

Noise Pollution Monitoring using IoT in Urban and Rural Areas

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Abstract: This large amount of increasing pollution has made human life prone to large number of diseases. Therefore, it has now become necessary to control the pollution to ensure healthy livelihood and better future. Here i propose a sound pollution monitoring system that allows us to monitor and check live sound pollution in a particular areas through IOT. Also system keeps measuring sound level and reports it to the online server over IOT. The sensors interact with microcontroller which processes this data and transmits it over internet. This allows authorities to monitor noise pollution in different areas and take action against it. Also authorities can keep a watch on the noise pollution near schools, hospitals and no honking areas, and if system detects noise issues it alerts authorities so they can take measures to control the issue.

Keywords: IoT, Microcontroller, Monitoring System, Noise Pollution.

1. Introduction

The sensors interact with raspberry pi which processes this data and transmits it over the application. This allows authorities to monitor air pollution in different areas and act against it. Also, authorities can keep a watch on the noise pollution near schools, hospitals and no honking areas, and if system detects air quality and noise issues it alerts authorities so they can take measures to control the issue. Some future consumer applications envisioned for IoT sound like science fiction, but some of the more practical and realistic sounding possibilities for the technology include: Receiving warnings on your phone or wearable device when IoT networks detect some physical danger is detected nearby. Self-parking automobiles. Automatic ordering of groceries and other home. Automatic tracking of exercise habits and other day-to-day personal activity including goal tracking and regular progress reports. Network Devices and the Internet of Things All kinds of ordinary household gadgets can be modified to work in an IoT system. Wi-Fi network adapters, motion sensors, cameras, microphones and other instrumentation can be embedded in these devices to enable them for work in the Internet of Things. Home automation systems already implement primitive versions of this concept for things like light bulbs, plus other devices like wireless scales and wireless blood pressure monitors that each represent early examples of IoT gadgets. The main objective of IOT Air & Sound Monitoring System is that the Air and sound pollution is a growing issue these days.

It is necessary to monitor air quality and keep it under control for a better future and healthy living for all. Due to flexibility and low cost Internet of things (IoT) is getting popular day by day. With the urbanization and with the increase in the vehicles on road the atmospheric conditions have considerably affected. Harmful effects of pollution include mild allergic reactions such as irritation of the throat, eyes and nose as well as some serious problems like bronchitis, heart diseases, pneumonia, lung and aggravated asthma. Monitoring gives measurements of air pollutant and sound pollution concentrations, which can then be analyzed interpreted and presented. This information can then be applicable in many ways. Analysis of monitoring data allows us to assess how bad air pollution and sound pollution is from day to day.

A. Internet of things

The IoT abbreviated as Internet of Things is the physical objects network. Mainly includes devices, buildings, vehicles and other items which are embedded with the electronics, sensors, software's and network connectivity which enables the objects to collect and exchange the data. The objects in the Internet of Things allows to sense and control remotely across existing network infrastructure. Opportunity creation for physical world directs the integration into computer based systems. An improved efficiency will be resulted. The accuracy and economic benefit also achieved. Augmentation of Internet of Things with the sensors and the actuators, technology becomes the more general instance of classes of cyber and physical systems, that encompasses the technologies like smart cities, smart homes, smart grids and the intelligent transportation systems. Each of the things is uniquely identifiable with the embedded computing systems but also it is able to interoperate within the existing infrastructure of Internet. The experts used to estimate that IoT consists of almost 50 billion objects by the year 2020.

B. Sensors application in data collection

The physical objects that are being connected will possess one or more sensors. Each sensor will monitor a specific condition such as location, vibration, motion and temperature. In IoT, these sensors will connect to each other and to systems that can understand or present information from the sensor's data feeds. These sensors will provide new information to a

company's systems and to people.

C. IP network communication

In the past, people communicated with people and with machines. Imagine if all of your equipment had the ability to communicate. What would it tell you? IoT-enabled objects will share information about their condition and the surrounding environment with people, software systems and other machines. This information can be shared in realtime or collected and shared at defined intervals. Going forward, everything will have a digital identity and connectivity, which means you, can identify, track and communicate with objects.

2. Block diagram of the proposed system

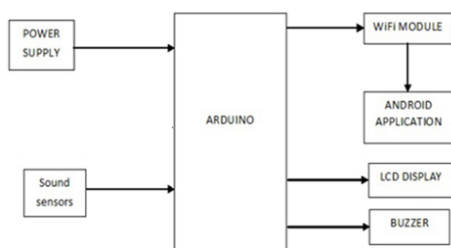


Fig. 1. Block diagram of the proposed system

This system is made to fulfill the purpose and need of the society to monitor and check the live air quality and sound pollution in an area through IOT. The system uses air sensors to check the presence of harmful and hazardous gases/compounds [such as Methane, propane, Butane, alcohol, noxious gases, carbon monoxide etc. in the air and also uses the sound sensor to keep measuring sound level in the surroundings. MQ2 is the air sensors which are used to collect air pollutants and a sound sensor module mic is used to capture sound. These sensors interact with arduino which processes this data and then transmit it over the mobile application. To send the data over remote location WIFI modem is also installed. and whenever the air pollution is detected, a buzzer immediately beeps and when there is a noise pollution an LED starts blinking continuously. With this system, not only the authorities but also the localized people can check the transmitted data through their mobile phone and that too without spending single penny and the people can act against it on their level and try to bring the pollution level under control. This system would contribute as a part in the building of a healthy society.

3. Circuit diagram of noise pollution monitoring system

First of all we will connect the ESP8266 with the Arduino. ESP8266 runs on 3.3V and if you will give it 5V from the Arduino then it won't work properly and it may get damage. Connect the VCC and the CH_PD to the 3.3V pin of Arduino. The RX pin of ESP8266 works on 3.3V and it will not communicate with the Arduino when we will connect it directly to the Arduino. So, we will have to make a voltage divider for it which will convert the 5V into 3.3V. This can be done by

connecting three resistors in series like we did in the circuit. Connect the TX pin of the ESP8266 to the pin 10 of the Arduino and the RX pin of the esp8266 to the pin 9 of Arduino through the resistors. ESP8266 Wi-Fi module gives your projects access to Wi-Fi or internet. It is a very cheap device and make your projects very powerful. It can communicate with any microcontroller and it is the most leading devices in the IOT platform. Learn more about using ESP8266 with Arduino here. Then we will connect the MQ135 sensor with the Arduino. Connect the VCC and the ground pin of the sensor to the 5V and ground of the Arduino and the Analog pin of sensor to the A0 of the Arduino. Connect a buzzer to the pin 8 of the Arduino which will start to beep when the condition becomes true. In last, we will connect LCD with the Arduino. The connections of the LCD are as follows

- Connect pin 1 (VEE) to the ground.
- Connect pin 2 (VDD or VCC) to the 5V.
- Connect pin 3 (V0) to the middle pin of the 10K potentiometer and connect the other two ends of the potentiometer to the VCC and the GND. The potentiometer is used to control the screen contrast of the LCD. Potentiometer of values other than 10K will work too.
- Connect pin 4 (RS) to the pin 12 of the Arduino.
- Connect pin 5 (Read/Write) to the ground of Arduino. This pin is not often used so we will connect it to the ground.
- Connect pin 6 (E) to the pin 11 of the Arduino. The RS and E pin are the control pins which are used to send data and characters.
- The following four pins are data pins which are used to communicate with the Arduino.
- Connect pin 11 (D4) to pin 5 of Arduino. Connect pin 12 (D5) to pin 4 of Arduino. Connect pin 13 (D6) to pin 3 of Arduino. Connect pin 14 (D7) to pin 2 of Arduino.
- Connect pin 15 to the VCC through the 220 ohm resistor. The resistor will be used to set the back light brightness. Larger values will make the back light much more darker.
- Connect pin 16 to the Ground.

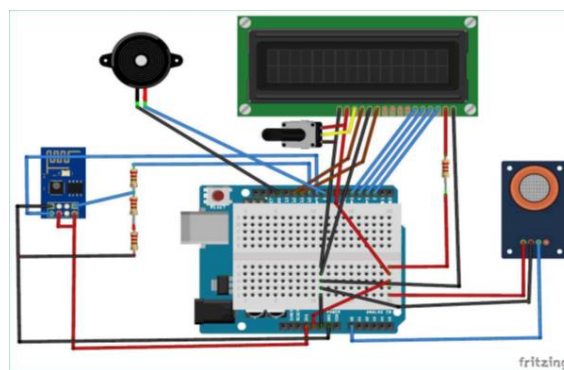


Fig. 2. Circuit diagram of noise pollution monitoring system

4. Flow Chart

The MQ135 sensor can sense NH₃, NO_x, alcohol, Benzene, smoke and some other gases, so it is perfect gas sensor for our noise Quality Monitoring. When we will connect it to Arduino then it will sense the gases, and we will get the Pollution level in PPM (parts per million). MQ135 gas sensor gives the output in form of voltage levels and we need to convert it into PPM. So for converting the output in PPM, here we have used a library for MQ135 sensor, it is explained in detail in “Code Explanation” section below. Sensor was giving us value of 90 when there was no gas near it and the safe level of air quality is 350 PPM and it should not exceed 1000 PPM. When it exceeds the limit of 1000 PPM, then it starts cause Headaches, sleepiness and stagnant, stale, stuffy air and if exceeds beyond 2000 PPM then it can cause increased heart rate and many other diseases. When the value will be less than 1000 PPM, then the LCD and webpage will display “Fresh Air”. Whenever the value will increase 1000 PPM, then the buzzer will start beeping and the LCD and webpage will display “Poor Air, Open Windows”. If it will increase 2000 then the buzzer will keep beeping and the LCD and webpage will display “Danger! Move to fresh Air”.

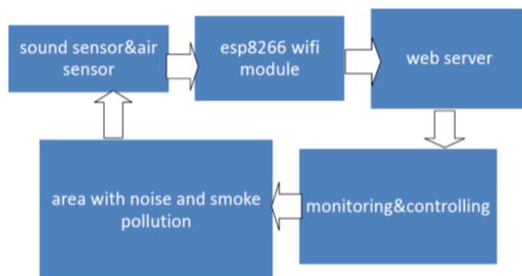


Fig. 3. Flow chart of proposed system

5. Conclusion

In this paper it is concluded that, the system is designed using structured modeling and is able to provide the desired results. It can be successfully implemented as a Real Time system with certain modifications. Science is discovering or creating major

breakthrough in various fields, and hence technology keeps changing from time to time. Going further, most of the units can be fabricated on a single along with microcontroller thus making the system compact thereby making the existing system more effective. To make the system applicable for real time purposes components with greater range needs to be implemented.

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