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Medium Frequency Signal Propagation Characteristics of A Lifeline as A Transmission Line in Underground Coal Mines

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Abstract— *The purpose of this project is to propose a solution suitable to mine wireless communication, safety monitoring. The various environmental parameters of mine safety monitoring and controlling system, such as Heartbeat, carbon monoxide, temperature are used in the helmet when an sensor detects the gas it will alert through the buzzer, and the information is transmit to the base station by using Zigbee technology.*

Keywords— Zigbee technology, mine safety monitoring, controlling system, Transmission Line.

I. INTRODUCTION

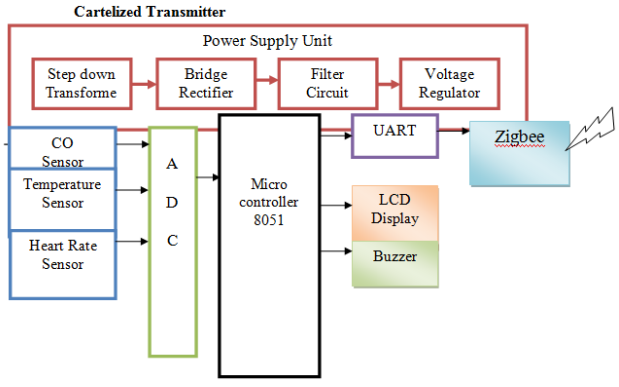
An embedded system is a special-purpose system in which the computer is completely encapsulated by the device it controls. A data logger is an embedded system device. Wireless sensor networking ,WSN, makes use of miniaturization made possible by advanced IC design to couple full wireless subsystems to sophisticated sensor, enabling people and companies to measure a myriad of things in the physical world and act on this information through IT monitoring and control systems.

A medium frequency (MF) communication system operating in an underground coal mine couples its signals to a long conductor, which acts as an MF transmission line (TL) in a tunnel to permit communications among transceivers along the line. [4] L. G. Stolarczyk, M. Sepich, K. Smoker, "A medium frequency wireless communication system for underground mines," Report from A.R.F. Products, Inc., Raton, New Mexico, 87740 to Bureau of Mines, Jan. 1983. Surveillance cameras were used for monitoring. It needs human beings to watch and identify dangerous situations.

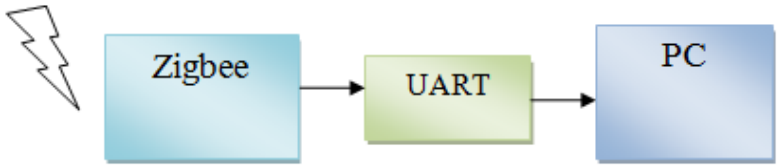
II. PROPOSED METHOD

The safety of coal mine is an important link in coal mine production; gas disaster is the most harmful for the safety of coal mine production. During the process of mine development, it is very important to measure the gas concentration in mines. For the present of situation of gas concentration monitoring system for monitor the harmful gases like CO_2 using sensors, Heartbeat through Heartbeat Sensor and temperature level is monitored using LM35. After detect the level of these gases then take the corresponding control process by micro controller. All the levels will be transmitted using Zigbee and the level is monitored in PC. If the level is increased above the normal level buzzer alert is provided for the coal mine workers for their safety.

2.1 Cartelized Transmitter



2.2 Control unit



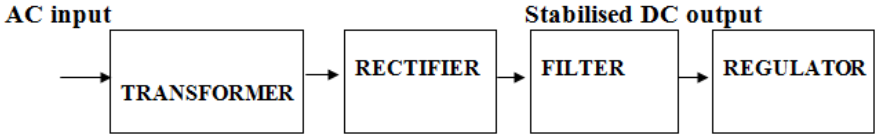
2.3 PROTEUS (Software)

Proteus is a software technology that allows creating clinical executable decision support guidelines with little effort. Once a guideline for a condition has been created, it can be executed to provide stepwise advice for any patient having that condition.

A software tool that allows creating and executing clinical decision support guidelines using the Proteus approach is available.

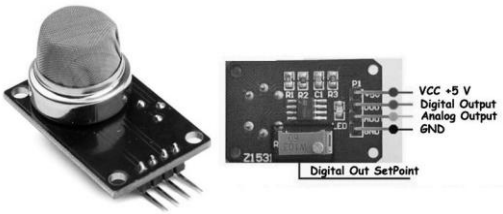
2.4 POWER SUPPLY

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.



2.5 CO_2 Sensor

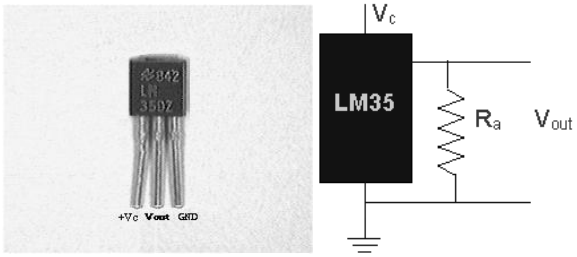
CO_2 sensor is a chemical optical sensor utilizing the acidic nature of CO_2 for detection. It consists of a gas-permeable membrane in which a pH-sensitive luminescence dye is immobilized together with a buffer and an inert reference luminescent dye. CO_2 permeating into the membrane changes the internal pH of the buffer.



2.6 LM35

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in ^oC)

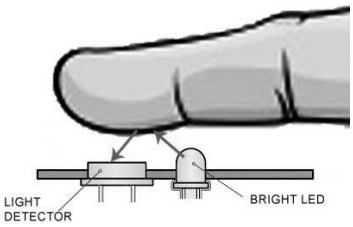
- You can measure temperature more accurately than a using a thermistor.
- The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.



- It has an output voltage that is proportional to the Celsius temperature.
- The scale factor is .01V/^{o}C
- Here is a photo of the LM 35 wired on a circuit board.
- The white wire in the photo goes to the power supply.
    - Both the resistor and the black wire go to ground.
    - The output voltage is measured from the middle pin to ground.l

2.7 Heart Beat Sensor

Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. This digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.



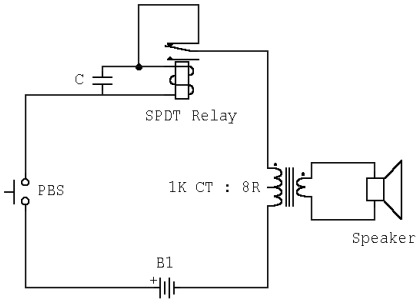
Heart beat is sensed by using a high intensity type LED and LDR. The skin may be illuminated with visible (red) using transmitted or reflected light for detection.

2.8 LCD Display

Liquid crystal cell displays (LCDs) used to display of display of numeric and alphanumeric characters in dot matrix and segmental displays. They used in laptops, computers, microwave and other electronic components.

2.9 Buzzer

A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio signaling device. A Piezo electric buzzer can be driven by an oscillating electronic circuit or other audio signal source. A click, beep or ring can indicate that a button has been pressed. A buzzer needs to have some way of taking in energy and converting it to acoustic energy.



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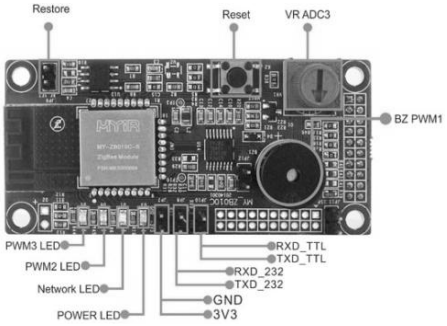
2.10 UART

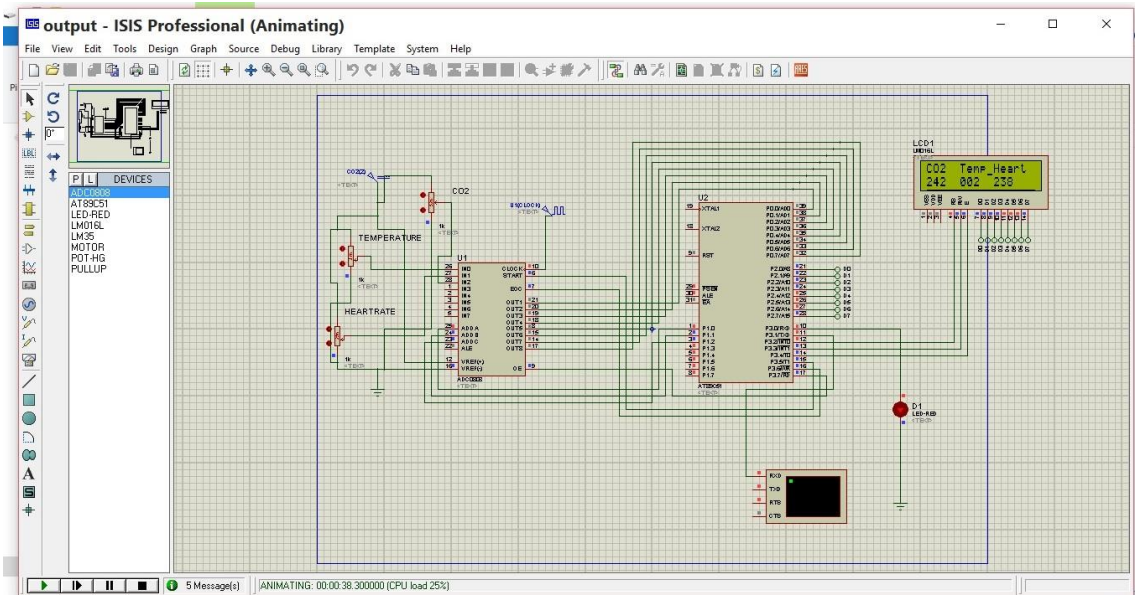
The Universal Asynchronous Receiver/Transmitter (UART) controller is the key component of the serial communications subsystem of a computer. UART is also a common integrated feature in most microcontrollers

2.11 ZIGBEE

ZigBee is a mesh network specification for low-power wireless local area networks that cover a large area. ZigBee was designed to provide high data throughput in applications where the duty cycle is low and low power consumption is an important consideration. Because ZigBee is often used in industrial automation and physical plant operation



III. SIMULATION OUTPUT



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The output of all the levels will be transmitted using Zigbee and the level is monitored in PC. If the level is increased above the normal level buzzer alert is provided for the coal mine workers for their safety.

IV. SOFTWARE TOOLS

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Embedded C

V. CONCLUSION

A special-purpose system in which ,we makes use of miniaturization made possible by advanced IC design to couple full wireless subsystems to sophisticated sensor, enabling people and companies to measure a myriad of things in the physical world and act on this information through IT monitoring and control systems. These notes are completely self contained, and will typically run off a battery source for many years before the batteries need to be changed or charged for future use.

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[5] L. G. Stolarczyk, H. Bobroski, "Medium frequency vehicular control and communication systems for underground mines," IEEE Vehicular Technology Conference, May 1984, Pages 316–321.

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