



Zigbee Based Monitoring System in Industrial Application

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ABSTRACT: :Wireless Sensor Networks (WSNs) offers several advantages on monitoring and controlling applications over other traditional technologies in which we interact with the environment; i.e., through sensing the physical properties of the natural surroundings. By using wireless device we can overcome hazards occur due to wires and analog devices such as transducers. The main use of this module helps in an industry during the worst cases as the analog devices may be damaged during the fire accidents, etc. But with the wireless transmission we can get accurate data also we can monitor the parameter in industry without human interaction. It leads to the cheap wireless technology so it can be used for the low rate data transfer. This system forms star topology and developed to detect emergencies like gas leaks.

KEYWORDS:ARM, Wireless Sensor Network(WSN),Star topology

I.INTRODUCTION

Indevelopment of network and communication technology, the inconvenience of wiring is solved with WSN especially in the area of remote sensing, industrial automation control. WSN has good functions of data collection, transmission, and processing. It has many advantages compared to traditional wired network like convenient organizing network, small influence to environment, low power dissipation, low cost, etc. At present, near field wireless communication technology has been used widely, especially Bluetooth, wireless local area network (WLAN), infrared, etc. But, they have a number of disadvantages, for example, complexity, large power dissipation, short distance, networking in small scale. In order to satisfy the demand of low power dissipation and low speed among wireless communication devices, a new type of wireless net technology-Zigbee emerges as the times require. In this paper, we will introduce the networking technology and application of Zigbee in industrial application as it consists certain hazards while monitoring the parameter through wires and analog devices such as transducers. To overcome this problem here we use wireless device to monitor the parameters so that we can take certain steps even in worst case. The main use of this module helps in an industry during the worst cases as the analog devices may be damaged may be during the fire accidents, etc. But with the wireless transmission we do not have an accurate data but when compared to the analog failure the errors are very minimum so we use wireless to monitor the parameter in industry where there is no means of human operator to monitor the parameters[1]. It leads to the cheap wireless technology so it can be used for the low rate data transfer. The ZIGBEE technology is widely used for industrial automation. System consists of two parts one is transmitter and another is receiver part and both can be any number. Transmitter consists of gas sensors, peripheral interface controller (PIC) and Zigbee and the receiver part consist of PC interfaced with Zigbee through PC serial port. Here we monitor LPG, CO, and Air Quality with the help of MQ6, MQ7, MQ135 respective sensors. The data from the sensors are collected by microcontroller and transmitted to the receiver section through wireless medium. All the parameters are viewed by the PC using visual basic program at the receiver side .All these data mail to mail id so that we can access it from anywhere. This system mainly developed to detect emergencies such as gas leaks in industry.

II.PROPOSED SYSTEM

Fig.1 shows transmitter side of proposed system which consists gas sensors, peripheral interface controller (PIC) and Zigbee. Here we monitor LPG, CO, and Air Quality with the help of MQ6, MQ7, MQ135 respective sensors .All this data are collected as per priority we set and transmitted simultaneously to receiver part of system.

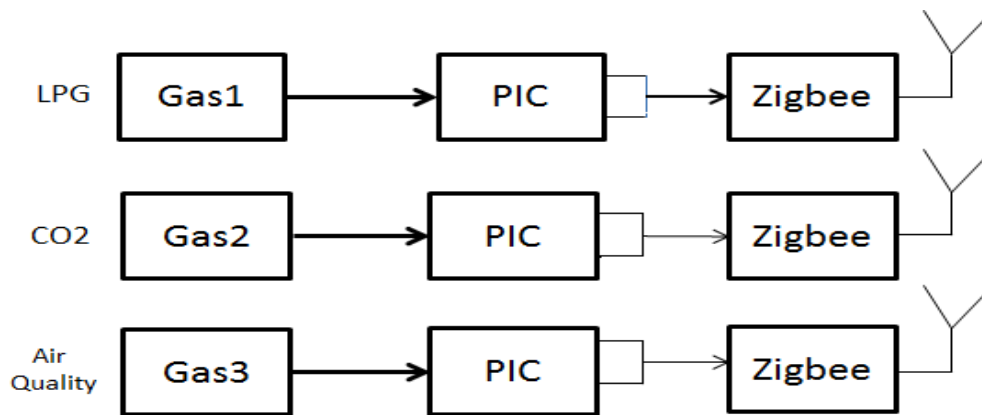


Fig.1.Transmitter

Fig.2 shows receiver side that receives data from the sensors. All these parameters are viewed by the PC using visual basic program at the receiver side and also mailed to mail id so we can monitor the data from anywhere

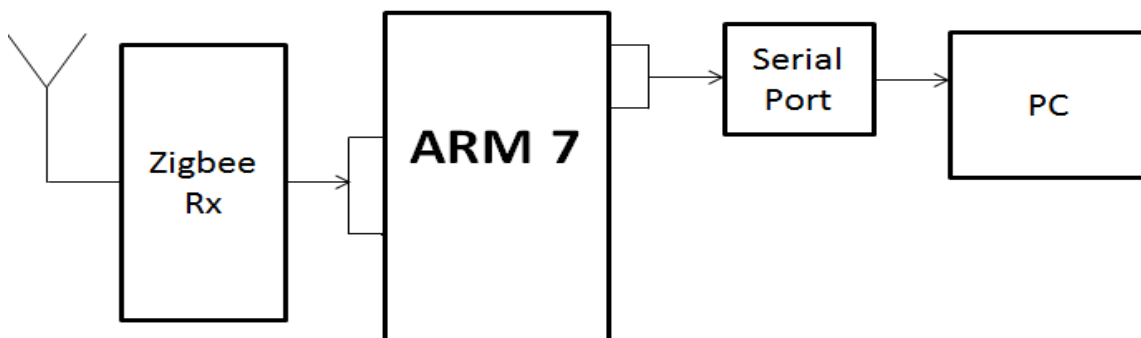


Fig.2.Receiver

III.ZIGBEE CHARACTERISTICS

1. ZIGBEE stack protocol: IEEE Std 802.15.4 defines the physical layer (PHY) and medium access control (MAC) sublayer specifications for low-data-rate wireless connectivity with fixed, portable, and moving devices with very limited battery consumption requirements typically operating in the personal operating space (POS) of 10 m[1].
2. Physical Layer: The 802.15.4 standard specifies two different services that the Physical Layer (PHY) provides. The PHY data service controls the radio, and thus, the transmission and reception. The management service performs Energy Detection in the channel, Clear Channel Assessment before sending the messages and provides LQI for the received packets[3][4].
3. Wireless Sensor Network: The ZIGBEE (IEEE 802.15.4) is a new technology that permits the implementation of Wireless Personal Area Networks(WPAN). It is very suitable for wireless sensor networks due to the very low power consumption. This was one of the reasons why it was chosen for the implementation of the system presented in this paper[2].
4. ZIGBEE network topology: Network topology is the arrangement of the elements of a network. These elements are nodes or links. When two computers or devices are connected directly through a link then this topology is called peer-to-peer and is the simplest topology of all. The most wide spreading topologies are:-



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- The BUS topology
- The RING topology
- The STAR topology
- The TREE topology
- The Mesh topology

5. Security in ZIGBEE: The mechanism protects the confidentiality, integrity, and authenticity of the MAC frames An auxiliary header field in front of the MACpayload indicates if the frame is encrypted or not. The MAC frames integrity is supported by calculating and using a MIC at the end of the MAC payload. Nonce is used to provide MAC confidentiality and authenticity [2].

IV.SENSORS DESCRIPTION

A. LPG Gas Sensor: MQ6 This sensor used in gas leakage detecting equipments in industry, are suitable for detecting of LPG, iso-butane, propane, LNG, avoid the noise of alcohol and cooking fumes and cigarette smoke.

B. CO Gas Sensor:MQ7 This sensor used in gas detecting equipment for carbon monoxide(CO) in and industry. It has High sensitivity to carbon monoxide and Stable and long life

C. Air Quality:MQ135 They are used in air quality control equipments for buildings/offices, are suitable for detecting of NH3,NOx, alcohol, Benzene, smoke,CO2 ,etc.

V. RESULT AND DISCUSSION

The Comparison of Wired and Wireless Networks given in a table no.1

Sr.No.	Characteristics	Wired Networks	Wireless Networks
1.	Installation	Difficult to moderate as more no. of Componentsrequire more cables	Easy installation
2.	Time to installation	More (due to connection of each and every computer in the network)	Less (no untidy cable connections involves in this)
3.	User connectivity	Connectivity is possible only to or from those physical locations where the network cabling extends.i. e. limited connectivity	Connectivity is possible beyond the bounds of physical network cabling.
4.	Mobility	Limited as it operates only on a connected computers linked with the network	Outstanding as it can enable wireless user to connect to network
5.	Hubs and switches	Need hubs and switches for connections	No need of hubs and switches
6.	Power consumption	High	Low

Table.1.Comparison of wired and wireless Networks

Table no.1 shows the advantages of wireless networks over wired networks in terms oflow cost, lowpower consumption, and low data rate.

VI.CONCLUSION

The nature of wireless sensor networks (WSN) offers several advantages on monitoring and controlling applications over other traditional technologies including self healing, self organization, and flexibility. ZIGBEE is an IEEE 802.15.4 standard for data communication with business and consumer device. The technology behind ZIGBEE specification is intended to be simpler and less expensive than WPANs, such as bluetooth and wifi[1]. The main objective of this paper is to derive the statistical information about gas leakage and send itthrough mail so that we can



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acquire data from anywhere without human interaction. The IEEE 802.15.4 covers the physical layer and the MAC layer of low rate WPAN[5]. It is feasible to construct a WSN for emergency response notification using IEEE 802.15.4 and ZIGBEE. Moreover there is a range of sensing applications which can be developed using 802.15.4 MAC and PHY along with ZIGBEE stack this system has the potential to reduce the response time in a cost effective way[3]. This system at the moment will be focusing on one aspect of the emergency detection like gas leakage.

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