

IoT BASED REAL TIME AIR AND NOISE POLLUTION ALERT SYSTEM FOR ASTHMA AND ANGINA PATIENTS

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Abstract -

Nowadays, the level of pollution is rapidly increasing due to the factors like urbanization, industrial activities, increasing usage of vehicles etc. This causes greater impacts on human health. Both air and noise pollution are major threat to asthma and angina patients. So to tackle this environmental issues, we proposed an IoT based real time noise and air pollution alert system. This system is very useful to the patients as it is capable of monitoring the air quality and noise level using sensors, when it exceeds a certain threshold level. We used NodeMCU as our microcontroller board and the sensors are MQ-7, MQ-135 (gas sensors) and KY-037 sound sensor. The user can access these information through an android application. The levels of air and noise pollution are displayed over Blynk app. This monitoring system will assist both the authorities as well as the public so that preventive measures can be taken as early as possible.

Key Words: IoT, Pollution, NodeMCU, Blynk, Monitoring system, Sensors

1. INTRODUCTION

Our environment is getting polluted day by day due to industrialization and urbanization. When this level of pollution exceeds a certain limit, we need to take proper actions and measures to purify the air, water, soil etc. As we know "Prevention is better than cure", we need to take immediate actions to make our life safe as well as to protect our nature. Hence there is a need for proper measurement and analysis of real time air and noise quality levels, so that appropriate decisions can be taken without exploiting our health and life.

1.1 Air Pollution

The effects of air pollution are alarming. The main sources of air pollution are increasing emission of toxic gases from industries vehicle emission and increased concentration of harmful gases and particulate matter in the atmosphere. These factors lead to many health issues like respiratory and heart conditions like asthma, chronic bronchitis, emphysema, heart attacks and strokes along with cancer. Not only these issues, they are also having an adverse effect on our nature also.

1.2 Noise Pollution

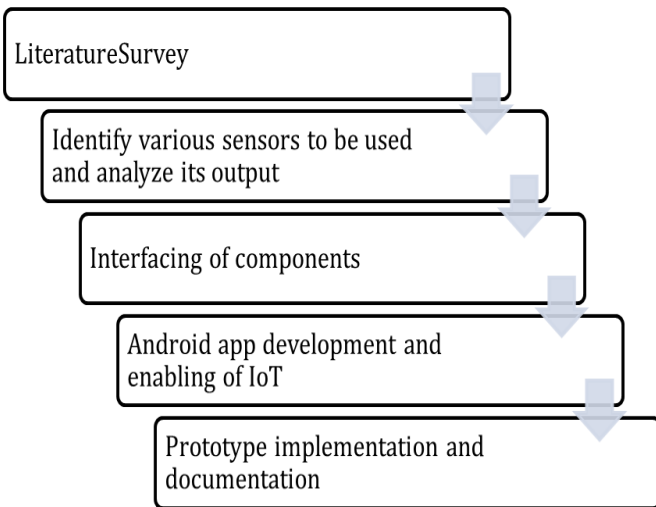
Noise pollution is the unwanted or excessive sound in our environment. It is mainly due to increasing number of vehicles and noise producing machines in the industries. The effects of noise pollution also have many health issues like stress related illness, high blood pressure, speech interference, hearing loss, sleep disruption. Our proposed system provides the solution to this problem with the help of Internet of Things

2. OBJECTIVE

To develop a real-time noise and air pollution monitoring system which is capable of monitoring the air pollution and noise level using sensors when it exceeds a certain threshold level. The user can access this information through an android application. This monitoring system will assist the authorities as well as the public to view the information regarding pollution and contribute towards controlling it at their possible level. The levels of air and noise pollutions are displayed over blynk platform. It can control hardware remotely and can display and store sensor data. The result is displayed in the form of gauge widget indicating the levels of pollution

3. PROPOSED MODEL

The proposed work aims at making a low-cost real-time noise and air pollution monitoring system which is capable of monitoring the air pollution and noise level using sensors when it exceeds a certain threshold level. The project uses a ESP8266 NodeMCU board to control the system. It consists of KY037 sound sensor, MQ7 and MQ135 gas sensors. Data picked up by the sensors are provided to the board. A quad bilateral switch CD4066, is used for the multiplexing of analog signals. It consists of four switches that are used for switching analog signals with digital control. Once the input like analog signal is applied to the switch then the input is transmitted to control input. So, this analog signal will be transmitted in the switch from input to output. The output from the sensors is stored in the cloud environment. The data can be accessed by users through an android application. The application is developed using "Blynk" platform. It is used for displaying the levels of air and noise pollution so that this information is available for all the users. The result is displayed in the form of gauge widget indicating the levels.



3.1 HARDWARE COMPONENTS

- **NodeMCU**



Fig-1 NodeMCU

It is a low-cost open source IoT platform

It can connect objects and let data transfer using the Wi-Fi protocol

- **MQ-7 Gas Sensor**



Fig-2 MQ-7 Gas Sensor

Carbon Monoxide (CO) sensor suitable for CO concentrations in the air.

Long service life and reliable stability

Rapid response and recovery characteristics

- **MQ-135 Gas Sensor**



Fig-3 MQ135-Gas sensor

Suitable for detecting of NH₃, NO_x, alcohol, Benzene, smoke, CO₂ etc.

Fast response and High sensitivity

Can be used as digital or analog sensor

- **KY-037 Microphone Sensor Module**



Fig-4 KY-037 Microphone Sensor Module

This sensor emits a signal if the sensor detects a noise.

The sensitivity of the sensor can be adjusted by means of a controller.

The module has two outputs: A0 and D0

- **CD 4066**



Fig-5 CD4066

Quad bilateral switch intended for the multiplexing of analog signals.

High noise immunity

- **LCD Display Module**

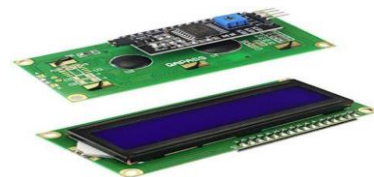


Fig-6 LCD Display Module

16*2 Alphanumeric display with I2C is used

Data is continuously displayed on the LCD if the pollution exceeds a set limit.

3.2 SOFTWARE PART

For developing the IoT based real time air and noise pollution monitoring system for asthma and angina patients, we have programmed the microcontroller board in C language using Arduino IDE, which contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of

menus. The consolidated results from the sensors are available to the users through the developed android application. The android application was developed in the Blynk platform, which allows us to quickly build interfaces for controlling and monitoring hardware projects. The result is displayed in the form of gauge widget indicating the levels of pollution.

Noise pollution values are available in terms of decibel (dB). Noise levels are categorized as 'quite' when the values are less than 60 dB, 'moderate' when it is between 60 dB and 85 dB and 'high' when it is beyond 85 dB.

Air quality values are available in form of parts per million (ppm). It is also distinguished as 'good' when the value is less than 50 ppm, 'moderate' when it is between 51 and 100 and 'unhealthy' when the level is more than 101 ppm.

4. RESULTS AND DISCUSSION

The developed air and noise pollution monitoring system is capable of monitoring the air quality as well as the level of noise pollution using gas and sound sensors on real time basis. This data is continuously displayed on a LCD display whenever its value exceeds the set limit.

Blynk is an Internet of Things platform which is used for displaying the levels of air and noise pollution so that this information is available for all the users. The result is displayed in the form of gauge widget indicating the levels of pollution.

The level of noise pollution is expressed in terms of decibel(dB). Noise level is categorized as 'quite' when it is less than 60 dB, 'moderate' when it is between 60 dB and 85 dB and 'high' when it is beyond 85 dB.

Air quality is expressed in terms of parts per million (ppm). It is categorized as 'good' when it is below 50 ppm, 'moderate' when it is between 51 and 100 and 'unhealthy' when the level is more than 101 ppm.

Air Quality Indicator Range(ppm)	Result
0-50	Good
51-100	Moderate
100 and above	Unhealthy

Table 1 Air Quality Level

Sound Quality Level (dB)	Result
0-60	Quite
60-85	Moderate
85 and above	High

Table 2 Sound Quality Level

HARDWARE IMPLEMENTATION

It is a basic implementation of the proposed hardware system. We have successfully designed and made a hardware of the proposed design. This monitoring system is compact, cost effective and user friendly

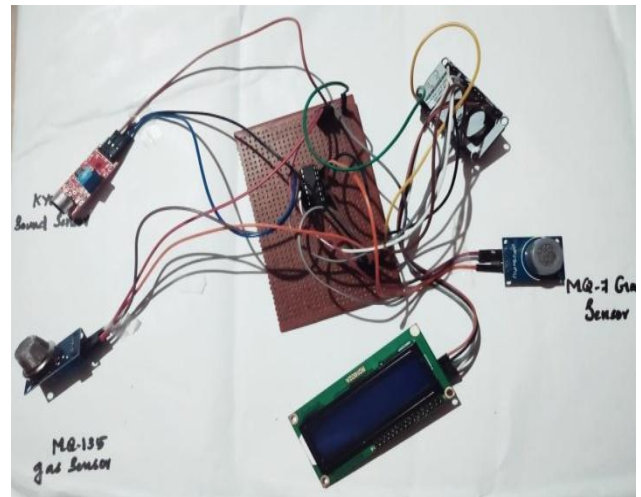


Fig-7 Hardware



Fig-8 Outputs on LCD

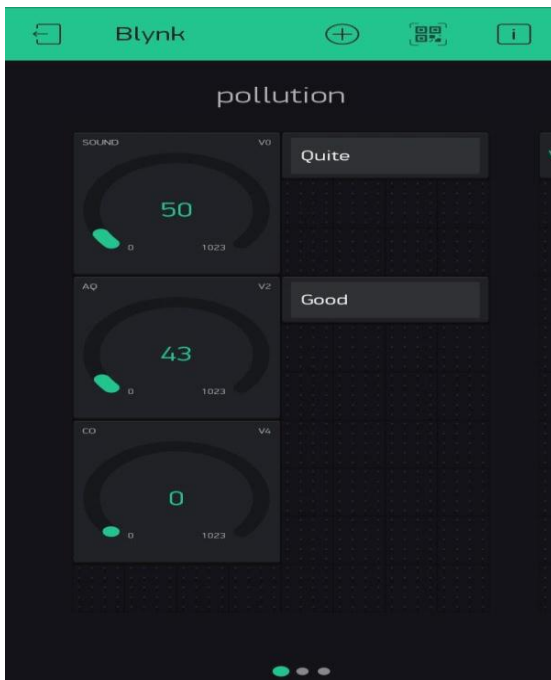


Fig -9 Pollution App

5. ADVANTAGES

- The users can monitor the air quality and noise levels on real time basis through blynk.
- The app will provide various categories of air quality (good, moderate, unhealthy) and noise levels (quiet, moderate, high) based on threshold limits.
- System is compact
- Cost effective
- User friendly
- Information is accessible to both authorities as well as the public.
- System is portable

6. FUTURE SCOPE

- More parameters can be monitored along with air quality and noise levels by using other sensors.
- Control system can be incorporated along with this monitoring system by the use of air purifiers, filters, anti-pollution masks etc for controlling air pollution and acoustic barriers can be used for reducing noise pollution to an optimal level.

7. CONCLUSION

The impacts of air pollution and noise pollutions are alarming day by day. So, an efficient monitoring system is necessary. The proposed system continuously monitors the air quality as well as the noise level using MQ-7, MQ-135 gas sensors and KY-037 microphone sensor module respectively. These data is available on real time basis through an android application. The level of pollution as well as the category of pollution based on threshold is available on this app. These information is useful to both public as well as the authorities. This system is compact, user friendly as well as portable.

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