A wireless sensor network air pollution monitoring system in Industrial areas

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Abstract –*This paper is based on monitoring air pollution and detection of parameter such as carbon monoxide, carbon dioxide and temperature. The system contains two parts , One is transmitter node and another one is receiver part. The transmitter parts consist of air sensor, microcontroller and RF transmitter and the receiver part consist of ARM, PC interfaced with Zigbee through PC serial port. In this project we deal with monitoring with air related parameters through wireless Zigbee modules. There sensor are connected one sensor to each node. The sensor is collected analog data and converting into digital data and monitoring takes place. Depending on hardware levels these will be indicated through alarm tone and LCD display showing the amount of gases. RF module contains RF transmitter and RF receiver are used to transmit data wirelessly. Zigbee is IEEE 802.15.4 standard is used to interface the data on PC.*

Key Words: Wireless communication, zigbee, Air pollution monitoring

1. INTRODUCTION

Now a days in an industry certain hazards gases is very difficult to monitor the parameters through wire and analog devices.

Industries air a main source for release of gases such as CO2, CO and temperature. Human beings are most affected through this. When the concentration of gases increases it causes disease such as lung problem, asthma etc.

The sensor such as MQ4, MQ9 and LM35 are used for detection of gases and temperature. These sensors are connected to microcontrollers respectively and UART through RF transmitter and receiver connected wirelessly cause communication between microcontroller and lpc2148 for data transmission. The lpc2148 interface with LCD display for the different parameters and through Zigbee it is being transmitted to PC.

1.1 Objective

1) Wireless communication: RF module is used to transmit data from microcontroller system very efficiently.

2) Monitoring: A software used coolterm is installed on computer on which data received by zigbee is displayed and updated time to time.

3) Detection: Detection of gases is done through the sensors having high sensitivity.

2. WORKING OF SYSTEM

The system has two section i.e. transmitter section and receiving section. On the transmitter section contains sensors, microcontroller and RF transmitter.
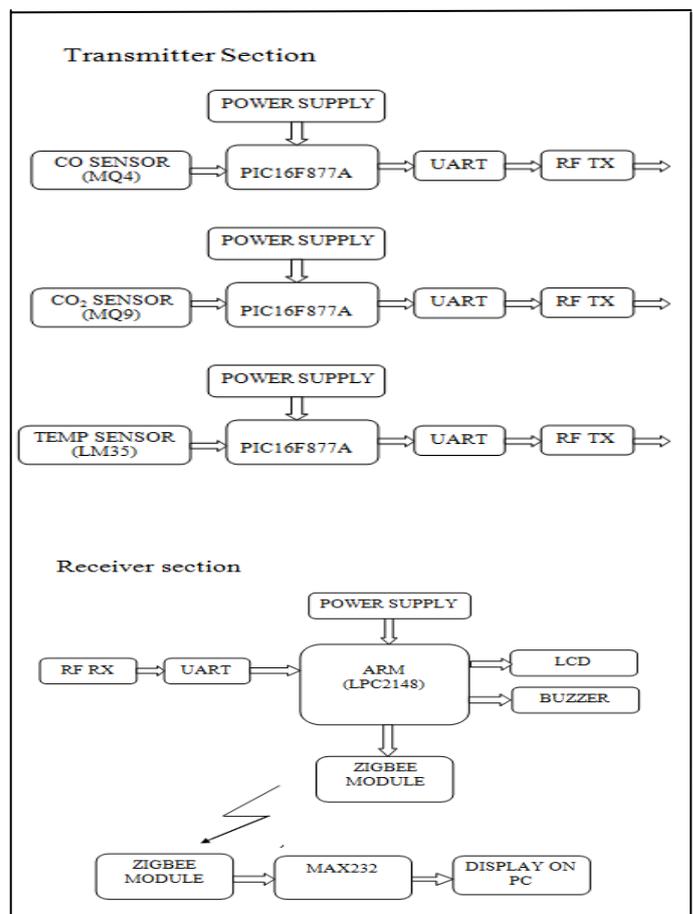

Fig -1: block diagram of system

These sensors such as MQ4, MQ9, LM35 used for the detection of gases and it connected to the microcontrollers respectively for AD conversion. This data transmitted through the RF transmitter to the RF receiver operates at 433.92 MHz and UART used for serial communication.

All transmitted data receive by the RF receiver and RF receiver interface with lpc2148 by using the UART. It operating speeds is 9600 bps. The Lpc2148 interface with the LCD and buzzer to display the contents of gases present and indicating cross limit in the atmosphere. It is a 16x2 LCD display and buzzer was based on an electromechanical system. On LCD display the contents of harmful gases in air such as CO, CO_2 in ppm (parts per million) and temperature in degree Celsius. The zigbee module used for transmitted data to the PC (personal computer) for storing data in memory. The coolterm software is used for display receive data using zigbee module.

2.1 Wireless network design

1) RF Module: RF module is the radio frequency within the electromagnetic spectrum associated with radio wave propagation. The 10 KHz to 300GHz frequency range that can be used for wireless communication.

2) Transmitter (TWS-434): The Transmitter is extremely small and are excellent for application requiring short range RF. The output is up to 8mw at 433.92MHz that is 400 foot outdoor and 200 foot indoor.
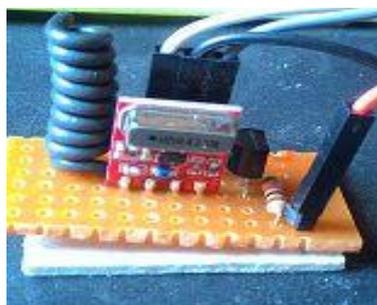

RF Transmitter

3) Receiver (RSW-434): The receiver operates at 433.92MHz and it has a sensitivity of 3microvolt. It gives both digital and linear output.


RF Receiver

2.2 Hardware used

Transmitter section
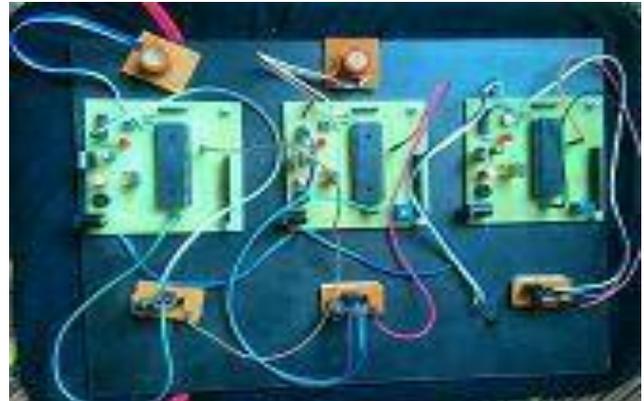
Receiver section
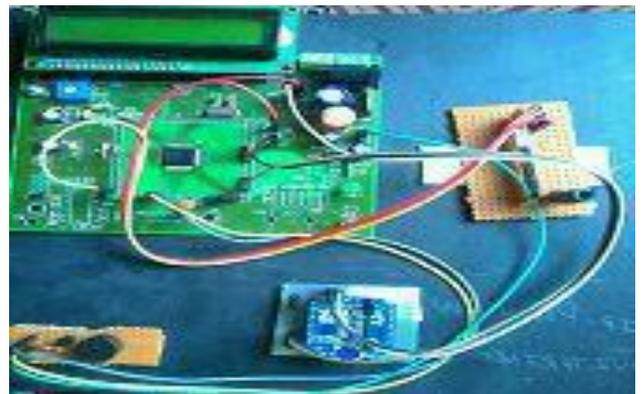
2.3 Software used

1) Eagle: For schematic circuit design, PCB design and layout.

2) Proteus: For simulation of hardware.

3) Coolterm: It is zigbee interfacing software used for displaying the data received by zigbee.

4) XCTU: It is a zigbee configuring unit software. We can configure zigbee module as coordinator and router in this software. The destination address and all other frames can be edited manually using XCTU software.

5) MPLABX_IDE: It provides a broad range of development tools like c compiler, macro assemblers, debuggers and simulators, IDE, the real-time operating systems and evaluation boards for 8051, PIC and ARM processors.

2.4 Future scopes

1. We can control hazardous gas and control various diseases such as asthma, lung problems.
2. The transmission of an image showing the quantity of gases at particular time is achieved.

3. CONCLUSIONS

This paper gives us an idea about monitoring air pollution and safety for environment. It indicates the temperature. It is efficient and user friendly method. Air pollution monitoring will be done in a node and check the accurate gases present in the environment.

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