INTRODUCTION

Workers in hazard areas like mining or chemical industry must handle extreme climatic and physiological hazards without specialized medical supervision. For this reason, the industry is constantly looking for improvements to existing occupational safety and health (OS&H) programs in order to enhance working conditions for people and equipment. The proposed system will use to continuous monitor and measure the physiological variables of the workers in hazard areas. Therefore a continuous control of the workers’ vital signs is necessary.

EXISTING SYSTEM:

In this system heartbeat sensor and temperature values are not monitored but just give alarm by using Bluetooth technology.

PROPOSED SYSTEM:

In this proposed system we are monitoring physiological variables of mining area and updated to PC by using ZigBee technology. We can observe the variable values continuously. Here we monitoring two parameters one is temperature of the mining worker and the other one is his heart beat continuously and sending the data to the PC. Temperature sensor is used to measure temperature of mining workers. Heart beat sensor is used to measure heart beats of mining worker.

BLOCK DIAGRAM:

Transmitter section:

Receiver section:

HARDWARE REQUIREMENT:

Abstract:

In this paper we are monitoring temperature and heart beat values of the workers in mining with the help of temperature sensor and heart beat sensor and updated to PC and also displayed on the LCD at user side by using ZIGBEE technology. It is very much useful for mines to avoid threats caused by sudden changes in health condition.

Keywords - Arduino, ZIGBEE, LCD, Temperature Sensor, Heart beat sensor.
ARDUINO:
The Arduino Micro Controller is an open source platform which has 6 analog pins, 14 digital pins, one serial port, one power jack and one USB jack for code dumping.

ATMEGA328P FEATURES:
- Elite steadiness, Low Power utilization with 8-Bit Microcontroller.
- Progressed Reduced Instruction Set Computer (RISC) Architecture which has the accompanying components as takes after
  - It has 131 Strong Instructions.
  - Most executable instruction is single clock cycle.
  - 32 sticks each with eight universally useful working registers
  - It accompanies completely static operation
  - At 20 MHz it has the throughput up to 20 Million Instructions Per Second (MIPS)
  - It has two cycles of multiplier on chip
    - It has senior non-fickle Memory Segments
  - It has 32 Kilo Bytes of In-scheme self-designed Flash program memory
    - It has 1K Bytes EEPROM
    - It has 2K Bytes Intramural static RAM (SRAM)
  - It has compose/eradicate cycles of 10,000 glimmer/100,000 EEPROM. The program can be bolted with the assistance of the product security
  - There are two 8-bit clocks/counters with independent re-scale and think about mode
  - There are two 8-bit clocks/counters with independent re-scale and think about mode
  - It has constant counter with isolated oscillator work
  - It has six PWM channels
  - It has 10-bit ADC in TQFP and QFN
  - An arrangement of 10-bit ADC in PDIP
  - A USART for serial communication
  - There are two-master slave SPI linkup’s
  - Designed guard dog clock with isolated on-chip oscillator
  - Special features of the µc are detailed:
    - It will get reset when power on.
    - It also has the internal Oscillator
    - Two separate sources are available.
    - An extra 6 sleep modes are available, stand-by mode is also available
  - The I/O and Babbage are
    - It has 28- I/O lines
    - 28-pin in PDIP, 32-lead in TQFP, 28-pad in QFN/MLF and 32-pad in QFN/MLF
  - Executing voltage are as follows
    - 1.8 - 5.5V for Atmega328P
  - Temperature range is
    - -40°C to 85°C
  - Speed grade is
    - 0 - 20 MHz at 1.8 - 5.5V
  - Low Power utilization at 1 MHz, 1.8V, 25°C for ATmega328P:
    - Active Mode: 0.2 mA
    - Power-down Mode: 0.1 µA
    - Power-save Mode: 0.75 µA (Including 32 kHz RTC)

PIN ARRANGEMENT
PIN VERSION

- **VCC:** Digital supply voltage.
- **GND:** Earth ground.
- **Port B (PB.7-PB.0):** It contains the data transmission from 8-bit two-way I/O port, these having internal pull-up resistors. It has the PIN range from PB.7-PB.0. These pins also have some external features such as XCTL1, XCTL2 and OSC1, OSC2 for oscillator Frequency and Asynchronous timer/Counter.
- **Port C (PC.5-PC.0):** It is a 7-bit two-way port I/O port which has in-built pull-up resistors the pin arrangement is from PC.5-PC.0.
- **PC6/RESET:** It is a programmable reset pin which is used to RESTART the program from the starting position. The Execution starts from the first line of the program.
- **Port D (PD.7-PD.0):** It is a 7-bit two-way port I/O port which has in-built pull-up resistors the pin arrangement is from PD.7-PD.0.
- **AVCC:** It is the Power Supply pin for A/D conversions, PC3:0 and ADC7:6. It should be linked with the VCC supply.
- **AREF:** It is the analog reference pin for the A/D Converter.
- **ADC7:6 (TQFP and QFN/MLF Package Only):** In the TQFP and QFN/MLF package, ADC7:6 act as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels.

**TEMPERATURE SENSORS:**

Temperature sensors are used in various projects, while overseeing serious warmth, threats, or blocked off measuring focuses. There are two fundamental flavors: contact and noncontact temperature sensors. Contact sensors such as thermocouples and thermistors that touch the protest they might be to degree, and noncontact sensors measure the warm radiation a warmness source discharges to choose its temperature. The last gathering measures temperature from a separation and as often as possible are utilized as a part of hazardous situations.

**HEART BEAT SENSOR:**

There are three sensors utilized inside the transmitter module. They are the, Heartbeat Sensor, Pressure Sensor and Drug discovery Sensor. This sensor is intended to show advanced yield of coronary heart beat while a finger is situated on it. At the point when the coronary heart beat indicator is running, the beat LED flashes as one with every pulse. This virtual yield might be identified with microcontroller without a moment's delay to degree the Beats in venture with Minute
(BPM) charge. It works at the guideline of Light balance through blood skim by means of finger at each heartbeat.

![Heartbeat Sensor](image1.png)

**Fig. heart beat sensor.**

It is a circuit which converts AC to DC. It is very essential circuit required for any electronic gadget like mobile, laptop, etc.,

**Some Basic components used in Power Supply: Transformers**

Transformer is an electrical component which transfers electrical energy from one circuit to another circuit by changing its voltage strength.

Here we are using step down transformer for reducing 230 V to 12 v.

**LCD (Liquid Crystal Display)**

- LCD (Liquid Crystal Display) screen is a digital display module and discover a vast hodgepodge of employments. A 16x2 LCD show is fantastically basic module and is commonly used as a piece of numerous gadgets and circuits.

- A summon is a used to give directions to LCD for predefined tasks like initialize it, to clear display, places the cursor function in required position, and so on. The statistics enlist shops the statistics to be shown on the LCD. There are different styles of LCD’s like 16x2 and 20x4. Here we are using 16x2 and dot matrix LCD.

**Pin Diagram:**

![Pin Diagram](image2.png)

Basically, there are two sides in a transformer one is primary coil and other one is secondary coil.

**Rectifier:**

Rectifier is an electronic component which converts AC to pulsating DC.

Here we are using four diodes as a bridge rectifier which has high efficiency.

**It doesn’t change voltage strength.**

**Capacitors:**

Capacitors are used to convert pulsating DC to smooth pure DC. It filters small AC components.
Voltage regulators:
Voltage regulator is used to regulate constant voltage. Here we are using 7805IC which can output 5 V DC.

ZIGBEE MODULE
Zigbee standard is an IEEE 802.15.4. Zigbee is used to create PAN (Personal Area Network) and it suite for high level communication protocols. It used for home automation, in medical for data collection, it provides wireless communication for small scale projects. Zigbee requires less power and its data rate is low and it is close to wireless and hoc networks.

This device network has the characteristics of electric power-saving, reliability, low cost, large capacity and security, and it can be widely used in various fields of automatic control. This can be used at different applications like industry area, home automation, remote control, medical vehicles and agriculture applications.

How Zigbee Works (brief)
In a single network ZigBee has the capacity to address up to 65535 nodes. In general there are three nodes and named as coordinators, routers and end devices. Atleast one coordinator is required for one network. All nodes are used to send data and receive data. These nodes play their specific roles. A sample zigbee network is as shown in figure.

Zigbee Coordinators (Network Creator) - are the most efficient one in the network. It originally establish network and exactly one is present in each network. It is used to store information and security keys of the network.

Zigbee routers (multi-hop routing) - it acts like an intermediate router in network and used for relaying data from other devices in network.

Zigbee End Devices (Very low power) – these zigbee end devices are low powered or battery powered devices. They are used to communicate with their parents i.e., either a coordinator or a router. But it does not relay data from other devices as the router does. It reduces the cost.

ZigBee uses two types of devices they are RFDs and FFDs. RFDs which stands for Reduced-Function devices and these RFDs are sensors that are used to communicate with FFDs (Full-Function Devices). These FFDs are complex nodes and can serve as a routers. ZigBee Coordinator gives instructions to the end devices. ZigBee networks must have a coordinator, which is a full function device that used to manages the network. ZigBee technology have different algorithms in networking to gives large coverage area like static and dynamic star, cluster tree and mesh networking structures. If the end device is far away from its
coordinator, at that time it communicates through a router with the coordinators. The figure shows a mesh network.

Zigbee Applications

a. Home, building and industrial
b. Automation
c. Energy harvesting
d. Home control/security
e. Medical/patient monitoring
f. Logistics and asset tracking
g. Sensor networks and active RFID
h. Advanced metering/smart energy
i. Commercial building automation

These zigbee is mainly used to collect the analog data from the sensors and transmitting it wirelessly. Some of the sensor application are lighting control, TV remote control, door control & remote temperature sensor.

SOFTWARE DESCRIPTION:

Arduino IDE:

The Arduino IDE software is an open source software, where we can have the example codes for the beginners. In the present world there are lot of version in the Arduino IDE in which present usage is Version 1.0.5. It is very easy to connect the PC with Arduino Board.

APPLICATIONS:

Used to monitor the human physiological variables of mining workers at high altitude

ADVANTAGES:

• Low power consumption
• More reliable
• More compatible
• Less cost

RESULT:

The monitored results of heat beat and temperature of the workers are displayed on LCD as shown in below figure.

CONCLUSION:

In this system we are monitoring physiological variables of mining workers and updated to PC by using zigbee module in order to protect the workers from health issues.

REFERENCES:


AUTHORS’ PROFILE:
1. Dr. D. Vishnu Vardhan received his BTech degree in ACE from RDM college of engineering and MTech from JNTU Kakinada. Currently he is working as assistant professor in JNTUA college of engineering, Anantapuram. His research areas includes embedded in embedded system, signal processing and VLSI system design.

2. Shaik Karimullah received his BTech degree in MeRITS college of engineering and MTech from Madina college of engineering. Currently he is working as assistant professor in Annamacharya Institute Of Technology and Sciences, Rajampet. His research areas includes VLSI system design.

3. P. Sai Bhavya studying final year in Annamacharya Institute Of Technology and Sciences, Rajampet and her research area Embedded system and Verilog HDL.

4. P. Parameshwar yadav studying final year in Annamacharya Institute Of Technology and Sciences, Rajampet and his research area Embedded system.