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Air Monitoring and Data Acquisition System

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ABSTRACT
Atmosphere surrounds the earth. All the living beings are surrounded by the atmosphere .So we need to measure different parameters of atmosphere which have the impact on human health. The various parameters include the atmospheric pressure, humidity and various gases. This project is a simple wireless sensor based air quality monitoring and data acquisition system for industrial and urban areas. The framework comprises of temperature sensor, humidity sensor, pressure sensor and a set of gas sensors (like carbon monoxide, smoke). In case of unexpected values the system sets the buzzer on. Wireless transmission is efficient technology which can accumulate and measure parameters from real world.
KEYWORDS: Wireless sensor; air quality monitoring

1. INTRODUCTION
Life of the human beings follows the "Theory of Evolution" given by Charles Robert Darwin. Life is all about survival of human race we require a quality of environment to live in. As we all are very much familiar about the day to day increment of pollutants in our environment we need to keep check on it. There are many health disorders which occur to the living organism due to little or more ups and down in the amount of different environmental components especially in air. So we need to measure different gasses.

The WHO states that 2.4 million people die each year due to air pollution with 1.5 million of those death attributes the indoor air pollution. Therefore it's a necessity to establish this system on public places on large scale due to ever increasing air pollutants.

Nevertheless there are other parameters like temperature, pressure and humidity also which plays a vital role in the selection of the locality for different business purposes like agriculture, factory setup etc.

By turning this wireless, we get different benefits. There will be no need for the person to be present physically at the site, this reduces the risk on his/her health.

So, in this project we are designing a wireless [RF Module] based system to measure these parameters related to the two different areas.

2.HARDWARE ARCHITECTURE
The microcontroller at the transmitter end read the values of the temperature sensor, humidity sensor, pressure sensor, CO sensor and smoke sensor. Fig 1 is the basic block diagram of the transmitter end of the system.

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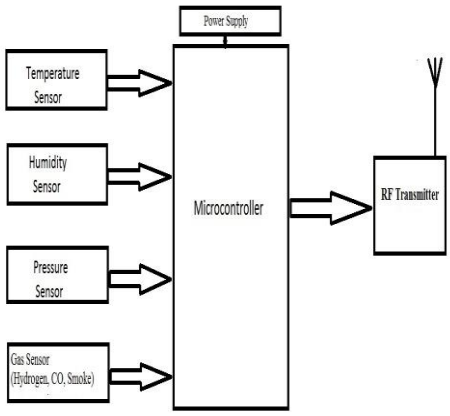

Fig 1: BLOCK DIAGRAM OF THE TRANSMITTER END

The sensors acquire the parameters in the real time and the parameters are processed by the microcontroller and the output is displayed on LCD. Fig 2 is the basic block diagram of the receiver end of the system.

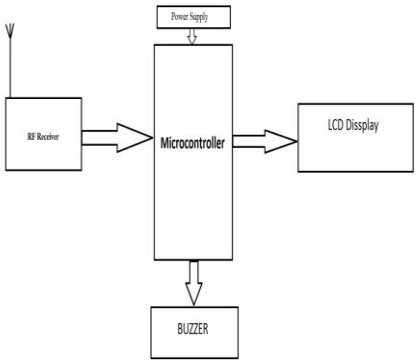

Fig 2: BLOCK DIAGRAM OF THE RECEIVER END

2.1 MICROCONTROLLER

The powerful yet easy to program CMOS FLASH based 8 bit microcontroller packs Microchip's powerful architecture into 40 or 44 pin package and is upwards compatible with PIC16cfx.The PIC16F877A EEPROM data memory is of 256 bytes, self programming an lcd,2 comparators,8 channels of 10 bit analog to digital converters, the synchronous serial port can be configured as either 3 wire serial peripheral interface(SPI) or the 2 wire Inter integrated circuit(I2c) bus and a Universal Asynchronous receiver transmitter(USART).All of these features make it ideal for more advanced level of A/D applications in automotives, industrial appliances and consumer appliances.

2.2 TEMPERATURE SENSOR

The LM35 series are precision integrated circuit temperature sensors whose output voltage is linearly proportional to Celsius (centigrade) temperature. The LM35 thus have advantage over linear temperature sensors calibrated in Kelvin as the user is not required to subtract a large constant value from its output to obtain convenient centigrade scaling.

2.3 PRESSURE SENSOR

The BMP180 measures in the range of 300 to 1100 hPa The accuracy down to 0.02 hPa in advanced resolution mode. For high accuracy, ruggedness and long term stability it is based on piezo-resistive technology. These come factory-calibrated, with the calibration coefficients already stored in ROM.

2.4 HUMIDITY SENSOR

Humidity is the presence of water in the air. The presence of water vapour also influences various physical, chemical and biological processes. Controlling or monitoring humidity is of paramount importance in many industrial and domestic applications and many others, humidity sensors are employed to provide an indication of the moisture levels in the environment. The DHT11 is a ultra low-cost humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and gives a digital signal on the data pin .

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2.5 SMOKE SENSOR

Smoke is a collection of airborne solid and liquid particulates and gases emitted when a material undergoes combustion together with the quantity of air that is entrained or otherwise mixed into the mass. For the measurement of the amount of smoke we use MQ-2.

2.6 CO SENSOR

Carbon Monoxide is one of the most harmful gasses present in the atmosphere. It is colourless, odourless gas. It affects the cardiovascular and nervous system. A little increment in its amount can cause a vital effect on the human. To measure this we use MQ-7.

2.7 RF MODULE

An RF Module is a (usually) small electronic circuit used to transmit, receive, radio waves on one of a number of carrier frequencies. They are used over remote controls as it doesn't require the line-of-sight operation. This process reduces paper, data entry time delays, cycle count processing, out of stock quantities and typing errors. Here we are using the frequency of 434 MHz.

2.8 TRANSMITTER CIRCUIT DIAGRAM

The microcontroller is working on 4 MHz frequency. All the sensors are connected to port A of the microcontroller PIC16F877A. Fig 3 shows the circuit diagram. Pin 25 of microcontroller is connected to the RF transmitter of the transmission purpose. The frequency of RF module is 434MHz.

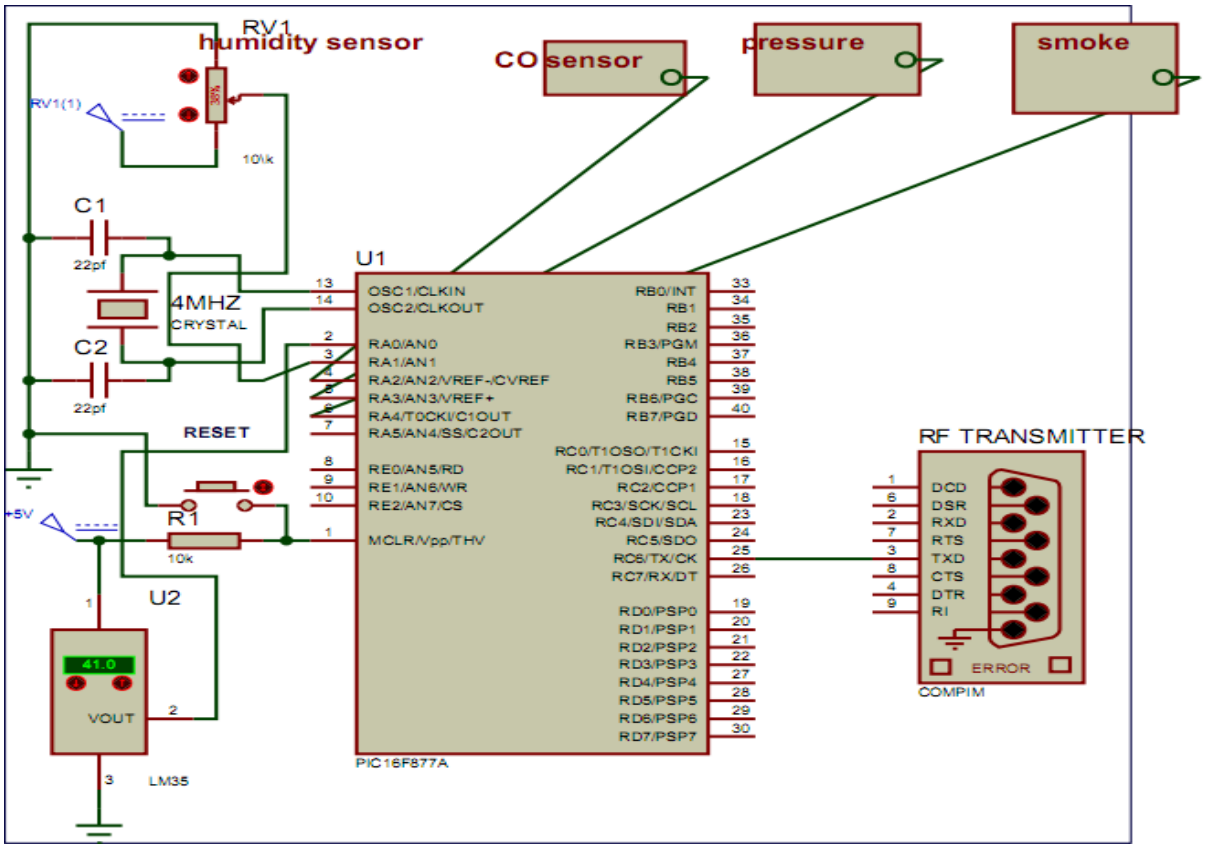

Fig 3: CIRCUIT DIAGRAM OF TRANSMITTER END

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2.9 RECEIVER CIRCUIT DIAGRAM

LCD is connected to port B of the microcontroller. Potentiometer is connected to the VEE pin of LCD. It is used to control the brightness of the LCD. Pin 26 of microcontroller is connected to the RF receiver to receive the data. The buzzer is set on when the values exceed the predefined limits which varies according to the surroundings.

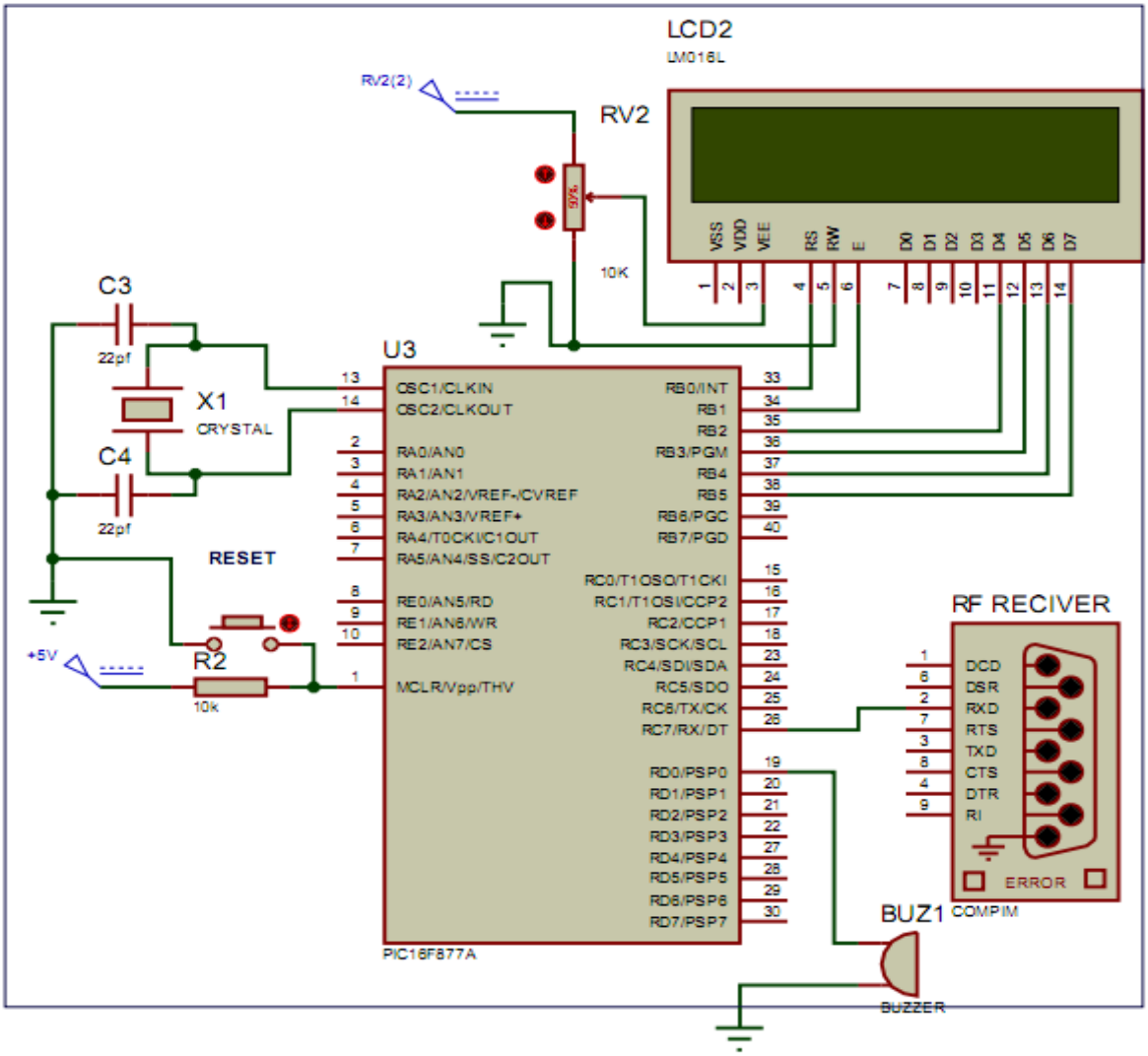

Fig 4: CIRCUIT DIAGRAM OF RECEIVER END

CONCLUSION AND FUTURE WORK

This project measures the temperature, pressure, humidity, smoke and amount of CO in the atmosphere. This helps us to know the atmospheric balance at different places. In most of the sub urban areas we need this technology to keep check on these parameters as well as in the buildings. The wireless system makes this project more user friendly. For the future aspects we can increase the range.

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