Monitoring the Room Environment using WSN

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***Abstract*-We present a wireless sensor network (WSN) for monitoring indoor air quality, which is crucial for people's comfort, health, and safety because they spend a large percentage of time in indoor environments. The aim of the project is to maintain indoor air quality.In this paper we propose a design using WSN. Here we are developing a system which can monitor the indoor environment. The system is developed to monitor the indoor air quality like temperature, humidity and gas leakage. Here we developed system having the gas sensor, temperature sensor and humidity sensor and using here microcontroller for programming part. The input to the system is sensor value and output is displayed on LCD. Also when there is dangerous situation, the alarm will be on and the data will be stored on PC for further reference. The system is less cost and convenient to use. The system gives wide application and we can use it in various areas of our day today life.**

Index Terms — WSN, PIC Microcontroller, sensors, GSM modem

I.INTRODUCTION

People's daily lives is closely related to the ambient temperature. Therefore monitoring and control of temperature and humidity has become a very important technology. Today peoples comfort is the most important thing, so to improve people's comfort, health and safety it is very useful to monitor Indoor Air Quality. Now a day's WSN having its wide area of application.WSN used in various field, here we are using it with sensor to improve the peoples comfort. Wireless sensor networks (WSNs) have opened up an exciting field of research. A WSN can be seen as a system of self-powered, wireless sensors which are able to detect and transmit events to a base station. WSNs are deployed wherever it is not possible or practical to maintain a wired network infrastructure. In recent years, a great number of prototype sensor networks have been deployed, including networks for volcano monitoring, habitat monitoring or glacial movement monitoring Headaches, nausea, dizziness, eye and throat irritation is usual symptoms of the so-called Sick Building Syndrome (SBS). Earlier, only CO2 concentration was controlled, but in the recent several years Volatile Organic Compounds (VOCs) are also used as indicators of persons' comfort important sources of VOCs in a building are people(bio effluents), furniture, building materials, paints, etc .Another important task in monitoring the indoor climate is detection of dangerous situations, like pipe leakage. Methane is a principal constituent of the natural gas used in almost

every household for cooking or heating. When it reaches a certain concentration in air (5–15%), it is flammable and explosive. Carbon monoxide sources are tobacco smoke, gas heaters and stoves, leaking chimneys, etc. It is colorless, odorless and tasteless, hence impossible to notice without a sensing device. In smaller quantities it causes headaches and dizziness after a couple of hours of exposure. Higher concentrations cause headaches and dizziness after 5–10 min, and death within 30 min. Very high concentrations (e.g. 12800) cause unconsciousness after a couple of breaths, followed by death in less than 3 min. One of the most important parameters which have to be monitored and controlled is the temperature.The system represents how wireless visual sensor is used with gas leakage sensor & used to transmit.

The temperature must be monitored and controlled not only for human health but also for avoiding accidents and in industrial processes. Overheating can lead to explosions causing important damages or, worse, human deaths. Temperature is crucial in many industrial domains, such as chemistry, electronics; manufacturing of integrated circuits visual information with gas leakage data .Such system forms a node in wireless sensor network. Here we are just developing one node. Wireless sensor network (WSN) is a novel technology in acquiring and processing information and has been an active research area in recent years. There are no. of applications of WSN outlined in many areas such as military, environmental, health, home, commercial, and the industrial. Particularly, the WSN solutions for real time monitoring of nuclear power plant. Sensor networks are commonly comprised of lightweight distributed sensor nodes such as low-cost video cameras. Most sensor networks will also be based on employing content-rich vision-based sensors. Applications that will be facilitated through the development of visual sensor networking technology include automatic tracking, monitoring and signaling of intruders within a physical area, assisted living for the elderly or physically disabled, environmental monitoring, and command and control of unmanned vehicle. These wireless visual sensor with gas leakage sensor can also be used in used in industrial application like at bio –gas plant or at sugar factory or at gas filling plant where detection of gas leakage is very much essential with wireless transmission of picture information of that physical environment. This paper consists of eight chapter . Each chapter serves the purpose of describing the various aspects of the seminar such as the basic information of the protocol and performance parameters. Introduction part which gives basic knowledge about the gas sensor with its scope. Literature Survey contains overview and related work in same field. It contains the block diagram of project and its description.

II. RELATED WORK

In the literature review of this project we studied the following papers related to this project. It gives us the brief study of the project. The paper mentioned below are the work which up till now done on the gas, temperature and humidity sensor.

The paper [1] presents a wireless sensor network **(**WSN) for monitoring indoor air quality, which is crucial for people's comfort, health, and safety because they spend a large percentage of time in indoor environments. A major concern in such networks is energy efficiency because gas sensors are power-hungry and the sensor node must operate unattended for several years on a battery power supply. A system with aggressive energy management at the sensor level, node level, and network level is presented. The paper[2]presets a system which aims to develop an advanced power efficient Early Warning System (EWS) to safeguard the miners from explosions by detecting concentrations of methane gas. The limitation is in the proposed system only the methane gas was sensed, while a system which can monitor various other parameters like humidity, temperature, oxygen, carbon monoxide can be implemented. All these parameters can help predict mine explosions with even more accuracy. The paper[3] presents Embedded systems connected to a local network sense the temperature and send the data to a server but the limitation is we cannot control temperature in a building, through mobile modules; an alarming system consisting in emails or SMS.The paper[4] presents a system for WSN based on environmental monitoring. The system can monitor several environmental parameters such as underground water level, barometric pressure, ambient temperature, atmospheric humidity, wind direction, wind speed and rainfall and provide various convenient services for end users who can manage the data via a website from long-distance or applications in console terminal. So this is the related work done up till now regarding the WSN in case to monitor the indoor air quality.

III. PROPOSED SYSTEM

Here we are developing a device which can sense the gas leakage, temperature and humidity. To improve people's comfort, health and safety it is very useful to monitor Indoor Air Quality (IAQ).Headaches, nausea, dizziness, eye and throat irritation is usual symptoms of the so-called Sick Building Syndrome (SBS). Earlier, only $CO2$ concentration was controlled, but in the recent several years Volatile Organic Compounds (VOCs) are also used as indicators of persons' comfort. Another important task in monitoring IAQ is detection of dangerous situations, like pipe leakage (e.g. CH4 or CO).$CH4$ (methane) is a principal constituent of the natural gas ,used in almost every household for cooking or heating .When it reaches a certain concentration in air (5–15%), it is flammable and explosive. Carbon monoxide sources are tobacco smoke, gas heaters and stoves, leaking chimneys, etc. It is colorless, odorless and tasteless, hence impossible to notice without a sensing device.MQ-5 Semiconductor Sensor for Combustible Gas Sensitive material of MQ-5 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exist, the sensors conductivity is higher along with the gas concentration rising. We use simple electro-circuit, convert change of conductivity to correspond output signal of gas concentration.MQ-5 gas sensor has high sensitivity to Methane, Propane and Butane and could be used to detect both Methane and Propane. The sensor could be used to detect different combustible gas especially Methane, it is with low cost and suitable for different application. The proposed system come under two parts as system block diagram and hardware part.

A. System Block Diagram

The system architecture consist of transmitter part (fig.1) and receiver part (fig 2).The transmitter part consist of the microcontroller and the sensors namely gas sensor, temperature sensor and humidity sensor. Further the serial interfacing device connected to it and the zigbee transmitter. The receiver figure consists of the receiver part, zigbee receiver and pc display.

a. Transmitter

Fig.1 consists of the transmitter part. It contains the temperature sensor, humidity sensor and gas sensor. These three sensors sense the value of temperature, humidity and gas value and send its information to microcontroller. Microcontroller does the programming part and there is MAX232 is used for serial interfacing between microcontroller and other devices. The Zigbee transmitter is connected to the serial interfacing device. Further the microcontroller is connected to the keypad, alarm and display, the keypad is used to give the input to the system and alarm is used for output and the display unit will display the information.

b. Receiver

Fig.2 consist of receiver part consist of the Zigbee receiver, RS232 connector and PC display. The Zigbee receiver will receive the information from the transmitter part; the RS232 is used for the serial interfacing and PC display the used for the display the output

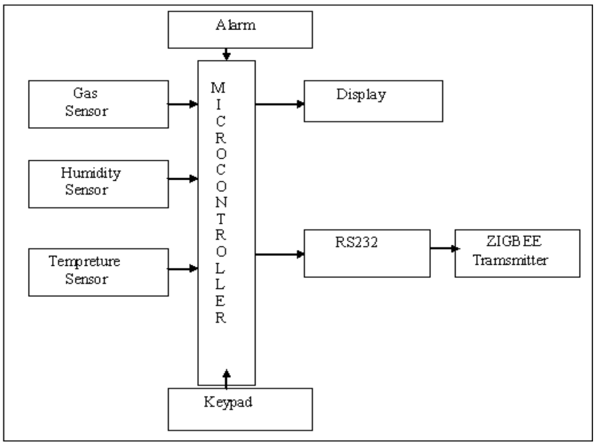

Fig.1 Transmitter system

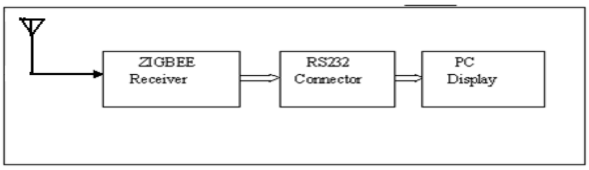

Fig .2 Receiver system

c. Working

Using keypad we can store some fixed or reference value of gas in the memory of PIC processor. Processor always compares the value of gas with the readings shown by gas leakage sensor and the decision is taken accordingly. When gas leakage is detected, the system gives audio indication .At the same time processor collects the visual/picture information sends it at the remote receiver.

B.Hardware part

The system consists of mainly sensor containing the sensor gas sensor, temperature sensor and humidity sensor. The other hardware part contains the GSM module, microcontroller Zigbee and power supply unit

a. MQ-5 LPG Gas detector module

Here MQ series sensor is used. It mainly detect the LPG gas leakage. The sensing material in TGS gas sensors is metal oxide, most typically SnO_2. When a metal oxide crystal such as SnO_2 is heated at a certain high temperature in air, oxygen is adsorbed on the crystal surface with a negative charge. Then donor electrons in the crystal surface are transferred to the adsorbed oxygen, resulting in leaving positive charges in a space charge layer.

b. Temperature Sensor

The LM35 series are precision integrated-circuit temperature sensor, with an output voltage linearly proportional to centigrade temperature. Thus the LM35 has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract large constant voltage from the output to obtain convenient integrate scaling. LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾e.°C low over a full -55°C to 150°C temperature range.

c. Humidity Sensor Module

The HH10D relative humidity sensor module is comprised with a capacitive type humidity sensor, a CMOS capacitor to frequency converter and an EEPROM used to holding the calibration factors. Due to the characteristics of capacitor type humidity sensor, the system can respond to humidity change very fast. Each sensor is calibrated twice at two different accurate humidity chambers; two unique sensor related coefficients are stored onto the EEPROM on the module. The data is used for humidity calculation

IV. SOFTWARE IMPLEMENTATION

The software architecture for controller will be as follows. The software that is used for coding of controller is Keil µVision. The various codes for controller is developed using this platform. Coding is done in C language. The software implementation of project contains the following flowchart. The algoritham tells us how the software system will work. The programming for controller is done using embedded development platform called Keil µVision. For coding we use C language using same software. The flow of this is explained as given below

1. First controller will receive the information from the sensor
2. Then the MCU ask a GSM module.
3. If GSM module replies ok then it will go next step
4. After that it will sense that is the temperature, humidity and gas value is normal.
5. If the value is not normal then it turns on the buzzer and LED.
6. After that it will send a message to stored phone no.

The flow chart tells the detail description of software working. Our goal is to maintain the indoor air quality. This will help us to control the indoor air quality using simple mobile devices. This application should automatically pass the instruction to the connected network system, which directly passed the instruction to the stored mobile number, which work using PIC controller the application should have simple user interface and it should avoid resource intensive instruction parsing and methods**.**

V. RESULT

In the result we get output on LCD display. The reading of temperature, humidity and gas sensor will be displayed on LCD and if there is any dangerous situation then the alarm will be ON and the message will be send to the stored mobile number.

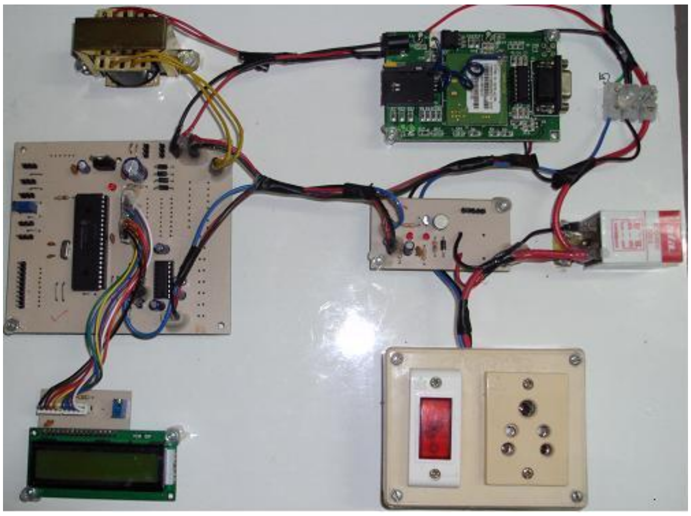

Fig.3. Snapshot of system

The above Fig.3 gives the output of tempreture and humidity displayed on LCD.In the output part we also get the database on PC and the message will be send to the stored mobile number in case of dengerous situation.

VI. CONCLUSION

The system monitor the parameter like temperature, humidity and gas leakage. The microcontroller receives data from the sensors and after doing programming, it transmits data to PC for display. So we can maintain the indoor air quality .It gives a wide range of applications, we can use it anywhere in our day today life such as hospitals, colleges or any other public places to improve the health quality of people.

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