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IOT Based Air and Sound Pollution Monitoring and Proactive System

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Abstract
In universe nature is God gift for all kinds of leaving creatures. Pollution makes nature spoil. Generally, we have different types of pollutions are there in the environment like air pollution, sound pollution, water pollution etc.., but mainly measuring two types of pollution that is air and sound. Air and sound pollution are 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. 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 in a particular 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. 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. Air sensor senses the presence of harmful gases in the air. To reduce the air level, we use Calcium chloride. If the air level exceeds its threshold value means led will glow to decrease that air level blower is used.

Keyword: *Microcontroller, IoT, Sensor, Pollution, Calcium chloride, Air level blower.*

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I. INTRODUCTION

The primary goal of IOT Air and Sound Monitoring System is that the Air and sound contamination is a developing issue these days. It is important to screen air quality and monitor it for a superior future and sound living for all. Here we propose an air quality as well as sound contamination observing framework that permits us to screen and really look at live air quality as well as sound contamination in a space through IOT. Framework utilizes air sensors to detect presence of destructive gases/compounds in the air and continually send this information. Likewise, framework continues to gauge sound level and reports it. The sensors communicate with raspberry pi which processes this information and sends it over the application. This permits specialists to screen air contamination in various regions and act against it. Additionally, specialists can keep a watch on the clam or contamination close to schools, emergency clinics and no blaring regions, and assuming framework distinguishes air quality and commotion issues it cautions specialists so they can go to lengths to control the issue. Some future purchaser applications imagined for IoT sound like sci-fi, however a portion of the more pragmatic and reasonable sounding opportunities for the innovation include Receiving admonitions on your telephone or wearable gadget when IoT networks recognize some actual peril is distinguished close by. Self-leaving autos. Programmed requesting of groceries and other home. Programmed following of activity propensities and other everyday individual action including objective following and customary advancement reports. Network Devices and the Internet of Things All sorts of standard family gadget scan be altered to work in an IoT framework. Wi-Fi network connectors, movement sensors, cameras, receivers, and other instrumentation can be inserted in these gadgets to empower them for work on the Internet of Things. Home mechanization frameworks as of now execute crude adaptations of this idea for things like lights, in addition to different gadgets like remote scales and remote circulatory strain screens that each address early instances of IoT devices.

II. PROBLEM STATEMENT

In this paper, 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, CO and radiation levels). At the point when the items like condition furnished with sensor gadgets, smaller scale controller and different programming application turn into a self-securing and self-observing condition. To overcome this issue, we are introducing a system through which the level of sound and the existence of the harmful gases in the surroundings can be detected.

III. PROPOSED METHODOLOGY

The project is about IOT Based Air and Sound Pollution Monitoring System in which will monitor the Air Quality and Sound level. Over a webserver using internet and will trigger an Alarm when the air quality and sound level goes down beyond a certain level. It means when there are enough harmful gases are present in the air like CO2, smoke, alcohol, benzene and NH3. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily. MQ135 Gas sensor which is the best choice for monitoring Air Quality as it can detects most harmful gases and can measure their amount accurately and also sound sensor it will detects the noise pollution. For measuring Sound pollution LM393 Sensor is used. In this IOT project, we can monitor the pollution level from anywhere using your computer or mobile

A. System Architecture

The Fig.1 represents the design of our proposed system, as well as the devices used in this model, are described in this section. For this we use Arduino as principal regulator. In framework we use MQ135 gas sensor for identifying or detecting gases and utilize sound sensor LM393 module for distinguish the sound contamination. Detected information of sensor given to simple pin of the Arduino then computerized yield pin are associated with LCD, signal, and LED. If air contamination is there, bell will begin blaring and if sound contamination is there, LED will shine. All state of contamination shows on LED, and we can likewise dissect past information utilizing thing talk in graphical structure. Arduino is an open-source model. Programming will work in Arduino IDE Computer code can be composed and transfer to the actual board. Arduino board is a board that can be worked by means of Arduino IDE by sending a bunch of directions to the microcontroller on it. For controlling Sensors. For Arduino programming we will utilize Embedded C. We will assemble project in Embedded C and for observing that project we are utilizing Cloud.

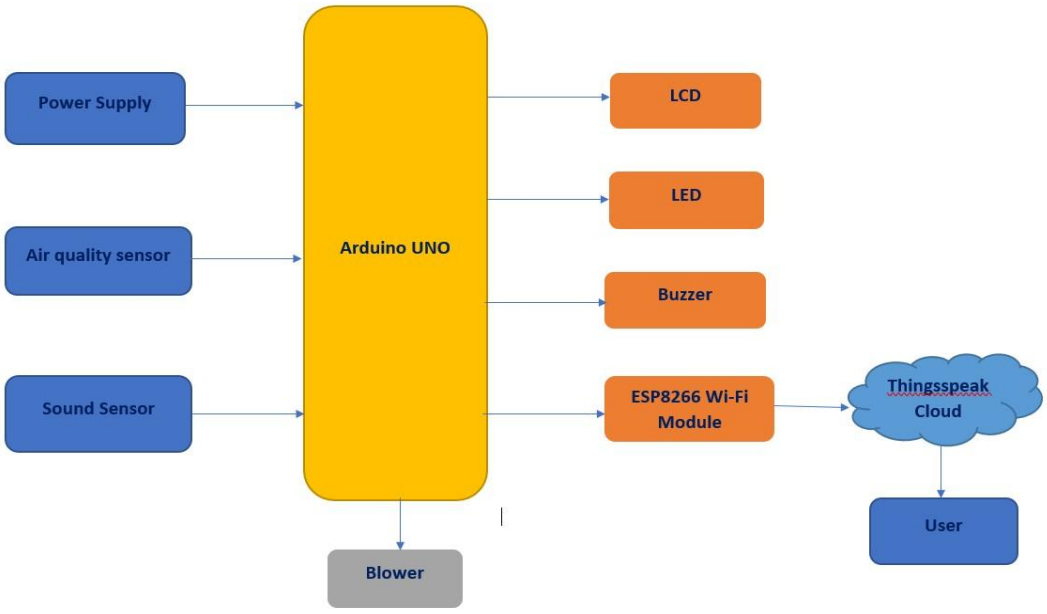

Fig.1: Block diagram of System Architecture

1.Air Sensor:

The MQ-135 Gas sensor can detect gases like Ammonia (NH3), sulfur (S), Benzene (C6H6), CO2, and other harmful gases and smoke. Similar to other MQ series gas sensor, this sensor also has a digital and analog output pin. When the level of these gases go beyond a threshold limit in the air the digital pin goes high. This threshold value can be set by using the on-board potentiometer. The analog output pin, outputs an analog voltage which can be used to approximate the level of these gases in the atmosphere.

The Fig.2 MQ135 air quality sensor module operates at 5V and consumes around 150mA. It requires some pre-heating before it could actually give accurate results.

Features:

Operating Voltage : 2.5V to 5.0V
Power consumption : 150mA
Detect/Measure : NH3, Nox, CO2, Alcohol, Benzene, Smoke
Model : MQ135

Fig.2: Air Sensor

2.Sound Sensor:

Sound detection sensor module detects the intensity of sound where sound is detected via a microphone and fed into an LM393 op-amp. It comprises an onboard potentiometer to adjust the setpoint for sound level. As shown in Fig.3 Sound Detection Sensor Module consists of four pins i.e., VCC, GND, DO, AO. Digital out pin is connected to the output pin of LM393 comparator IC while the Analog pin is connected to Microphone.

Features:

Operating Voltage : 3.3V to 5V DC
Model : LM393

Fig.3: Sound Sensor

3.Arduino UNO:

There are several types of commercially available Arduino boards, such as Arduino Uno, Arduino Due, Arduino Mega, and Arduino Leonardo. The Arduino Uno is one kind of microcontroller board based on ATmega328, and Uno is an Italian term which means one. As shown in Fig.4 Arduino Uno is named for marking the upcoming release of microcontroller board namely Arduino Uno Board 1.0. This board includes digital I/O pins-14, a power jack, analog i/ps-6, ceramic resonator-A16 MHz, a USB connection, an RST button, and an ICSP header [13]. All these can support the microcontroller for further operation by connecting this board to the computer. The power supply of this board can be done with the help of an AC to DC adapter, a USB cable, otherwise a battery.

Features:

Microcontroller : ATmega328
Operating Voltage : 5V
Analog Input Pins : 6

Fig.4: Arduino UNO

4.LCD Display:

An LCD screen is an electronic display module that uses liquid crystal to produce a visible image. As shown in Fig.5 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates o a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

Fig.5: LCD Display

5.LED:

The Fig.6 is a Light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

Fig.6: LED

6.Buzzer:

The buzzer is a sounding device that can convert audio signals into sound signals .As shown in Fig.7 It is usually powered by DC voltage. It is widely used in alarms, computers and other electronic products as sound devices. It is mainly divided into Piezoelectric Buzzer and Electromagnetic Buzzer represented by the letter “H” or “HA” in the circuit.

Fig.7: Buzzer

7.Blower:

A blower is a device that pushes out gases by imparting energy to increase its pressure and speed. The above Fig.8 They range from the large blowers found in applications such as production machinery and clean rooms, to the small blowers built into devices such as home appliances or personal computers, and are used to blow air for exhausting ventilation or cooling.

Fig.8: Blower

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 above Fig.9 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, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

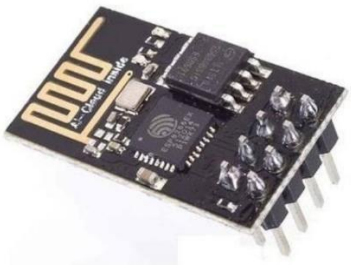

Fig.9: ESP8266 Wi-Fi Module

IV. IMPLEMENTATION AND WORKING

The Fig.10 is a flow chart initially we have to start and then establish a connections a with the sensors. Sensors are nothing but air and sound sensors and also made connection with the Wi-Fi module to the Arduino micro controller. And then from sensors the data is collected and collected data is given to Arduino .Arduino process the data and then send the AT command to Wi-Fi module. And then we have to check the status of Wi-Fi module connection if connection is established means check the connections with web server if yes means perform sensor data analytic and visualization data is displayed on web page. If connection is not established means we have to reset the Wi-Fi connection.

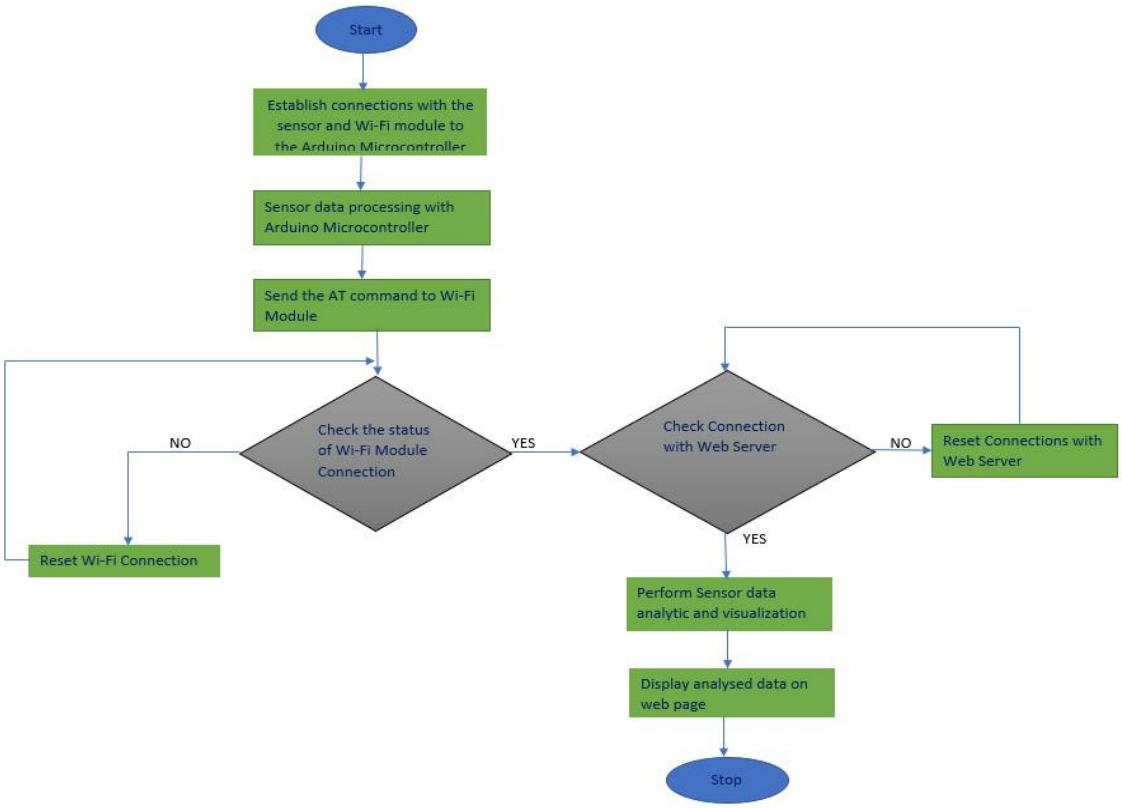

Fig.10: Flow chart of proposed model

V. REVIEW OF LITERATURE

The increasing air and sound pollution are 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 sound level 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 small places [1].

The objective of building a smart city is to work on personal satisfaction by utilizing innovation to work on the effectiveness of administrations and address inhabitants' issues. Data and Communication Technology permits city authorities to collaborate straight forwardly with the general population to determine what's going on in the city, how the city is developing, and how to empower a superior personal satisfaction. A Smart City is unified with somewhere around one drive tending to at least one of the accompanying six qualities: Smart Governance, Smart People, Smart Living, Smart Mobility, Smart Economy and Smart Environment. In this framework, an application was fostered that will bear a hand in this mission. A region that is being overviewed for assessing how much the region is impacted by contamination. The constituents of air alongside its extent are determined and if it is higher than generally expected, the authorities are insinuated about it. Then, at that point, individuals are emptied to a protected spot. The portrayal about the coordinated organization design and the interconnecting instruments for the solid estimation of boundaries by smart sensors and transmission of information through web is being introduced. The longitudinal learning framework could give a poise instrument to better activity of the gadgets in observing stage. The structure of the observing framework depended on a mix of inescapable dispersed detecting units, data framework for information conglomeration, and thinking and setting mindfulness. Results are empowering as the unwavering quality of detecting data transmission through the proposed incorporated network design is 97%. The model was tried to create constant graphical data rather than a proving ground situation.[2]

First is Smart Environment Monitoring utilizing Wireless sensor networks [3] in which the primary spotlight was on the fostering a climate liberated from contamination by making it savvy. The framework to screen the quality of climate utilizing Arduino microcontroller Technology is proposed to get to the next level nature of air. With the utilization of IOT innovation upgrades the most common way of observing different

parts of climate, for example, air quality observing issue proposed in this paper.[4] This paper gives a thought on how we can give moment caution to the specialists. The practical IOT innovation is utilized. Henceforth air and sound contamination is observed by utilizing this innovation [5]. The Automatic Air and Sound administration framework are a venture forward to contribute an answer for the greatest danger. The air and sound observing framework defeats the issue of the exceptionally dirtied regions which is a significant issue. It upholds the innovation and really upholds the solid life idea. This framework has highlights for individuals to screen how much contamination on their cell phones utilizing the application. Along these lines, it turns out to be entirely dependable and productive for the Municipal authorities alongside the Civilians to screen climate, this idea of IOT is valuable for the government assistance of the public. Also, it is executed utilizing the most recent innovation. [6]

VI. WORKING OF MODULE

The Internet of Things (IoT) will have the option to consolidate straightforwardly and consistently various and heterogeneous end frameworks, while giving open admittance to choose subsets of information for the improvement of a plenty of computerized administrations. In this paper, an overall engineering for the IoT was constructed and henceforth an extremely complicated task, chiefly due to the incredibly enormous assortment of gadgets, interface layer innovations, and administrations that might be associated with such a framework. In this paper, center was explicitly done around a metropolitan IoT framework that, while STIL being a seriously general classification, are portrayed by their application space. Metropolitan IoTs, as a matter of fact, are intended to help the Smart City vision, which targets taking advantage of the most progressive correspondence advances to help added-esteem administrations for the organization of the city and for the residents. This paper thus gives a thorough study of the empowering advances, conventions, and engineering for a metropolitan IoT. Besides, the paper introduced and examined the specialized arrangements and best-practice rules took on in the Padova Smart City project, a proof-of-idea organization of an IoT island in the city of Padova, Italy, acted in a joint effort with the city district. the goal of this paper is to examine an overall reference structure for the plan of a metropolitan IoT. They depicted the qualities of a metropolitan IoT, and the administrations that might drive the reception of metropolitan IoT by neighbourhood states. Then, at that point, the outline of the online methodology for the plan of IoT administrations, and the connected conventions and advances, examining their reasonableness for the Smart City climate. interconnected with the information organization of the city region. In such manner, we depict the specialized arrangements embraced for the acknowledgment of the IoT island and report a portion of the estimations that have been gathered by the framework in its first functional days.

VII. RESULTS

Here we propose an air quality as well as sound contamination checking framework that permits us to screen and really look at live air quality as well as sound contamination in a space through IOT. Framework utilizes air sensors to detect presence of hurtful gases/compounds in the air and continually send this information. Additionally, framework continues to gauge sound level and reports it. The sensors collaborate with Arduino UNO which processes this information and communicates it over the application. This permits specialists to screen air contamination in various regions and act against it.

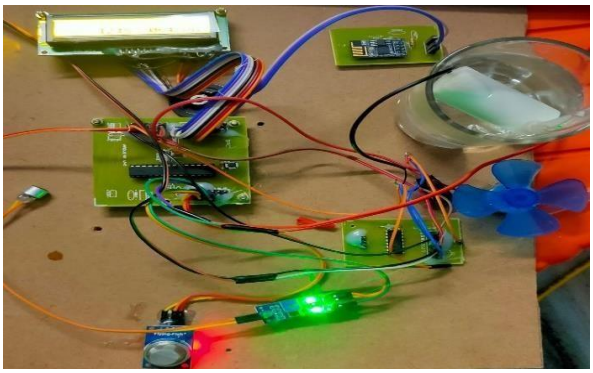

Fig.11: Sound notification through Thingspeak cloud App

Fig.12: Displaying on LCD

Additionally, specialists can keep a watch on the commotion contamination close to schools, medical clinics, and no sounding regions. It turns out to be extremely simple for us to redress the levels and air and clamour contamination around and plan for a solid living and encompassing. The figures that are remembered for our paper shows the way the framework works and how the result is gotten from the contribution in the

wake of handling. Sensors give the information to the microcontroller that can be tell through Thingspeak cloud application. The result is displayed in the simple structure for example if the air contamination is raised it will be shown on the result and Buzzer will likewise gets high all the while and likewise when the sound contamination surpasses the put forth line then additionally bell will buzz what's more, meanwhile we'll help a warning on our telephone through Thingspeak cloud application.

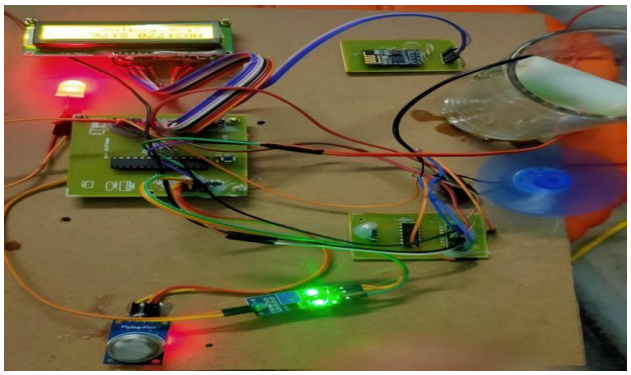

Fig.13: Air notification through Thingspeak cloud App

Fig.14: Displaying on LCD

Area/Locality	Air Pollution	Sound Pollution	LED ON or OFF (Air Pollution)	Buzzer ON or OFF (Sound Pollution)
Low Pollution Level	104	68	OFF	OFF
Medium Pollution Level	290	71	OFF	OFF
High Pollution Level	303	74	ON	ON

TABLE 1: Output value

The TABLE 1 represents the Output values it tells us about air and sound pollutions are measured in Area. And also air and sound pollutions are measured in different levels i.e, low pollution level, medium pollution level, high pollution level.

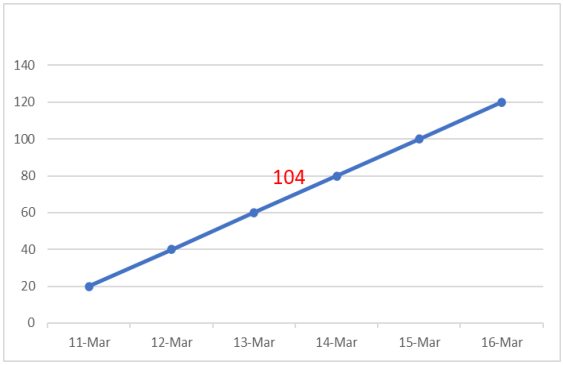

Fig.15: Low Air Pollution Level

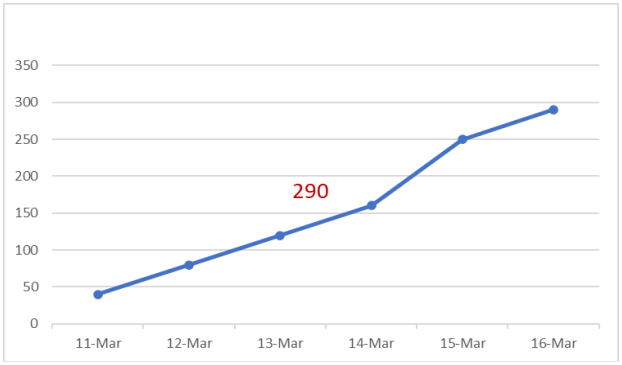

Fig.16: Medium Air Pollution Level

The Fig.15 is a graph in Thingspeak cloud it shows the low air pollution level.

The Fig.16 is a graph in Thingspeak cloud it shows medium air pollution level.

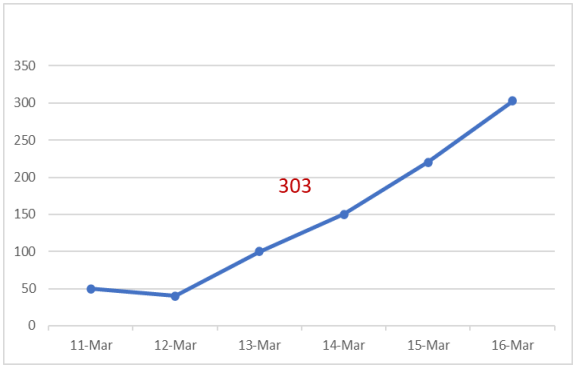

Fig.17: High Air Pollution Level

The Fig.17 is a graph in Thingspeak cloud it shows high air pollution level.

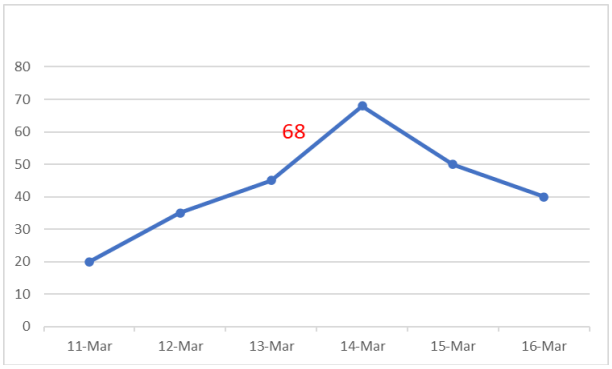

Fig.18: Low Sound Pollution Level

The Fig.17 is a graph in Thingspeak cloud it shows low sound pollution level.

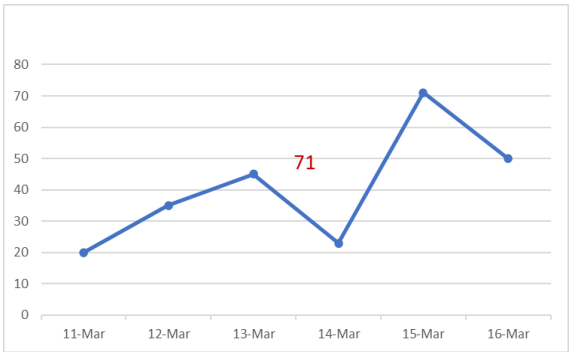

Fig.18: Medium Sound Pollution Level

The Fig.18 is a graph in Thingspeak cloud it shows medium sound pollution level.

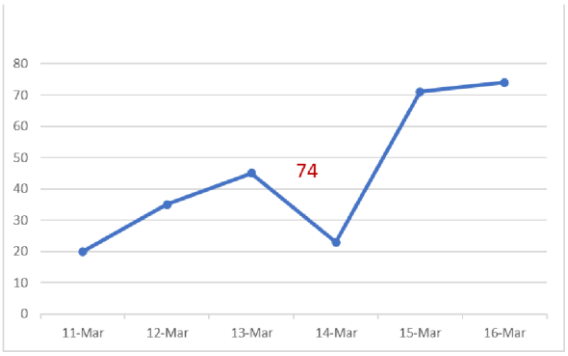

Fig.18: High Sound Pollution Level

The Fig.19 is a graph in Thingspeak cloud it shows high sound pollution level.

VIII. CONCLUSION AND FUTURE SCOPE

In the paper, The Automatic Air and Sound administration framework is a stage forward to contribute an answer for the greatest danger. The air & sound checking framework conquers the issue of the exceptionally contaminated regions which is a significant issue. It upholds the innovation and really upholds the solid life idea. This framework has highlights for individuals to screen the measure of contamination on their cell phones utilizing the application. Thus, it turns out to be truly dependable and productive for the Municipal authorities alongside the Civilians to screen climate. Letting regular citizens additionally engaged with this cycle enhances it. As regular people are currently similarly mindful and inquisitive about their current circumstance, this idea of IOT is gainful for the government assistance of the public. What's more, it is executed utilizing the most recent innovation.

REFERENCES:

[1]. Meng-Shiuan Pan and Yu-Chee Tseng, "ZigBee Wireless Sensor Networks and Their Applications" Department of Computer Science National Chiao Tung University Hsin-Chu, 30010, Taiwan, 2007.

[2]. Hemant Ghayvat, Subhas Mukhopadhyay, Xiang Gui and NagenderSuryadevara, "WSN- and IOTBased Smart Homes and Their Extension to Smart Buildings",Sensors 2015, 15, 10350- 10379; doi:10.3390/s150510350, 2015.

[3]. [3] Navreetinder Kaur, Rita Mahajan, Deepak Bagai,"Air Quality Monitoring System based on Arduino Microcontroller," International Journal Innovative Research in Science, Engineering and Technology (IJIRSET),Vol 5, Issue 6- June 2016.

[4]. Dhruvil Shah, Prathmesh Kudale, Prasad Shirwadkar, Samuel Jacob, Iot Based Air and Sound Pollution Supervising System, IOSR Journal of Engineering, 2018.

[5]. Arushi Singh, Divya Pathak, Prachi Pandit, Shruti Patil, Prof. Priti. C. Golar, IOT based Air and Sound Pollution Monitoring System, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 2017.

[6]. http://www.ijirset.com/upload/2018/may/136_17_IOT.pdf

[7]. Darshana N. Tambe, Netika A. Chavhan, "Evaluation Air Pollution Parameters Using Zigbee (IEEE 802.15.6),"IOSR Journal of Computer Engineering; Vol 11, Issue 4 - May-June 2013.

[8]. [8]Anjaiah Guthi,"Implementation of an Efficient Noise and Air Pollution Monitoring System Using Internet of Things," International Journal of Advanced Research in Computer and Communication Engineering, Vol 5, Issue 7- Jully 2016.

[9]. Dr. A. Sumithra, PJ.Jane Ida, PK. Karthika, Dr. S. Gavaskar,"A smart environmental monitoring system using internet of things," Members, IEEE Vol 3,Issue 3-Oct 2013.

[10]. P.Vijnatha Raju, R.V.R.S.Aravind, Sangeeth Kumar,"Pollution Monitoring System using Wireless Sensor Network," International Journal of Engineering Trends and Technology (IJETT),Vol 4, Issue 4 - April 2013.
[11]. A. R. Al-Ali, Imran Zualkernan and Fadi Aloul, ―A Mobile GPRS-Sensors Array for Air Pollution Monitoring‖ IEEE SENSORS JOURNAL, VOL. 10, NO. 10, OCTOBER 2010
[12]. F. Tsow, E Forzani, A. Rai, R. Wang, R. Tsui, S. Mastroianni, C. Knobbe, A. J. Gandolfi, and N. J. Tao, ―A wearable and wireless sensor system for real-time monitoring of toxic environmental volatile organic compounds, IEEE Sensors J., vol. 9, pp. 1734–1740, Dec. 2009.
[13]. "What are the different types of Arduino boards? ElProCus,"https://www.elprocus.com/different-types-of-arduino-boards/
[14]. "Sensors and LCD Display Components,"https://components101.com/16x2-lcd-pinout-datasheet".
[15]. IoT Analytics - ThingSpeak Internet of Things**,"**https://thingspeak.com/".

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