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AIR AND SOUND POLLUTION MONITORING SYSTEM USING IOT

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Abstract - *Air and sound pollution monitoring system using IoT describes a system that uses various sensors and IoT devices to monitor the levels of air and sound pollution in a given area. The system collects data from the sensors and transmits it to a central server for analysis and processing. The data collected by the system can be used to generate real-time alerts, providing valuable information for decision-makers and policymakers. Pollution based IoT is done by Arduino, it consists of Air sensor, Sound sensor, Temperature and Humidity sensor, CO2 Sensor, servo motor and Air Purifier. When pollution based IoT starts, it checks all the parameters provided by the sensor and Air purifier will give clean air by removing dangerous airborne particles and servo motor will automatically close the window to provide sound insulation to the room.*

Key Words: **Arduino UNO, ESP WIFI Module, IoT, MQ-135, LM393, MQ6, DHT11**

1.INTRODUCTION:

Air and sound pollution is a growing issue these days. It is necessary to monitor the air and sound pollution levels to ensure a healthy and safe environment. With the rapid increase in infrastructure and industrial plants, environmental issues have greatly influenced the need of smart monitoring systems. Due to its low cost, high efficiency and versatility, Internet of Things (IoT) has become very popular now these days. Internet of Things (IoT) allows interaction between devices and humans. It forms a communication medium from human to machine. Previously, data collectors had to travel long distances to the various locations to collect data after which the analysis was done. This was lengthy and time consuming. But now, sensors and microcontrollers connected to the internet can make environmental parameter monitoring more flexible, accurate and less time consuming. When the environment merges with sensors and devices to self -protect and self - monitor it forms a smart environment. Embedded intelligence makes the environment interact with the objects. This system proposes an air quality as well as sound pollution monitoring system that allows us to monitor and check live air quality as well as sound pollution in a closed area through IOT. System uses air sensors to sense presence of harmful gases/compounds in the air and constantly transmit this data to microcontroller. 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. The data received by the Wi-Fi module which interacts the air purifier and other devices connected to it and operates the devices based on the information given by the sensors. With this method human intervention can be reduced by making the devices operate automatically if any impurities found in the surroundings. Other than the air purifier, a servo motor is also used which automatically closes the window so that an insulation is provided for the sounds produced during the operation of these devices, this will reduce the sound pollution up to some extent in its surroundings.

2. OBJECTIVE:

The main objective is to monitor and check air quality and keep it under control and to purify air for a better future and healthy living for all. This project also monitors sound pollution in particular areas so that authorities can act against it. It gives the live data of

- Air pollution
- Sound pollution
- Temperature
- Carbon dioxide

3. PROPOSED SYSTEM:

Proposed system consists of various sensors like LM393 for sound, MQ135 for air, DHT11 for temperature and Humidity, MQ6 for Carbon dioxide. These sensors are interconnected with Arduino ATmega328P Microcontroller for functioning. The power supply is given by RPS(5v). The ESP8266 Wi-fi module is used to provide internet functionality to the system. Air purifier is used to remove the harmful components in air and servo motor is used to automatically close the windows and doors to provide sound insulation. The information will send to android app (Blynk IoT) through Wi-Fi module.

4. SENSORS USED:

4.1 Air sensor:

Fig -1: Air sensor

MQ135 is a gas sensor that can detect a wide range of air pollutants such as carbon monoxide (CO), nitrogen oxides (NOx), and other harmful gases such as ammonia, sulfide, and benzene. It is commonly used in air quality monitoring systems and indoor air quality detectors.

The MQ135 sensor uses a small heater element and a metal oxide sensing element, which changes its resistance based on the concentration of pollutants in the air. The sensor is sensitive to changes in temperature and humidity, which can affect its accuracy, so it is important to calibrate the sensor periodically.

4.2 Sound sensor:

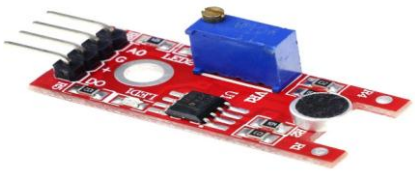

Fig – 2: Sound sensor

LM393 used to detect sound intensity. It uses a microphone which supplies the input to an amplifier, peak detector and buffer. When the sensor detects a sound, it processes an output signal voltage which is sent to a microcontroller then performs necessary operations

4.3 Temperature and Humidity sensor:

Fig -3: Temperature and Humidity Sensor

The digital temperature and humidity sensor DHT11 and it can be detecting digital output of temperature and humidity through the standard single-wire interface. The DHT11 is a basic, very low-cost temperature and humidity sensor. DHT11 is simple to use, it can interface with any microcontroller like Arduino, Raspberry Pi, etc. and get live data results.DHT11 sensor consists of three pins followed by ground pin,5v input pin and data signal pin.

4.4 MQ6 sensor:

Fig – 4: MQ6 sensor

The MQ-6 sensor is a type of gas sensor that can detect the presence of flammable gases such as LPG, propane, and butane in the air. It is commonly used in gas detectors, gas leakage alarms, and other safety systems. The MQ-6 sensor works by measuring changes in resistance as the gas concentration in the air changes. The sensor contains a sensing element made of tin dioxide (SnO2) that has a high sensitivity to combustible gases. When the gas molecules come into contact with the sensing element, they cause a change in its electrical resistance, which can be measured and used to determine the gas concentration.

One important thing to note is that the MQ-6 sensor is not designed to detect carbon monoxide (CO) gas, which is a common by product of incomplete combustion of fuels. If you need to detect CO gas, you should use a sensor specifically designed for that purpose, such as the MQ-7 sensor.

5. BLOCK DIAGRAM:

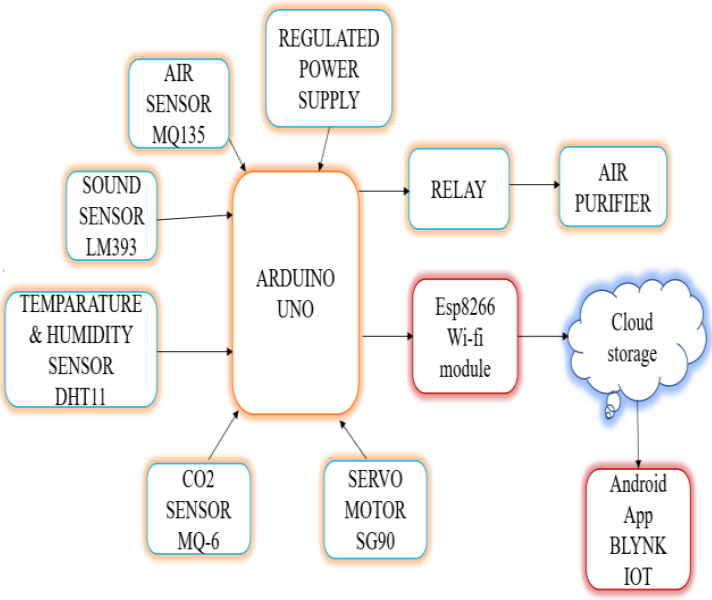

Fig – 5: Block diagram

Arduino is a type of open-source hardware and software, which is used to design and manufacture single board microcontroller and micro controller kits which is used to build digital devices. Arduino is the main heart of the project which is used as an interface.

• In this project we are using four sensors they are air sensor, DHT11 sensor, sound sensor and MQ6 sensor.

• These sensors are connected to the Arduino which is taken as input.

• Through this Arduino ESP8266 is taken as output, which mainly contain WIFI module in it.

• One relay is connected to the Arduino as output where it is used for air purifier.

• The servo motor is connected to Arduino. When sound sensor detects any sound pollution. It will trigger the servo motor to close the window of a room.

• When the power supply is on, the sensors send the data to the cloud, so we can monitor all this information through mobile with the help of android application like Blynk IoT.

6. WORKING MODEL:

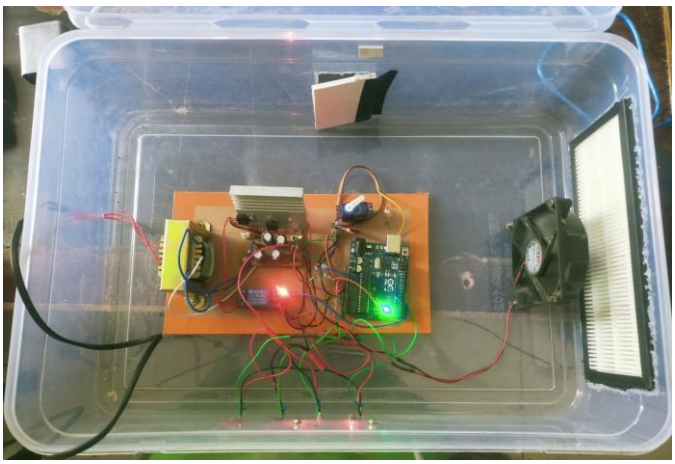

Fig – 6: Working model

In the working prototype model, the IoT devices like sensors, Blynk IoT application, and cloud play a significant part in pollution monitoring. All components are connected through Arduino pins and are used to control the target. Here all positive wires are connected to positive terminals and all black wires are connected to ground terminals. For working on each sensor, we required 5V and we have 12V power supply transformer. Here the power supply before the regulator is 12v and after the regulator is the voltage is 5v then this 5v output goes to sensors and microcontrollers.
We presented a 12v transformer, and in this 12v transformer, the supply is converted from ac to dc through a bridge rectifier. For smoothing and noise filtration we are using a condenser and capacitor. This is regulator input. By taking the regulator7805 it gives 5v output and this 5v output only we have to use a controller. In this project, if air sensor detects any impurities in air, then it will trigger the relay and the relay will on the exhaust fan which sucks the purified air from the filter and give it to the other side. When the sound sensor detects any sound pollution, it will trigger the servo motor to close the window of a closed room. DHT11 sensor reads the temperature and humidity readings and MQ6 sensor reads the carbon dioxide level in the atmosphere and sends the microcontroller and then the microcontroller to the cloud through a small ESP01 Wi-Fi module and then the data will be stored in the cloud. We implemented an IoT platform that is Blynk IoT in this IoT platform we have to log in with our mail id they will give us one authentication code, this code we have to dump into the microcontroller through our program. Then we will be able to see the virtual data of all the parameters provided by the sensors. If air sensor and sound sensor cross the threshold values, then it will send a notification and mail by saying that there is high sound and air pollution in our area. So that authorities can act against to it. All live monitoring data we can able to see in the Blynk IoT Platform.

7. CONCLUSION:

An air and sound pollution monitoring system using IoT can provide a reliable and efficient way of measuring and analyzing the levels of pollutants in the environment. This system can help in identifying the sources of pollution and implementing strategies to reduce the level of pollution. IoT-based air and sound pollution monitoring systems can be equipped with various sensors that can measure different parameters such as noise levels, temperature, humidity, and various air pollutants such as CO2, SO2, NOx etc. The data collected by these sensors can be transmitted to a central server for analysis, and the results can be accessed in real-time by the authorities, researchers, and the general public.

This system can help in identifying pollution hotspots and can be used to take appropriate measures to reduce pollution levels. It can also provide insights into the effectiveness of pollution control measures and help in developing new policies and regulations to improve air and sound quality. Therefore, an IoT-based air and sound pollution monitoring system can play a crucial role in protecting the environment and public health. By using this we can reduce air pollution by air purifiers and sound pollution by servo motors which doesn't allow the high sound into a closed room by closing the windows of a room.

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