

Implementation of Wireless Surveillance and Safety System for Mine Workers based on ZigBee

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ABSTRACT

With continuous enlarging of exploiting areas and extension of depth in coal mine, many laneways become monitoring blind areas, where are lots of hidden dangers. Moreover, it is inconvenient to lay cables which are expensive and consume time. In order to solve the problems, we designed a mine safety monitoring system based on wireless sensor network, which can improve the level of monitoring production safety and reduce accident in this work. Zigbee technology provides a direction for scientists who commit to solve the safety monitoring problems. We have proposed a low-cost solution to enhance the remote monitoring capability of existing industrial system. It is secure, robust and low-power consuming. It can also operate on multiple channels so as to avoid interference with other wireless devices or equipments in the industry.

Keywords: Zigbee, Mine Safety, Wireless Surveillance

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I. INTRODUCTION

Each of past three centuries has been dominated by a single technology. The 18th century was the era of the great mechanical system accompanying the industrial revolution the 19th century was the age of the steam engine. During the 20th century the key was information gathering, processing & distribution. among other developments we saw the installation of worldwide telephone networks, the invention of radio & television, the birth and unprecedented growth of computer industry, the launching of communication satellite. As a result of rapid technological process, these areas are rapidly converging and the difference between collecting, transporting, storing, and processing information are quickly disappearing .Organizations with hundreds of offices spread over geographical area routinely expect to be able to examine the current status of even their most remote outpost at the push of the button. As our ability to gather, process and distribute information grows, the demand for ever more sophisticated information processing grows even faster.

Now a days in industries automation is done. Each and every unit is controlled by a single computer. In each unit

everywhere sensors are placed and these sensors are interfaced to the controller. and according to instructions controller performs operations. This can be done using wired or wireless technologies. In wireless we have Bluetooth but they have some drawbacks like short range, high cost, power consumption is more etc. To overcome these drawbacks here we proposed a system which named as "Zigbee based sensor network". This is the integration of wireless technology and sensor network. The project is mainly targeted towards the reliability of the Industrial system.

ZigBee is an open technology developed by the ZigBee Alliance to overcome the limitations of BLUETOOTH and Wi-Fi. ZigBee is an IEEE 802.15.4 standard for data communications with business and consumer devices. It is designed around low-power consumption allowing batteries to essentially last forever. BLUETOOTH as we know was developed to replace wires and Wi-Fi to achieve higher data transfer rate, as such till now nothing has been developed for sensor networking and control machines which require

longer battery life and continuous working without human intervention. ZigBee devices allow batteries to last up to years using primary cells (low cost) without any chargers (low cost and easy installation).

In this project we monitor the temperature, pressure and DIP switches for turning on the light. These all are interfaced to PIC controller. One ZigBee transceiver is also connected to controller through SPI. At the control room same set up will be installed instead of sensors we will connect PC to controller using RS232. All measured parameters are display on PC.

II. PROPOSED SYSTEM

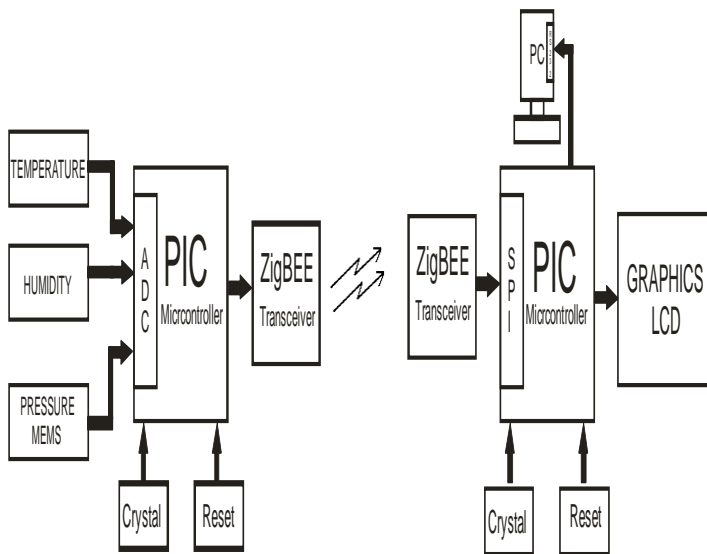


Fig 1. General Block Diagram Of Zigbee Based Sensor Network

The generalized block diagram of Zigbee based sensor network is shown as above. The block diagram can be divided into two parts first one is Master and second is slave. Master consists of following block:-

- PIC microcontroller
- Zigbee module
- Power supply
- PC

Similarly slave consists of following blocks:-

- PIC microcontroller
- Zigbee module
- Power supply
- Temperature sensor
- MEMS (pressure sensor)
- DIP switches

For the communication we require

- RS 232
- SPI

The parameters which we want to measure are physical parameters (i.e in non –electrical form).so as to convert it into electrical form we are using sensors. The output of sensor is in analog in nature to convert it into digital form

we apply it to ADC which is inbuilt in PIC controller. The converted digital output of sensor is analyzed by controller for taking proper action. After that controller ask Zigbee module it is ready or not. Then controller sends these data through SPI to Zigbee transceiver .The information is send to master module. It will receive it and decodes it. Then give it to PIC controller and according to information is received, will display on PC. Likewise information will be updated after every fixed duration.

If we want to switch of any process for example if temperature is more than set point then master will send command to slave to switch of the process. In this way bidirectional communication takes place. And we can get status of each sensor, switch on one pc. Also we can control it also.

III. RESULT

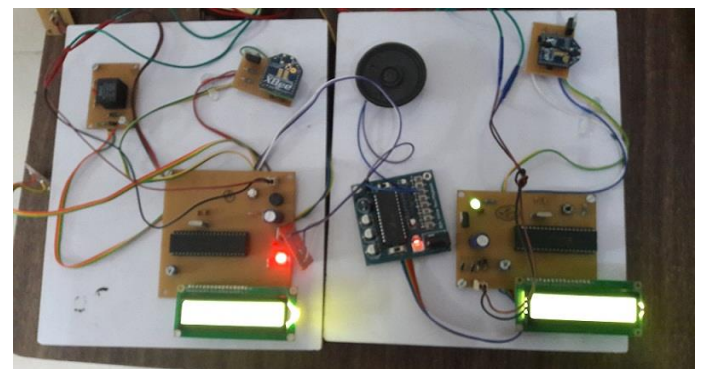


Fig 2. Complete Setup of proposed system



Fig 3. Low light intensity



Fig 4. Wireless coal

III. APPLICATION AND ADVANTAGES

Applications:

- **Home Entertainment and Control** — Smart lighting, advanced temperature control, safety and security, movies and music
- **Home Awareness** — Water sensors, power sensors, smoke and fire detectors, smart appliances and access sensors
- **Mobile Services** — m-payment, m-monitoring and control, m-security and access control, m-healthcare and tele-assist
- **Commercial Building** — Energy monitoring, HVAC, lighting, access control
- **Industrial Plant** — Process control, asset management, environmental management, energy management, industrial device control

Advantages:

- Low cost
- Low power consumption
- Using one PC whole plant can be monitor
- Real time monitoring

IV. CONCLUSION

We have proposed a low-cost solution to enhance the remote monitoring capability of existing industrial system. It is secure, robust and low-power consuming. It can operate on multiple channels so as to avoid interference with other wireless devices or equipment's in the industry.

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