IoT Based Air and Noise Pollution Monitoring System

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ABSTRACT:

The increasing air and sound pollution is one of the significant issue now days. As the pollution increasing it is giving rise number of diseases so, it has become essential to control the pollution for better future and healthy life .here we propose 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 monitoring in particular areas through IOT . System uses air sensor to detect or sense presence of harmful gases, compounds in the air and constantly transmit data to microcontroller. Also system keeps measure soundlevel and report it to the online server over IOT. The user friendly and easy handling of the system technology is such that it can be installed in houses, schools and in smallplaces.

KEYWORDS: Arduino Uno,Gas Sensor MQ135,Sound Sensor LM393,Wifi Module.

INTRODUCTION:

Pollution is the beginning of hazardous substances into the surroundings. The substance that harms a natural resource is called pollutants. The cause of pollutants can be natural or created by human behaviour. There are various types of pollution including air, noise or sound, water, and land. Air and sound pollution are a growing issue now not only in Malaysia . The air and sound pollution become the global issue where many countries have the same problem especially in the urban area. Air pollution is necessary to monitor and overcame because it can give the health issue. Air pollution can be visible and invisible, both can make the living difficulty to breath and make the eyes burn. It also can increase the possibility to have the lung cancer. Figure 1 shown the air pollution produce by the factory. In 1984, there was an accident which is more than 40 tons of toxic gas leaked from a plant in Bhopal, India [3]. The accident cause at least 3,800 people dead and many thousands more were permanently injured [3]. The World Health Organization (WHO) state that 4.2 million deaths every year occurs because of the outdoor air pollution [4]. There are many sources can cause sound pollution such as people, machines, building activities and construction, music performances, transportation system, industrial, animal, traffic etc. The sound pollution is most occurring at the urban area where there has traffic noise such as the horn from vehicles shown in Figure 2. This pollution also found in the workplace [5]. It became common occupational hazard because of high sound level from the variety of equipment and activity especially in the food factory [6]. Not all noise or sound becomes pollution, there are some conditions that will turn noise into International Conference on Robotic Automation System 2021 (ICORAS 2021) Journal of Physics: Conference Series 2319 (2022) 012013 IOP Publishing doi:10.1088/1742-6596/2319/1/012013 2 pollution. The World Health Organization (WHO) defines noise above 65 decibels (dB) as noise pollution [4]. Thus, the monitoring system of air quality and levels of sound is necessary. Bavani Nadaraja et. al. [7] revealed that only 5% of respondents said the traffic flow at night was light, another 95% said that the traffic flow at night was heavy in Serdang Raya, Selangor. That is because on 2010, there is the one of the famous issues in Malaysia. In the previous research, monitoring system such as air monitoring systems, health monitoring systems are developed by using Bluetooth, GPS and GPRS wireless technologies. The proposed system is costly, and data is messy to recorded. It also become difficult in the remote area to record the data needed. The most preferred technique is cloud based monitoring system was proposed [8]. The monitoring system by using IoT become efficient to develop because the increasing usage of sensor and smart phones [9][10]. The IoT Base on Air and Sound Pollution Monitoring System has been proposed to overcome the problem. This system allows us to monitor and check live air quality and sound level in an area through IoT. The addition of Internet of Things (IoT) to the system gives the benefits to the data loggers to analyse the air quality and sound level at certain area without visit the site every time they wanted the data. The data from the remote areas can be access and save in the database by using the IoT. IoT is become popular day by day due to the flexibility and low cost,

AIR POLLUITION

SOUND POLLUITION

PROBLEM STATEMENT:

An effective natural observing framework is essential to screen and estimate the conditions in the event of surpassing endorsed level of parameter (for example, commotion, COand radiation levels). At the point whenthe items like condition furnished with sensor gadgets, smaller scale controller and different programming application turn into a self-securing and self-observing condition.

OBJECTIVES

1. To study the existingsystem.

2. To design the blockdiagram.

3. To decide the components specification &device insystem.

4. To design the circuit diagram and simulate it using suitablesoftware.

5. To design the PCB and implement hardware.

6. To test the circuit and observe the result.

7. To prepare report.

METHODOLOGY :

This system was developed based on the block diagram in Figure 3. The inputs are air sensor, sound sensor, and power supply. The sound sensor detects the sound intensity levels in that area in the unit of decibel (dB). The air sensor will record the quality of air in that area in the unit of parts per million (ppm). An electrical signal will send it to the ESP 8266 which is connected to the Wi-Fi module by using the Arduino programming. These sensors will interact with Arduino and processes this data to transmit it over the application. The LCD display in the IoT platform displayed the quality of the air and

level of the sound at that area. Figure 3. The system block diagram The flowchart of this system prototype shown in Figure 4. The system is run when the power supply is On. The gas and sound sensor will detect the air quality and noise in that area. The data processed and upload to the cloud by Arduino and transmitted it to the IoT platform. Admin can view and analysis the data displayed.

RELATED WORK:

There are numerous works that have been done related to IOT based Projects. Kavitha.B.C[1], Deepa Jose[2],Vallikannu.r KCG College of Technology, Chennai, India.[1] The idea can be realized by introducing raspberry pi & IOT shield . This project uses 3 different gas sensors, namely mq7, mq135 & DHT 11the air quality can be displayed on and as well as monitoring easy. Lcd display webpage which makes. Ajitesh Kumar, Mona Kumari, Harsh Gupta, GLA University Mathura, India.[2] They used node mcu to monitoring air and noise which present in atmosphere MQ 2 gas sensor used to sense the smoke and MQ9 gas sensor used to sense carbon monoxide . PMS3003 G3 particle they used pm2.5 giving reading to node mcu processor and data to the rends. The dada internet. They also used a tod converter a dc to convert and leg data. To digital. They used OLED display, to display the pollution condition. All sensors will sends data to node mcu and and they node mcu send to think speak then graph shows on think speak and also data show on OLED . In this system used PIC 16F877 Module for the Industrial Air monitoring system. The remote monitoring & controlling of Air quality of the room inside a building can designed the main purpose of constructing the proposed system.

BLOCK SCHEMATIC &WORKING:
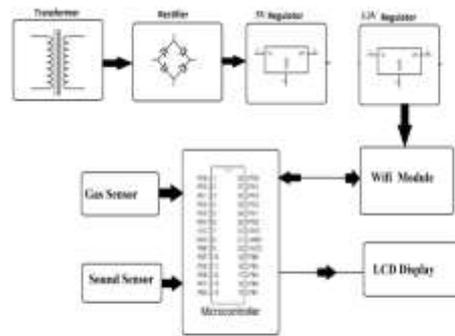
As shown in fig. in system we use arduino as main controller. In system we use MQ135 gas sensor for detecting or sensing gases and also use sound sensor LM393 module for detect the sound pollution. Sensed data of sensor given to analog pin of the arduino then digital output pin are connected to LCD, buzzer and LED. If air pollution is there then buzzer will start beeping and if sound pollution is there then LED will glow. All condition of pollution display on LED and we can also analyze past data using thingspeak in graphical form. Arduino is an open source prototype. Software will operate in Arduino IDE Computer code can be written and upload to the physical board. Arduino board is a board that can be functioned via Arduino IDE by sending a set of instructions to the microcontroller on it. For controlling Sensors. For arduino programming we are going to use Embedded C. We are going to build project in Embedded C and for monitoring that project we are using Cloud.

ALGORITHM:

1. Start Arduino UNO.

2. initialize LCD, gas sensor & noise sensor

3. Establish WITI connections.

4. If connection successful. next step else go to step 1

5. Read sensor values.

6. If Sensor value available establish TCP connection else read values again.

7. Establish TCP connection

8. If TCP connections successful. send data to server (Thingspeak). else set go to step 7

9. If TCP connections successful. send data to server (ThingSpeak). else set gob to step 7

10. Check for acknowledgement.

11. If acknowledgement received. go to step some time & else wait for go to step no 5.

COMPONENTS:

1. ArduinoUNO

2. MQ135 (Gassensor)

3. LM393 (Noisesensor)

4. ESP8266 WIFIModule

5. 16*2 LCD DisplaY

6. LED

7. Buzzer

- **Arduino UNO**

Arduino is 8 bit microcontroller board based on the ATmega328P. The operating voltage is 5V. It has 14 pins digital input output pins (Of which can be used 6 as PWM output) Oscillator frequency is 16 MHz It contains everything needed to support the microcontroller simply connect it to a computer with USB cable. It has 6 analog input pins.

Feature

• Operating voltage is5v.

• DC current per input pin is 40mA.

• Clock speed16MHz.

• DC current for 3.3v pin is 50mA.

• SPAM 2 KB.

• EEPROM 1KB.

• **MQ135 Gas Sensor**

The MQ135 is a gas sensor it used for detecting or sensing harmful gases in the atmosphere. It has wide detecting scope. It gives fast response and also it it high sensitivity sensor. It is simple and long life device. They are used in air quality control equipment for building offices are suitable for detecting of NH3, alcohol, benzene, smoke CO2 etc.

Feature

• Wide detecting scope

• Fast response and High sensitivity

• Stable and long life

 • Operating Voltage is +5V

• Detect/Measure NH3, NOx, alcohol, Benzene, smoke, CO2, etc.

 • Analog output voltage: 0V to 5V.

- **LM393 Sound Sensor**
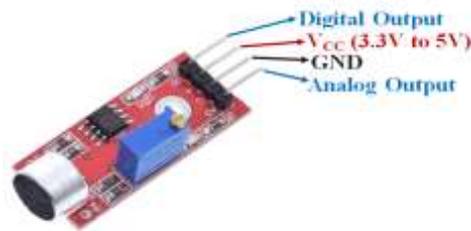
The sound sensor module provide an easy way to detect sound and it generally used for detecting sound intensity. Module detect the sound has exceeded a threshold value. Sound is detected via microphone and fed into an LM393 op amp. The sound level adjust through pot.

Feature

• Operating voltage 3.3V-5V

• Output model: digital switch outputs (0 and 1, high or low level)

• Voltage Gain 26dB

• Microphone Impedance 2.2kΩ

• Microphone Frequency 16.20 kHz

- **ESP8266 WIFI Module**
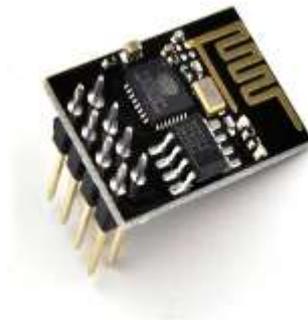
The esp8266 WIFI module is a self contain edsoc with integrated TCP/IP protocol stack that can give any microcontroller access to your WIFI network. The esp8266 is capable of either hosting an application or offloading all WIFI networking functions from another application processor.

Feature

- General-purpose input/output (16 GPIO).

- Inter-Integrated Circuit (I²C) serial communication protocol.

- Serial Peripheral Interface (SPI) serial communication

- protocol

- **16*2 LCD Display**

LCD is used for to display the condition there are three conditions in air pollution and three conditions in noise pollution means air and sound is clear, moderately polluted or highly polluted that is displayed on LED.

Feature

- Operating Voltage is 4.7V to 5.3V.

- Current consumption is 1mA without backlight.

- Alphanumeric LCD display module, meaning can display alphabets and numbers .

- Consists of two rows and each row can print 16 characters.

- Each character is build by a 5×8 pixel box Can work on both 8-bit and 4-bit mode.

ADVANTAGES

1. Sensors are easily available.

2. Sensors are effortlessly accessible.

3. Detecting of wide range of gases.

4. Simple, compact and easy to handle.

5. Sensors have long life time.

6. Low cost

7. Data can be used to control pollution.

APPLICATIONS

1. To estimate the pollution.

2. Indoor Air Quality Monitoring.

3. To design server and upload data on that server with date and time.

4. We can use it at industrial area as there is lot of noise pollution

5. In city roads traffic noise.

FUTURE SCOPE:

In future we modify the system to notify a user about the air quality and noise level it reaches beyond permissible level through sms or app. We can monitor air and sound pollution level at any place of the world.

CONCLUSION:

In this paper, air and sound pollution monitoring system using IoT has been developed. Apart from that, this system allow user to monitor and analyzed data for air and sound pollution between two different company. The results show that Eastern Steel Sdn Bhd has higher sound pollution, but lower air

pollution compared to Optimistic Organic Sdn Bhd. The IoT base on Air and Sound Pollution Monitoring system can be viewed by the admin and the people assigned to analysis the data. The data from the system display the live updates of the pollution level of the area by using smart phones. This IoT base on air and sound pollution monitoring system provides effective, low cost system for long term monitoring surroundings and it is more suitable in nature to monitor the surrounding parameters.

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