management system, which are already in use in the coal mine. It uses an intelligent phone as a platform to carry out its functions of safety monitoring and production control by monitoring the data thresholds of current systems and collecting correlative data, aswell as sending SMS alerts to safety and management personnel. As a result, this system can be described as a "mobile production andsafety control centre" that allows users to access production and safety information anywhere and at any time.

WANG FU-ZENG THE STATE KEY LABORATORY OF COAL RESOURCES AND SAFE MINING, CHINA UNIVERSITY OF MINING AND TECHNOLOGY, BEIJING, CHINA INTERFERENCE OF EFT ON MONITORING SYSTEM OF COALMINE ELECTRIC POWER SAFETY

The electromagnetic environment of the mine's substations is severely contaminated. In mine, there are a lot of electromagnetic interferences. Electrical Fast Transient/Burst (EFT) is a high- energy, short-duration, low-energy, and repeating pulse group that has a substantial impact on mine safety monitoring systems. This paper introduces the notion of EFT. The effects of EFT interference on mine safety monitoring systems are investigated. Meanwhile, the effects of EFT interference on the mine safety monitoring system are being investigated.

4. EXISTING SYSTEM

There is a device in this system that monitors the temperature of the mine and the level of gas. Alertis not one of them. Only the caretakers are in charge of keeping an eye on the situation.

5. PROPOSED SYSTEM

If an abnormal state is detected during monitoring, the system will send a message to theright people. We can easily control this system via Zigbee (wireless communication)

6. MODULES

1) GAS SENSOR
2) HUMIDITY SENSOR
3) ULTRASONIC SENSOR
4) HEARTBEAT SENSOR

1) GAS SENSOR:

Chemical sensors, such as gas sensors, are extremely important. A chemical sensor consists of a transducer and an active layer that converts the information into an electrical signal such as frequency, current, or voltage change. Becausethe air we breathe contains a variety of gases thatcan be harmful to humans, pollute the environment, or be important in industrial or medicinal processes. Because the environment welive in is mostly populated by humans, plants, andanimals, it becomes extremely important to identify the presence of these gases. Traditional detection methods, which generate systems thatsound an auditory alert to notify people when a gas leakage that is toxic or is not very dependablebecause accurate real-time measurements of atarget gas are required, are not very reliable. For centuries, however, various gas sensortechnologies such as semiconductor gas sensors, catalytic gas sensors, electrochemical gas sensors,optical gas sensors, and acoustic gas sensors have been utilised to detect various gases. Sensitivity, selectivity, detection limit, reaction time, and recovery time are some of the factors that determine a sensor's performance. A sensor's sensitivity (S) is calculated as/c, where c is the change in analyte concentration. S is measured inHz/ppm or Hz/vol% of the total volume. The factors that govern whether a sensor can respondselectively to an alyte or a group of analyses are referred to as selectivity. The detection limit of ananalyse is the lowest concentration that the sensor can detect under specified conditions.

2) HUMIDITY SENSOR:

The relative humidity in the air is sensed, measured, and reported by a humidity sensor (or hygrometer). As a result, it measures both moisture and temperature. The ratio of actual moisture in the air to the maximum amount of moisture that may be held at given air temperature is known as relative humidity. Humidity sensors measure the relative humidity ofthe surroundings in which they are installed. Relative humidity is expressed as a percentage of the ratio of moisture in the air to the maximum quantity that can be held in the air at the current temperature. The amount of water vapour in the air is referred to as humidity. The gaseouscondition of water, which is invisible to the nakedeye, is known as water vapour. Humidity denotes whether or not there will be rain, dew, or fog. By slowing the drainage of fluids from the skin, higherhumidity diminishes the efficiency of sweating in cooling the body. A heat index table or humidex isused to calculate this effect. As the temperature rises, the amount of water vapour required toachieve saturation rises as well. Humidity can be measured in three ways: absolute, relative, and specific. The water content of air, expressed in gramme per cubic metre, is known as absolute humidity. The current absolute humidity relative to the maximum (highest point) for that temperature is measured by relative humidity, which is reported as a percentage. The mass of water vapour divided by the entire mass of the wet air parcel is known as specific humidity.

3) ULTRASONIC SENSOR:

The HC - SR04 ultrasonic ranging module has a non-contact measurement range of 2cm to 400cm with a ranging precision of 3mm. Ultrasonic transmitters, receivers, and a control circuit are included in the modules. The essential premise ofwork is as follows:

- The Module automatically sends eight 40 kHz and detects whether there is a pulse signal back using IO trigger for at least 10us high level signal.
- If the signal returns at a high level, the time of high output IO duration is the period between sending ultrasonic and receiving it. (high level temporal velocity of sound (340M/S) / 2, test distance.

Directly connect the wires as follows:

- 0V Ground
- 5V Supply
- Trigger Pulse Input
- Echo Pulse Output

4) HEARTBEAT SENSOR:

The Heart Beat Sensor is a basic device that can beused to analyse the heart's function. The blood flow via the ear lobe is monitored by this sensor. The volume of blood in the ear lobe changes throughout time as the heart forces blood throughthe blood vessels in the ear lobe. A light lobe(small incandescent lamp) is shone through the ear by the sensor, which detects the amount of light that is transmitted. The clip can also be usedon the web of skin between the thumb and index finger or on a fingertip. In the box, the signal is amplified, inverted, and filtered. The heart rate may be measured by graphing this signal, andsome aspects of the heart's pumping action can beobserved on the graph.

A sample measurement taken with the heartbeat sensor:

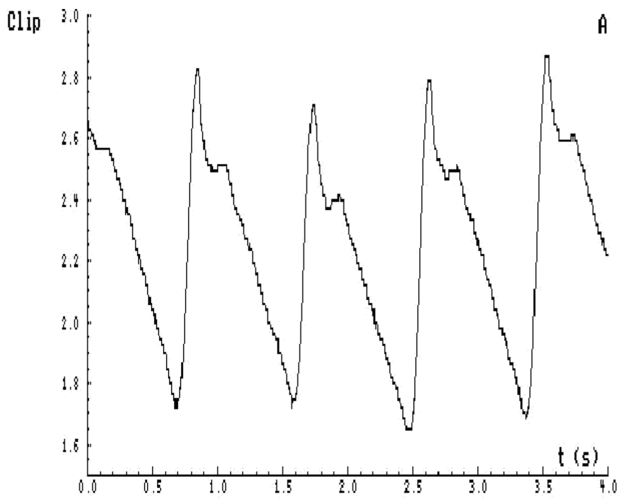

Fig 1- Measurement of Heartbeat Sensor

7. WORKING PRINCIPLE

A. TRANSFORMER:

The power supply voltage (0-230V) will be steppeddown to (0-6V) using the potential transformer. The secondary of the potential transformer will then be connected to the precision rectifier, whichwill be built using an op–amp. Precision rectifiers have the advantage of providing peak voltage output as DC whereas the rest of the circuits only provide RMS output.

B. BRIDGE RECTIFIER:

The circuit is known as a bridge rectifier when four diodes are linked as indicated in the diagram. The circuit's input is applied to the network's diagonally opposed corners, while the output is drawn from the remaining two corners.

Assume that the transformer is in good working order and that point A has a positive potential andpoint B has a negative potential. Positive potential at point A will cause D3 to forward bias and D4 toreverse bias.

D1 will be forward biassed and D2 will be reversedas a result of the negative potential at point B. D3 and D1 are forward biassed at this time, allowing current to flow through them; D4 and D2 are reverse biassed, blocking current passage.

Current flows from point B through D1, up throughRL, through D3, and back to point B via the transformer's secondary. The solid arrows point in the right direction. Waveforms (1) and (2) arevisible in D1 and D3.

The polarity across the secondary of the transformer reverses one-half cycle later, forwardbiassing D2 and D4 and reverse biassing D1 and D3. The current flow is from point A to D4, up via RL, through D2, through T1's secondary, and backto point A. The broken arrows point in the right direction. Across D2 and D4, waveforms (3) and (4)can be seen. The current in RL always moves in thesame direction. This current creates a voltage that corresponds to the waveform depicted when it flows through RL (5). This bridge rectifier is a full- wave rectifier because current flows through the load (RL) during both half cycles of the supplied voltage.

One advantage of a bridge rectifier over a normal full-wave rectifier is that it provides a voltage output nearly twice as high as the typical full-wave circuit with the same transformer.

Because of the modest voltage drop across the diode, the maximum voltage that appears across the load resistor is nearly-but never exceeds-500 volts. The maximum voltage that can be rectified in the bridge rectifier illustrated in image B is the whole secondary voltage, which is 1000 volts. As aresult, the output voltage across the load resistor reaches approximately 1000 volts at its peak. The bridge rectifier circuit delivers a higher output voltage than the typical full-wave rectifier circuit when both circuits use the same transformer.

8. FIGURES AND TABLES

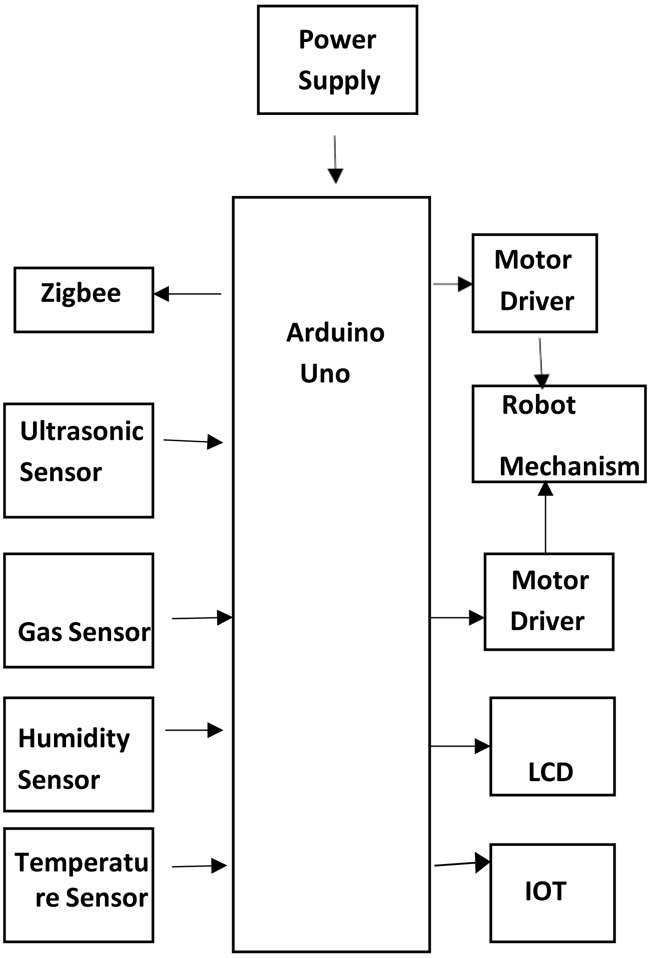

Fig 2- Block Diagram

9. FUTURE ENHANCEMENT

Later research reveals that intellectualization is a problem area. Despite sophisticated early risk reprimand, examination of swift control following the occurrence of dangers is of unusual importance.

With the advancement of technology, future study on this experiment could include a bettering of the framework by utilizing other advanced sensors for monitoring the subterranean. Similarly, all of the subsurface duties can be accomplished from the start. New developing communication enhancements can be used in conjunction with sharp sensors to identify mining conditions for quick data transfer. More IoT- enabled frameworks can also be designed for more advanced applications.6. Final thoughts Gassensor, temperature sensor, vibration sensor, andMEMS sensor are used in a coal mine security system to improve R&D safety.

10. RESULT

Gas level:

Initially, the gas levels will be abnormal.

Fig 3-Abnormal Gas Level

Temperature and humidity at normallevel:

The temperature and humidity will be moderateat first.

Fig 4-Temperature and Humidity at normal level

Ultrasonic Sensor:

This device's ultrasonic sensor alerts the user when obstacles are close.

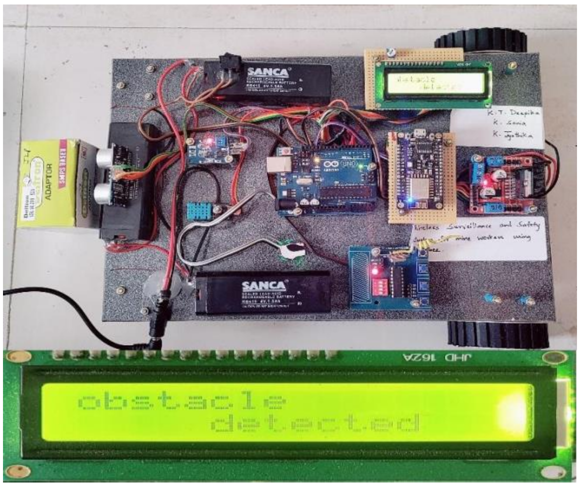

Fig 5-Ultrasonic Sensor

Attributes	**Temperature Level**	**Humidity Level**
With one incense stick	33°C	56%

With two incense sticks	35°C	55%
With bunchof incense sticks	40°C	49%
With one matchstick	34°C	46%
With two matchsticks	36°C	44%
With bunchof matchsticks	42°C	42%

Table 1- Comparison of Temperature and Humidity Levels

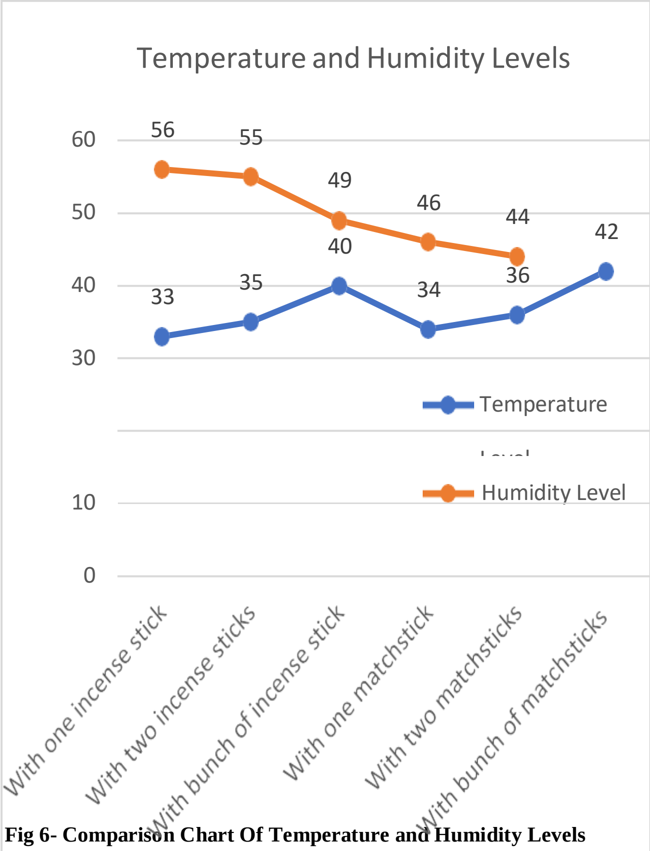

Fig 6- Comparison Chart Of Temperature and Humidity Levels

Gas levels will be abnormal, temperature andhumidity will also be normal at the beginning.

With one incense stick:

From the above graph, the temperature levels will begin to rise as a result of the incense stick's vapours. And whenthe temperature rises, the humidity will decrease.

Fig 7-Temperature and Humidity Levels with one incense stick

With two incense sticks:

From the above graph, Temperatures levels steadily rise. The humidity will decrease as the temperature rises.

Fig 8-Temperature and Humidity Levels with two incense sticks

With bunch of incense sticks:

From the above graph, The temperature rises to 40℃ or greater when incense sticks are consumed. The temperature will be extremely high, triggering an alarm. As the temperature rises, the humidity will decrease.

Fig 9-Temperature and Humidity Levels with bunch of incense sticks

With one matchstick:

From the above graph, The temperature will begin to rise as the vapours from the match stick react. As the temperature rises, the humidity will decrease.

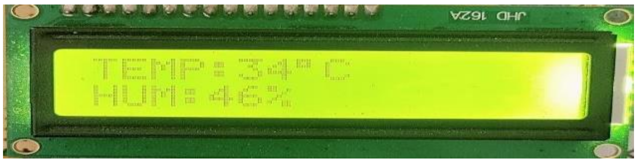

Fig 10-Temperature and Humidity Levels with one matchstick

With two matchsticks:

From the above graph, Temperatures continue to increase. As the temperature rises, the humidity will decrease.

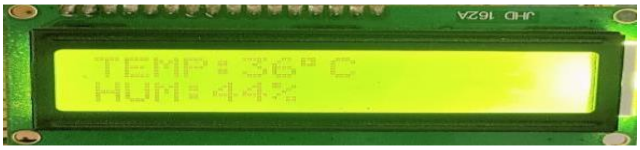

Fig 11-Temperature and Humidity Levels with two matchsticks

With bunch of matchsticks:

From the above graph, When the temperature rises above 40℃. The temperature will be extremely high, prompting an alarm. This will result in a decrease in humidity.

Fig 12-Temperature and Humidity Levels with bunch of matchsticks

11. CONCLUSION

Maintaining mining operations today necessitates safeguarding the safety and well-being of employees and assets. The employment of Arduino, Gas Sensor, Heartbeat Sensor, and Humidity Sensor in the development of coal mining security for personnel continues to monitor mining safety and update data to the IoT site. When workers use this strategy, their safety is guaranteed

12. REFERENCES

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