POLLUTION MONITORING USING INTERNET OF THINGS

A Mini Project Report

Bachelor of Technology (Electronics and Telecommunication Engineering)

By

SUDARSON SENGUPTA (510718018)

RAVIPATI SHISHIR CHOWDHURY (510718028)

HARSH BANDHU (510718031)

MODI ABHIJEETH (510718052)

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR

HOWRAH-711103.

CERTIFICATE

This is to certify that the project report titled **"**Pollution monitoring using Internet of things**"** being submitted by Sudarson Sengupta(510718018), Ravipati Shishir Chowdhury(510718028), Harsh Bandhu(510718031) and Modi Abhijeeth(510718052) in fulfillment of the requirement for the award of Bachelor of Technology degree in the Department of Electronics and Telecommunication Engineering and to the Department of Electronics and Telecommunication Engineering at Indian Institute of Engineering Science and Technology, Shibpur is a record of bonafide work carried out by them under my supervision and guidance.

Date: 10/06/2020

Professors/Assistant Professors

Department of Electronics and Telecommunication Engineering

Indian Institute of Engineering Science and Technology, Shibpur

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DATE:10/06/2020	PLACE: IIEST, Shibpur

Sudarson Sengupta	Ravipati Shishir Chowdhury	Harsh Bandhu	Modi Abhijeeth
510718018	510718028	510718031	510718052

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ABSTRACT:

Air quality has been largely affected by industrial activities, which have caused many health issues among people. Air pollutants levels can be measured using gas sensors. Internet of Things (IoT) technology can be used to remotely detect pollution. IOT devices can be used to control basic functions from anywhere around the world through the internet. The data gathered by such a system can be transmitted instantly to a web-based application to enable monitoring real time data and allow immediate risk management. The aim is to build a system which can be used to monitor the parameters in different environments. Here, we describe an entire Internet of Things (IoT) system that collects real-time data in specific locations. This real-time data collected is compared with a predetermined threshold. This data is sent to the concerned organization notifying them about the values exceeding the threshold if any and take necessary actions if needed.

1. INTRODUCTION

1.1 EXISTING SYSTEM MODEL:

In today's world many pollution monitoring systems are designed by considering different environmental parameters. Existing system model is presented in figure.1 uses Zigbee based wireless sensor networks to monitor physical and environmental conditions with thousands of application in different fields. The sensor nodes directly communicated with the moving nodes deployed on the object of interest which avoided the use of complex routing algorithm but local computations are very minimal. RFID is a means of storing and retrieving data through electromagnetic transmission to an RF compatible integrated circuit. It is basically used to track and label items in supermarkets and manufactories. There are two main components of RFID systems: tags and readers. A tag has an unique identification (ID) number and a memory which is used to store additional data such as manufacturer, product type, and environmental factors such as temperature, humidity, etc. Through Wireless Communication the reader is capable to write and/or read data to tags. In need of identification or tracking, tags are embedded or attached into objects in a typical RFID application. RFID tags can be classified into three major categories by their power source: active tags, passive tags, and semi passive (semi-active) tags are embedded or attached into objects in a typical RFID application.

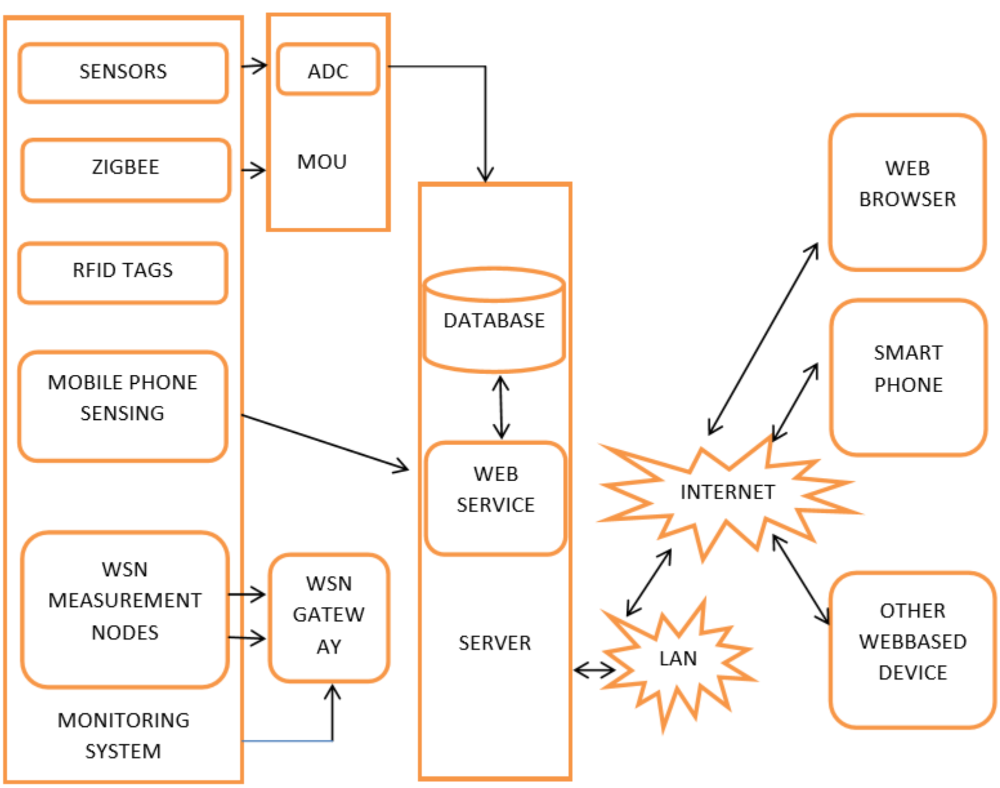


Fig 1: Existing System Model

Mobile phones or smart phones those are cap abled and in built with sensors are applicable for impact on social including how technology of mobile has to be used for to protect environmental, sensing and to influence just-in-time information to create movements and actions ecofriendly. Mobile phone sensors were deployed and used on urban areas for monitoring and it was categorized into two major classes, participatory sensing where user is directly involved and opportunistic sensing where user is not involved, but its limitation includes power and static information processing or mobility restrictions. A Wireless Sensor Network inbuilt of many wireless sensors those are inexpensive, which are able to collect, store, process an environmental information, and to communicate with nodes those are neighbors to each other. Previously, sensors are connected by wire lines. The access method of WSN gateway node is convenient because data can be received from a WSN via the gateway at any time and any place. In charge of node authentication, message buffering, the gateway works as the network coordinator where you can collect, process, analyze, and present your measurement data. Wireless sensor network management model consists of end device, router, gateway node and management monitoring center. To collect wireless sensor network data, and to forward them to parent node, Hence end device is trustworthy then data are forward to gateway node from parent node directly or with the help of router. Gateway node extracts data after getting data from wireless sensor network, then analyzes and packaged them into Ethernet format data, forward them to the server. A server is an occurrence of a computer program that is used to accept then reply to another program request; called as a client. So we could say that to run the server software any device could be considered a server. To manage network resources Servers are used. In the servers, the services or information are provided through the Internet those are connected through LAN and made available for users via smart phones, web browser or other web browser devices to make the system more intelligent, adaptable and efficient.

1.2 PROPOSED MODEL:

The proposed embedded device is for monitoring noise and CO levels in the atmosphere to make the environment intelligent or interactive with the objects through wireless communication. The proposed model is shown in figure 2 which is more adaptable and distributive in nature to monitor the environmental parameters. The proposed architecture is discussed in a 4- tier model with the functions of each individual modules developed for noise and air pollution monitoring. The proposed model consists of 4-tiers. The tier 1 is the environment, sensor devices in tier 2, sensor data acquisition and decision making in tier 3 and intelligent environment in tier 4.The proposed architecture is shown in figure 2.

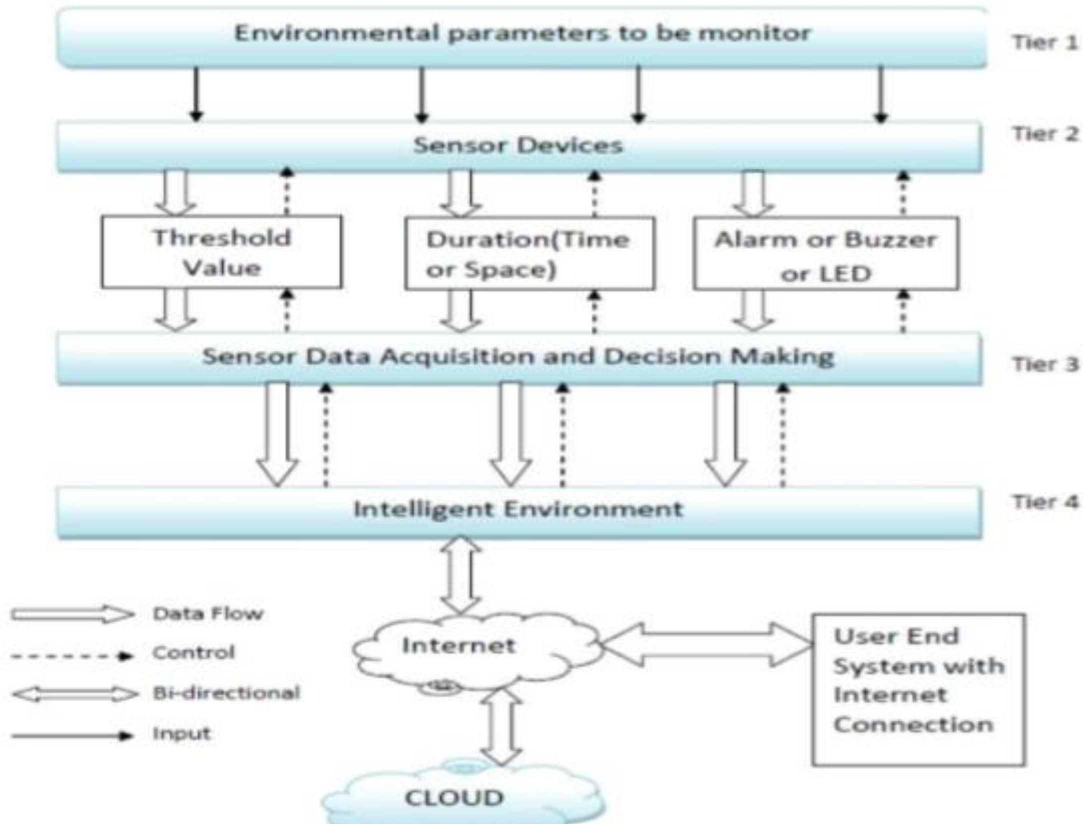


Fig.2: Proposed model

Here, the tier 1 provides information about the parameters under the region which is to be monitored for noise and air pollution control. Tier 2 deals with the sensor devices with suitable characteristics, features and each of these sensor devices are operated and controlled based on their sensitivity as well as the range of sensing. In between tier 2 and tier 3 necessary sensing and controlling actions will be taken depending upon the conditions, like fixing the threshold value, periodicity of sensing, messages (alarm or buzzer or LED) etc. Based on the data analysis performed in between tier 2 and tier 3 and also from previous experiences the parameter threshold values during critical situations or normal working conditions are determined. Tier 3 describes about the data acquisition from sensor devices and also includes the decision making. Which specify the condition the data is representing which parameter. In the proposed model tier 4 deals with the intelligent environment. Which means it will identify the variations in the sensor data and fix the threshold value depending on the identified level of CO or noise levels. In this tier sensed data will be processed, stored in the cloud i.e.in to the Google spread sheets and also it will show a trend of the sensed parameters with respect to the specified values. The end users can browse the data using mobile phones, PCs etc. Based on the framework shown in figure 2, we have identified a suitable implementation model that consists of different sensor devices and other modules, their functionalities are shown in figure 3.In this implementation model we used AVR UNO board with Wi-Fi module is as embedded device for sensing and storing the data in cloud. AVR UNO board consist of analog input pins (A0-A5), digital output pins (D0D13), inbuilt ADC and Wi-Fi module connects the embedded device to internet. Sensors are connected to AVR UNO board for monitoring, ADC will convert the corresponding sensor reading to its digital value and from that value the corresponding environmental parameter will be evaluated. The Wi-Fi connection has to be established to transfer sensors data to end user and also send it to the cloud storage for future usage. Before sending the sensed data to cloud, the data will be processed in MATLAB for analyze and visualize data to end user. The data analysis in MATLAB makes easier to us to set threshold level and to perform necessary controlling actions. An embedded system designed for environmental monitoring and its components are shown in figure 4.The embedded device is placed in particular area for testing purpose. The sound sensor detects sound intensity levels in that area and Carbon Monoxide (CO) sensor MQ-9 will record the air quality in that region, if the threshold limit is crossed the corresponding controlling action will be taken (like issuing message alarm or buzzer or LED blink).All the sensor devices are connected to internet through Wi-Fi module. It shows the embedded system with its components for reading and to store the pollution parameters in cloud. After successful completion of sensing, the data will be processed and stored in database for future reference. After completing the analysis on data the threshold values will be set for controlling purpose.

CO levels in air at regular time intervals. All the above information will be stored in the cloud, so that we can provide trending of noise intensity and CO levels in a particular area at any point of time. After sensing the data from different sensor devices, which are placed in particular area of interest. The sensed data will be automatically sent to the web server, when a proper connection is established with sever device. The figure 5 shows the web server page which will allow us to monitor and control the system. By entering IP address of server which is placed for monitoring we will get the corresponding web page. The web page gives the information about the intensity of sound and the CO level variations in that particular region, where the embedded monitoring system is placed. The sensed data will be stored in cloud (Google Spread Sheets). The data stored in cloud can be used for the analysis of the parameter and continuous monitoring purpose. The figure 6 shows the noise intensity levels and CO levels in air at regular time intervals. All the above information will be stored in the cloud, so that we can provide trending of noise intensity and CO levels in a particular area at any point of time.

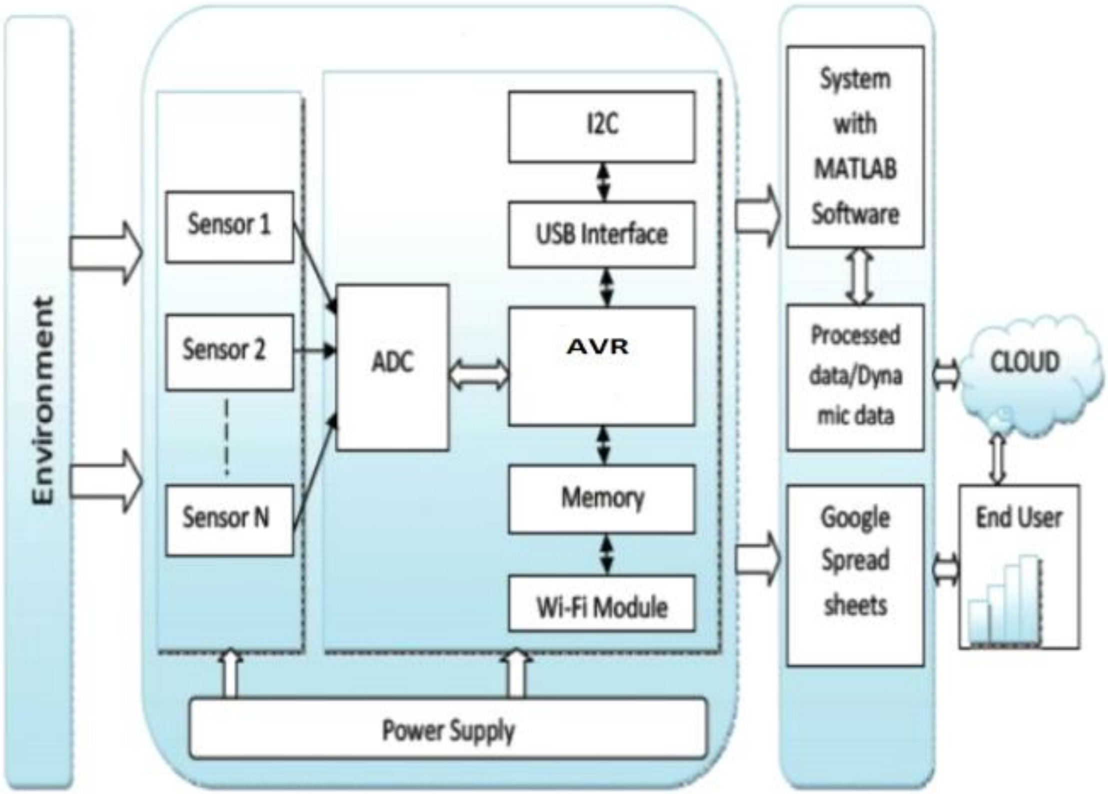


Fig. 3: Schematic diagram of implementation model

2. CHALLENGES IN IMPLEMENTATION:

In order to realize the aforementioned IoT enabled sustainable applications in the context of a smart city, raises a plethora of challenges catering to the iot-based systems. The challenge to be faced, refers to embedding intelligence into common electrical objects by enabling these devices to learn and be smarter becoming more autonomous through sharing and exchange of data and information with other objects, as well as the maintenance of reliability following the volatility which tends to be introduced due to real-world dynamics. The other major challenge is to cope up with the heterogeneous platforms of the multiple smart devices that we plan to implement, by coordinating these devices on the basis of their relationship with one another, goals achieved and location requirements also their adaptation to the network of things. Furthermore, issues with regards to the end-to-end security and privacy needs to be addressed. Therefore encryption and prohibition of data theft from these devices are cardinal to their implementation. Protection from hacking via the use of firewalls and redundancies need to be incorporated into these devices. Prevention of system failure is also cardinal in the implementation of such devices and presence of backup system software which is to take over in case of a failure is detrimental. Additionally the support for scalable data analysis systems are an important requirement for these kind of systems. The requirement of processing huge amounts of metadata in real time is one of the biggest challenges we need to overcome.

3. DESIGNS AND REQUIREMENTS:

This section contains the different subsections where the design and creation of the prototype together with the algorithms implementation and its cloud connection are explained. The design of the device had to accomplish some requirements for achieving the final goals Proposed. Some statements have to be achieved in order to follow the low-cost, but reliable, final Device. The requirements for this prototype were:

• The device has to use low-cost components to create affordable sensor networks of several devices with a relation cost-quality.

• The device has to have reliability for long-term measurements.

• The device should have capability to be connected to the cloud for remote updates of the software and for sharing results.

• The quality of the measurements has to be enough for advanced audio parameters' calculation.

• The device has to have enough computing power to do on-board calculations.

• The device has to be able to connect to the peripherals needed for the purposes of the project (e.g., a microphone).

• The device has to be able to interpret MATLAB programming language.

• The sound flow acquisition has to have the less noise inputs as possible, for avoiding extra Filtering steps.

• The final device has to be protected against outdoor conditions using a protective housing.

• The device needs to have different connectivity options (i.e., Wi-Fi or Ethernet).

• The distance from the nodes to the power source should be a maximum of 100 m.

4. COMPONENTS:

1. Xmega 2560
2. Regulator
3. Mq-7 Gas Sensor
4. Sound Sensor Module
5. Buzzer
6. DHT 11 Temperature and Humidity Sensor
7. MQ-135 Gas Sensor
8. Wi-Fi Module(ESP8266)

4.1 COMPONENT DESCRIPTIONS:

4.1 Xmega 2560: XMEGA 2560 is an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for it. The Xmega 2560 Uno is a variety of Xmega 2560 board based on the Xmega 2560. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. The Xmega 2560 programming language is an implementation of wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment. The microcontrollers inserted in the Xmega 2560 board can be easily programmed by imply uploading the program using IDE software. Xmega 2560 (sold as Genuine outside of the U.S. and U.K due to a trademark dispute) is a hardware and software company, project, and user community that designs and manufactures computer hardware, open-source software, and microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The gas sensor module consists of a steel exoskeleton under which a sensing element is housed. This sensing element is subjected to current through connecting leads. This current is known as heating current through it, the gases coming close to the sensing element get ionized and are absorbed by the sensing element. This changes the resistance of the sensing element which alters the value of the current going out of it. This is one of the main components of this project. It offers 23 i/o pins and a 16 MHz crystal Oscillator is used to provide timing /clock reference.

FEATURES OF XMEGA 2560 UNO XMEGA 2560:-

Microcontroller: Xmega 2560
Operating Voltage: 5V
Input Voltage: 7-12V
Digital I/O Pins: 14 (of which 6 provided PWM output))
Analog Input Pins: 6

DC Current: 40Ma
DC Current: 50mA
Flash Memory: 32KB
SRAM: 2KB
EEPROM: 1KB
Clock Speed: 16 MHz

4.2 Regulator: Voltage regulator IC's are the IC's that are used to regulate voltage. IC 7805 is a 5V Voltage Regulator that restricts the voltage output to 5V and draws 5V regulated power supply.

4.3 Mq-7 Gas Sensor: This semiconductor gas sensor detects the presence of Carbon Monoxide at concentrations from 10 to 10,000 ppm. The sensor's simple analog voltage interface requires only one analog input pin from your microcontroller. This Carbon Monoxide (CO) gas sensor detects the concentrations of CO in the air and outputs its reading as an analog voltage. The sensor can measure concentrations of 10 to 10,000 ppm. The sensor can operate at temperatures from 10 to 50°C and consumes less than 150 mA at 5 V.

Fig 6: MQ-7Gas Sensor

4.4 Sound Sensor Module: A mic used to capture the sound signal. Sound sensitive material which converts sound energy in to electrical energy An amplifier used to amplify the PM358 to amplify electrical signal produced.

Features

Easy to use sound sensor module

Provide analog or digital output signal.

Specifications

Operating voltage range: 4-12v

Operating current (Vcc=5v):4-8mA

Voltage gain 26dB.

Fig 8: Sound Sensor Module

4.5 Buzzer : A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio

signalling device. A piezo electric buzzer can be driven by an oscillating electronic circuit or other audio signal source. A click, beep or ring can indicate that a button has been pressed.

Working of Buzzer

A buzzer takes some sort of input and emits a sound in response to it.

They may use various means to produce the sound; everything from metal clappers to electromechanical devices. This can be understood by a simple circuit:

A buzzer needs to have some way of taking in energy and converting it to acoustic energy.

Many buzzers are part of a larger circuit and take their power directly from the device's power source. In other cases, however, the buzzer may be battery powered so that it will go off in the event of a mains outage.

Some devices that provide emergency power have buzzers on them so that the user knows that they are running on backup power and not on mains power.

Modern applications

• Novelty uses

• Judging Panels

• Educational purposes

• Annunciator panels

• Electronic metronomes

• Game showlock-out device

• ovens and other household appliances

• Sporting events such as basketball games

• Electrical alarms

• Joy buzzer- a mechanical buzzer used for pranks.

Fig 9: Buzzer

4.6 DHT- 11 Temperature and Humidity Sensor : The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It’s fairly simple to use, but requires careful timing to grab data.. This DH11 (Temperature & humidity sensor) has features a calibrated digital signal output with the temperature and humidity sensor complex. Its technology ensures the high reliability and excellent long-term stability. It has excellent quality, fast response, anti-interference ability and high cost performance advantages. Each DHT11 sensor features extremely accurate calibration of humidity calibration chamber. The calibration coefficients stored in the OTP program memory, internal sensors detect signals in the process, we should call these calibration coefficients.

Measurement and control of temperature and relative humidity finds applications in numerous areas. These days devices are available which have both temperature and humidity sensors with signal conditioning, ADC, calibration and communication interface all built inside them. The use of such smart sensors greatly simplifies the design and reduces the overall cost. The DHT11 sensor comes in a single row 4pin package and operates from 3.5 to 5.5V power supply. It can measure temperature from 0-50 °C with an accuracy of ±2°C and relative humidity ranging from 20-95% with an accuracy of ±5%. The sensor provides fully calibrated digital

outputs for the two measurements. It has got its own proprietary 1-wire protocol, and therefore, the communication between the sensor and a microcontroller is not possible through a direct interface with any of its peripherals. The protocol must be implemented in the firmware of the MCU with precise timing required by the sensor.

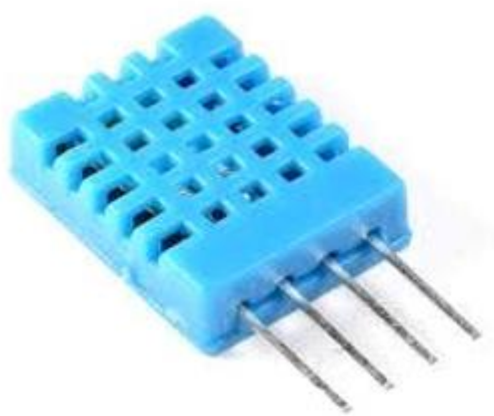


Fig 10: DHT 11 Temperature and Humidity Sensor

Technical Details

• Low cost

• 3 to 5V power and I/O

• 2.5mA max current use during conversion (while requesting data)

• Good for 20-80% humidity readings with 5% accuracy

• Good for 0-50°C temperature readings ±2°C accuracy

• No more than 1 Hz sampling rate (once every second)

• Body size 15.5mm x 12mm x 5.5mm

• 4 pins with 0.1" spacing

Hardware Connections

DTH11 To Xmega 2560

• Vcc --- 5v

• GND --- GND

• Data Pin --- DIGITAL PIN of Xmega 2560

4.7 MQ-135 GAS SENSOR : Different gas sensors are used to detect specific gases and the gas sensors used are MQ-135, MQ-5, MQ-4, MQ-8, MQ-9.

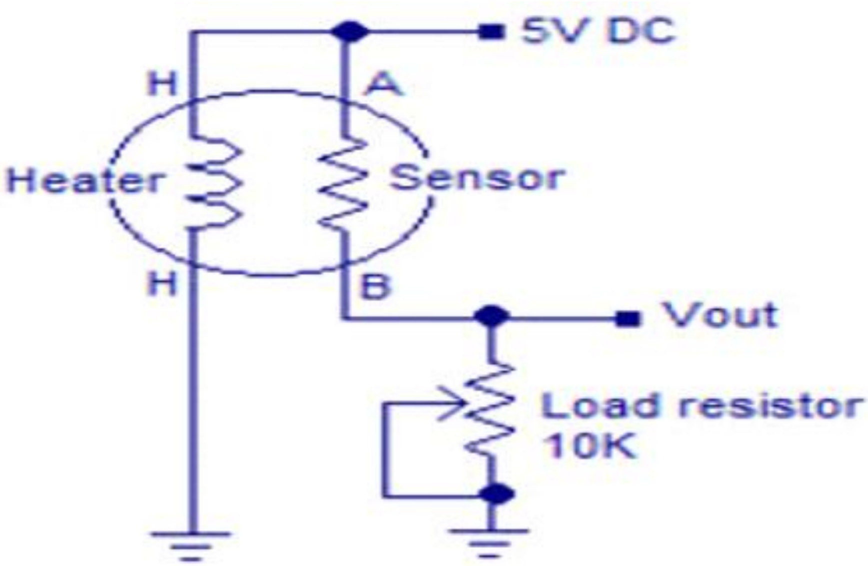
These are semiconductor sensors. The working principle of the semiconductor sensors is that they rely on a gas coming into contact with a metal oxide surface. The change in conductivity or resistivity is a linear and proportional relationship with the concentration of the gas coming in contact with the semi conducting material used. Tin dioxide is the most common material used in semiconductor sensors, and the electrical resistance in the sensor is decreased when it comes in contact with the monitored gas. This change in resistance is used to calculate the gas concentration. MQ-135 is sensitive to ammonia, alcohol and benzene. MQ-5 is sensitive to LPG. MQ-4 is used to detect methane. MQ-8 is used to detect hydrogen gas. MQ-9 is sensitive to carbon monoxide gas. Due to the reason that the sensor must come in contact with the gas to detect it, semiconductor sensors work over a smaller distance than infrared point or ultrasonic detectors. All gas detectors must be calibrated on a schedule. Of the two form factors of gas detectors, portable gas detectors must be calibrated more frequently due to the regular changes in environment they experience.

Fig 11:. Mq-135 Gas Sensor

Working of Gas Sensor

The MQ-135 alcohol sensor consists of a tin dioxide (SnO_2), a perspective layer inside aluminum oxide micro tubes (measuring electrodes) and a heating element inside a tubular casing. The end face of the sensor is enclosed by a stainless steel net and the back side holds the connection terminals. Ethyl alcohol present in the breath is oxidized into acetic acid

passing through the heat element. With the ethyl alcohol cascade on the tin dioxide sensing layer, the resistance decreases. By using the external load resistance the resistance variation is converted into a suitable voltage variation. The circuit diagram and the connection arrangement of an MQ 135 alcohol is shown below.



Characteristics

Good sensitivity to harmful gases in wide range

High sensitive to ammonia sulfide benzene

Long life

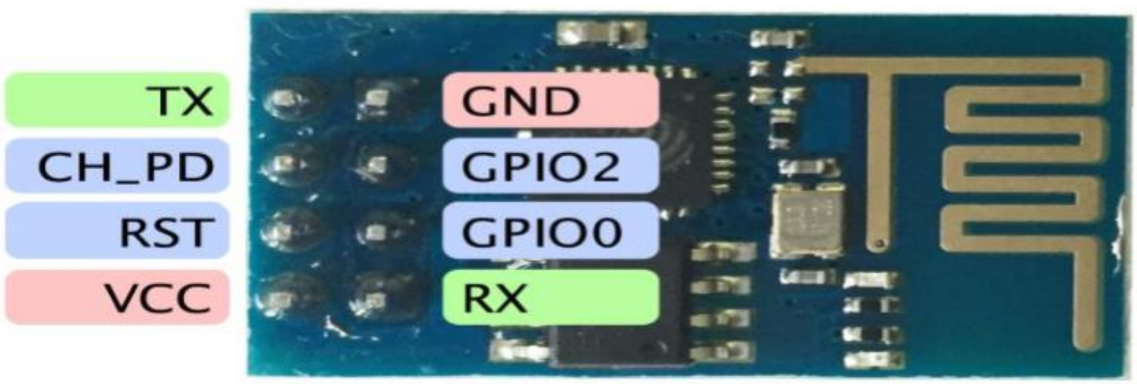
Low cost

Simple circuitry.

4.8 Wi-Fi Module (ESP8266) : The ESP8266 Wi-Fi module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware]. This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry. The ESP8266 Module is not capable of 5-3V logic shifting and will require an external logic level converter. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections. This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces; it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the WIFI, even instructions on how to transforming this module into an IoT (Internet of Things) solution.

Fig 13: ESP8266 Module

Internal Circuitry of ESP8266



FEATURES

• 802.11 b/g/n

• Wi-Fi Direct (P2P), soft-AP

• Integrated TCP/IP protocol stack

• Integrated TR switch, balun, LNA, power amplifier and matching network

• Integrated PLLs, regulators, DCXO and power management units

• +19.5dBm output power in 802.11b mode

• Power down leakage current of <10uA

• 1MB Flash Memory

• Integrated low power 32-bit CPU could be used as application processor

• SDIO 1.1 / 2.0, SPI, UART

- STBC, 1×1 MIMO, 2×1 MIMO
- A-MPDU & A-MSDU aggregation & 0.4ms guard interval
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)

5. WORKING OF THE PROJECT:

In view of the daily chores of a household the monitoring of real time parameters is highly beneficial for the sustenance of an organized and well informed standard of living. The parameters we are dealing here are different gases, dust, room temperatures and humidity present required for an ambient living. The respective sensors are being utilized for acquisition of the required data to be monitored as shown in Figures in next. DHT11 sensor has been used to monitor the room temperature and pressure. The sensor is soldered onto a PCB with a 3.3V regulator, I2C level shifter and pull-up resistors on the I2C pins. It is a 4 pins sensor of which 2 pins uses I2C protocol (SCL and SDA) which are connected to the respective I2C protocol supported pins on the Xmega 2560. It is based on the piezo resistive technology. The parameters are then send to the microcontroller MQ-2 sensor is a gas sensor which can detect the presence of combustible gases such as ibutane, LPG, hydrogen & methane. In this project, it is used mainly for detecting household LPG. The ionized constituents are detected by the sensing element, which creates a potential difference thus giving output in the form of current. The concentration of the gas detected is then send to the Xmega 2560. It has both the analog and the digital output but here we use the analog output which is connected to the analog pin of the microcontroller. DHT11 sensor is used for measuring humidity and temperature of the surroundings but, here I had used it for measuring only the humidity. The sensor provides fully calibrated digital outputs for the measurements of the parameters. It sends a data of 40 bits both for the temperature and humidity which also includes the checksum byte (bit error check). It operates at a voltage of +5v and gives the digital output connected to any of the digital pin of the microcontroller. The MQ-135 gas sensor senses the gases like CO2, ammonia nitrogen, oxygen, alcohols, aromatic compounds, sulfide and smoke. The operating voltage of this gas sensor is from 2.5V

to 5.0V. In the atmosphere we can find polluting gases, but the conductivity of gas sensor increases as the concentration of polluting gas increases. MQ-135 gas sensor can be implementation to detect the smoke, benzene, steam and other harmful gases. It has potential to detect different harmful gases. The MQ-135 gas sensor is low cost to purchase. ESP8266 module is a Wi-Fi module, which the backbone of this project. Here it is used for connecting the microcontroller to an access point (Wi-Fi). This module has inbuilt set of Attention Commands which are required to configure the module. Firstly we flash the ESP8266 module using the software then using the Attention Commands it is set in the Wi-Fi mode and then it is connected to a mobile hotspot or a Wi-Fi, which finally connects our microcontroller to the Wi-Fi. We create a channel (private) to view the changes in the parameters. The data is displayed graphically on the channel. One can get the access to the channel by getting the user ID and the data is transmitted to the channel by using the write API key provided by the channel, which enables our microcontroller to send the data. It requires a time of 15ms to update the data. Xmega 2560 UNO is one of the varieties of Xmega 2560 board microcontroller based on Xmega 2560, which takes input from the sensors and is connected to the Wi-Fi with the help of the Wi-Fi module which enable it to transmit data to the channel. The whole processing required is done by the processor in it. Starting with this project, first of all we flash the memory of the Wi-Fi module (ESP8266) to avoid any garbage values in our readings, then moving on to the next step we use some AT commands to set the module in the Wi-Fi mode and search for the available access points and then connect to any of them. If the module gets connected, it is well and good otherwise go back to the basic AT Commands then retry to connect which connects our microcontroller to the Wi- Fi. Then the next step is for taking inputs from the respective sensors in the microcontroller, now after obtaining values from the sensors, we need to convert the 5 volt logic of Xmega 2560 to the 3.3 volt logic as the Wi-Fi module works in 3.3 volt logic, after doing that use the channel API key to transmit the data/ input from the sensor to the channel and display them graphically on the space provided by the channel and for more understanding the whole process has been depicted. In this the components used in the project are represented in the form of blocks and shows how we carried out our work. First of all using all the 4 types of sensors we collected data then this data is latched in the microcontroller, then after performing all the basic requirements required by the Wi-Fi module, we connect our microcontroller to the access point and then finally we upload the data to the channel.

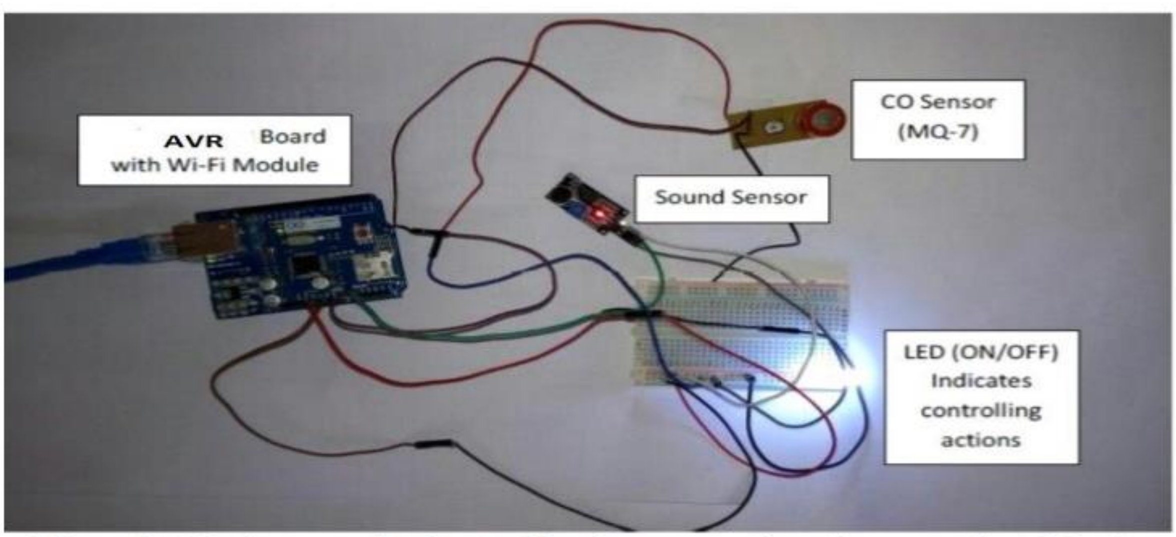


Fig. 4: Noise and air pollution monitoring embedded system with its components

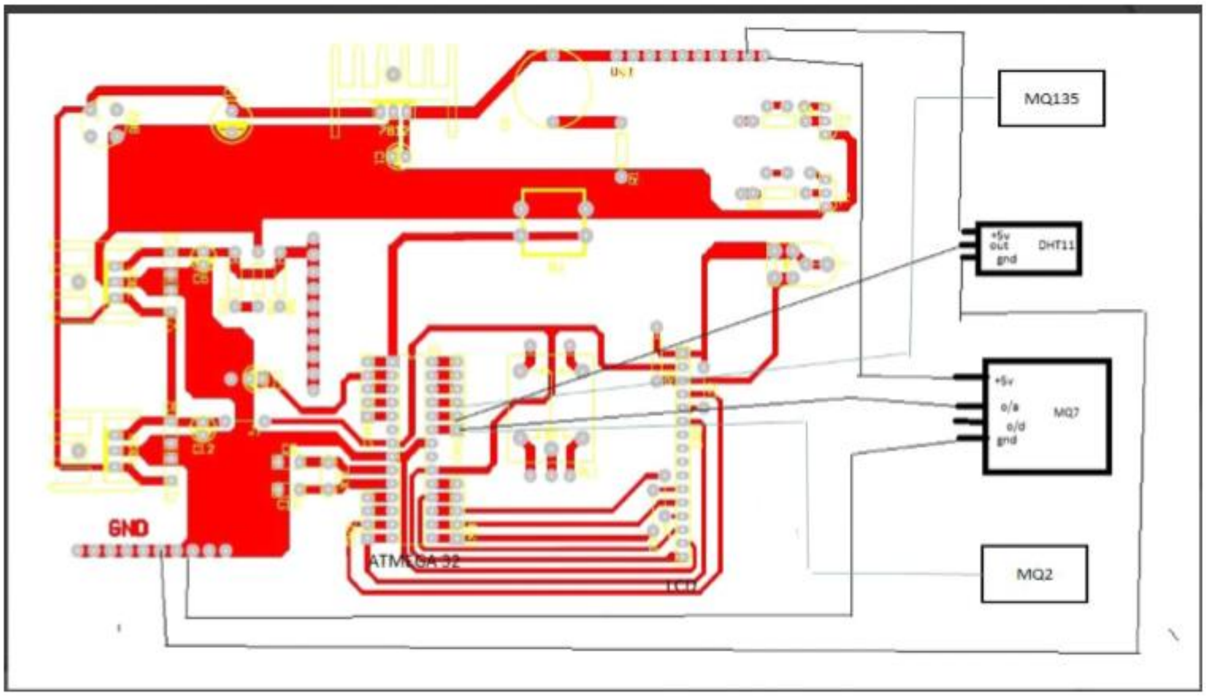


Fig 5: Block Diagram of the Project

6. ADVANTAGES OF THE PROJECT:

Sensors are easily available.

Interface any number of sensors to know detail content of all gases present in air.

Detecting a wide range of gases, including CO, MH4, alcohol, smoke etc.

Simple, compact & Easy to handle.

Sensors have long life time & less cost.

Simple Drive circuit.

System is Real time.

Operating voltage : 5 volt, -20°C to +50°C

7. APPLICATIONS OF THE PROJECT

Roadside pollution Monitoring.

Industrial Perimeter Monitoring.

Site selection for reference monitoring stations.

Indoor Air Quality Monitoring.

Design server using IoT and upload data on that server with date and time.

To make this data available to the common man.

To set a danger limit on that server and inform authorities to take future actions for wellbeing.

8. CONCLUSION:

To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network. Then the collected data and analysis results will be available to the end user through the Wi-Fi. The smart way to monitor environment and an efficient, low cost embedded system is presented with different models in this paper. In the proposed architecture functions of different modules were discussed. The noise and air pollution monitoring system with Internet of Things (IoT) concept experimentally tested for monitoring two parameters. It also sent the sensor parameters to the cloud (Google Spread Sheets). This data will be helpful for future analysis and it can be easily shared to other end users. This model can be further expanded to monitor the developing cities and industrial zones for pollution monitoring. To protect the public health from pollution, this model provides an efficient and low cost solution for continuous monitoring of environment.