Automatic Noise level data acquisition system using Raspberry Pi and Arduino

[1]Prof. Nilesh Mishra, [2]Prof Dhirendra Deode, [3]Rajani Harle, [4]Deeksha Varvade, [5]Chinmay Joshi, [6]Hardik Suryavanshi

[1,2]Assistant Professor, [3,4,5,6]Student
[1]Department of Artificial Intelligence and Data Science
[2,3,4,5,6]Department of Electrical and Electronics Engineering
Shri Balaji Institute of Technology and Management
Madhya Pradesh, India.

Abstract-
This System is being implemented by using an Arduino and Raspberry Pi it presents an innovative approach to take note of noise pollution issues. The noise sensors Integrated will capture environmental noise, with Arduino serving as the processing hub. The system will gather real-time data which are connected in wireless sensor network (WSN) enabling reading displayed by using LCD and it continuously acquire data of noise being generated in the place where it is being installed. Cost effectiveness and simplicity make it adaptable for diverse applications. By providing continuous monitoring, it facilitates proactive measures for noise control and compliance if there is any issues or infuture also we can see the data as it being uploaded into cloud by means of Mys Sql. The Arduino based solution contributes to sustainable urban planning and improved public health. This project showcases the potential of affordable Internet of Things (IoT) technology to create effective noise management strategies, along with a provision for capturing the picture of the person making Noise or sources involved in noise generation.

The government set the average sound intensity in the morning and evening around the non-noise places of worship is 55 dB .so this device is being calibrated by using the scale being provided by the government guidelines .Measuring instrument, the intensity of sounds in our surrounding is useful to decide to take action if needed to stop and reduce the noise pollution. Raspberry Pi is a small Computer with Wifi and four USB ports along with a provision to connect a camera, Arduino uno board is a combination of hardware and software with low resource requirements, which allows user to interact with objects (physical quantities) in the vicinity. Microphone sound sensor module is a high-sensitivity sound detector.

"The technology today, is outpacing humanity". The aim of this project is to design an Automatic Noise level data acquisition system using Raspberry Pi and Arduino. The working is based on serial Communication between Arduino Uno and Raspberry Pi, sound module, Raspberry Pi camera, Display and Adapter ".

Published in IJIRMPS (E-ISSN: 2349-7300), Volume 12, Issue 2, March- April 2024

1. INTRODUCTION

People are surrounded by a variety of health concerns about rapidly growing noise level. Industries and urbanization are the main reasons for the increase in noise levels. Traditionally, monitoring noise was a very difficult and inaccurate task. However, with the rapid development of science and technology, a number of modern methods of pollution monitoring have been introduced. Internet of Things offers a wide range of new opportunities in this field. It allows the exchange of data between electronic and electronic devices and between the Internet and a person with the help of various sensors. IoT is cheaper, more

efficient and feasible, which makes it an effective domain. According to research data, noise pollution is major causes of ill effects on human health and the environment. Data cutters used to visit individual sites to collect data on common comparisons and data analysis techniques. This process is time consuming and ineffective. In this paper, we have introduced a system that monitors and allows constant inspection of noise levels and to report to the relevant authorization if the level of pollution is above normal, so that what is needed is done. A series of sensors are distributed to detect noise level.

The data captured on these IoT sensors is constantly updated on the microcontroller. Outputs obtained from sensors are stored in a cloud compartment and are given remote access. It also allows us to compare custom-made algorithms with data from the previously stored cloud. The process described in this paper provides the process involved in building a prototype model for noise and air pollution control and to warn concerned council when the level incfrase beyond the maximum bearable level to take the necessa ry action as soon as possible and the situation can be prevented. . The main purpose of this project is to assist today's society with the use of the Internet. IoT is simply a network of objects / connected devices connected to sensors, software, network connections and the necessary electrical hardware deices that allows it to collect and exchange data that enables them to respond.

2. LITERATURE SURVEY

In a paper submitted by Tanuja Borate, Meghalata Lipani, Madhuri Kale, Vaishnavi Pardeshi, Prof. Prashant Jawalkar named Automatic Air & Sound management system is an advanced move ahead in delivering a solution to the greatest risk. It has supported new technologies and successfully supported the concept of a healthy lifestyle. The system had features that allowed people to monitor the level of pollution using a mobile system. To use this, they use sensory devices in the area to collect data and analyze it. network. Then the data collected and the analyzed result would be provided to the remote user via Wi-Fi. Collected data could be a critical factor while considering the impact due to idle vehicles in on state on air quality. Carbon monoxide concentration data can be updated using mobile devices, such as PDAs, cell phone devices, and tablets to maintain air quality.

In another paper proposed by, K. Cornelius, N. Komal Kumari, Sagar Pradhaan, Priyesh Patel, N. Vinay, developed IoT technologies for monitoring and monitoring air pollution and noise levels. and its sound quality can be monitored, tested and controlled in real time with the help of this model. Real-time monitoring allows users to take timely action when displaying a warning sign on an LCD screen and updated in the cloud with the help of IoT to prevent any major threats. Their next proposed development was the possibility of quality testing. noise and noise pollution of a particular stadium using the GPS of the mobile user.

GONÇALO MARQUES AND RUI PITARMA paper, in which they proposed the design of a wireless sensor network to monitor noise pollution in the area. They built the sensor node using the Teensy 3.2 an omnidirectional POW-1644P-B-R microphone and data is transmitted using the Xbee module with the Zigbee protocol. The design gate uses the Raspberry Pi 3 and contains an XBee module for data communication. They used four modules within 14 days of field work and testing to validate the proposed method with the best results of real-time audio-level data collection. The data acquisition system used the Raspberry Pi, audio codec, and mobile connection to the data connection. The system used two microphones with different sensors. Power is provided with the help of a solarpowered battery to charge. The hardware system used ethernet to power the system. The proposed route was confirmed and tested.

NoiseSpy was founded by E. Kanjo uses a microphone embedded in a cell device to determine the level of disturbance in terms of noise in the surroundings. Another device to monitor noise and air pollution was proposed by Chaithanya, Shruthi and Raste. But this system failed to detect level level units when the system was used to collect data. Another air and noise pollution monitoring program called Zagreb was launched in late 2017, which used a wearable sensor to measure air pollution and a mobile application for noise detection. But the proposed model did not work well on all devices, its accuracy has changed for mobile phones of different types. The good thing about this program is that it was a zero correction system.

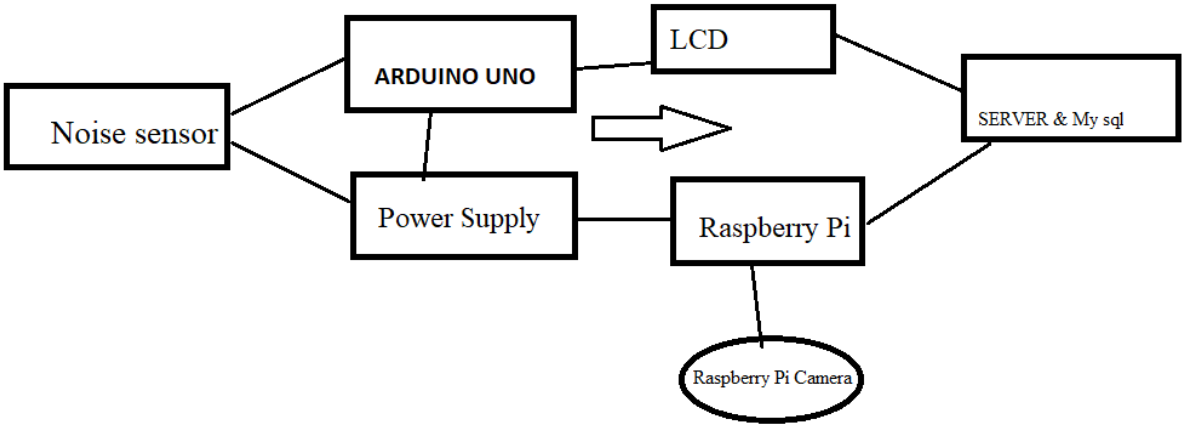
3.METHODOLOGY

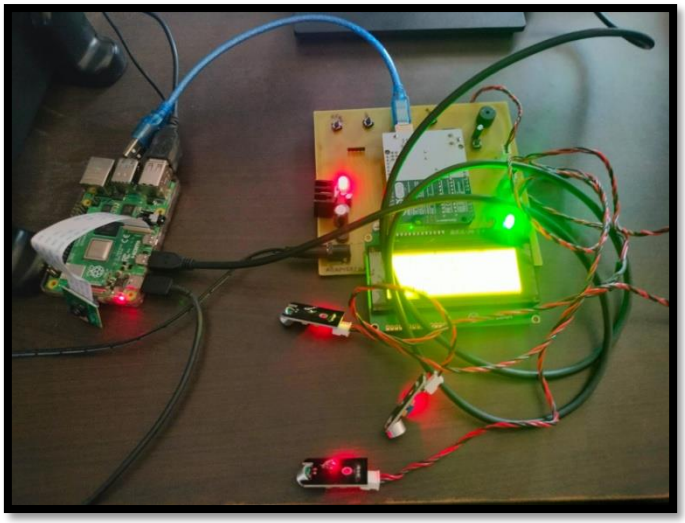
Presented here is an Arduino-based noise/sound level monitor that displays sound levels in decibels (dB) and corresponding voltage levels on an LCD alonwith data acquisition we have a provision for taking photographs of the person involved in noise creation activity.

A nose monitoring system is used in many applications such as healthcare, defence, mining robotics and so on.In forest we are having buffer zone where no sound is allowed so in this area we have to implement this device, nowadays DJ is Banned so in this alo we can utilize this system to prevent unnecessary fine imposed by govt, agencies.

The design of this noise level monitoring device utilizes a sound sensor, Arduino Uno microcontroller, seven
segment, and LED. The sound sensor will capture the sound from the sound source and will produce a signal. The signal will be sent to the Arduino Uno microcontroller that is connected to the number viewer and LEDs indicator.

Block diagram of the system is shown in Figure 1.





Experimental Setup

Sound Sensor Circuit

Sensor circuit based on analog sound sensor DFR0034 V2. The sound sensor V2 is a component that receives
sound waves and converts them into electrical signal. This sensor has 3 connections, the black cable for Ground, the
red cable for VCC, and the blue cable for analog signal ouput [7].

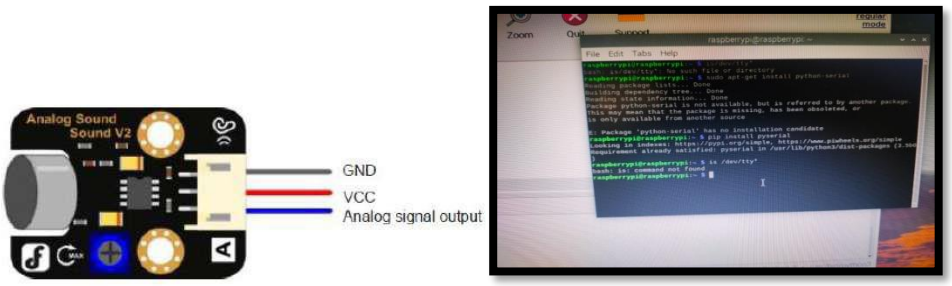


FIGURE 2. Analog sensor sound V2 (source: DFRobot)

This sensor has only 3 connections, connected as follows Table 1. The input voltage for the sound sensor uses a
voltage of 3.3 V. The output of sound sensor is connected to pin A5 of Arduino Uno.

TABLE 1. Configuration pin of sound sensor and Arduino Uno

Pin of Sound Sensor	Pin of Arduino Uno
Vcc	3.3 V
GND	GND

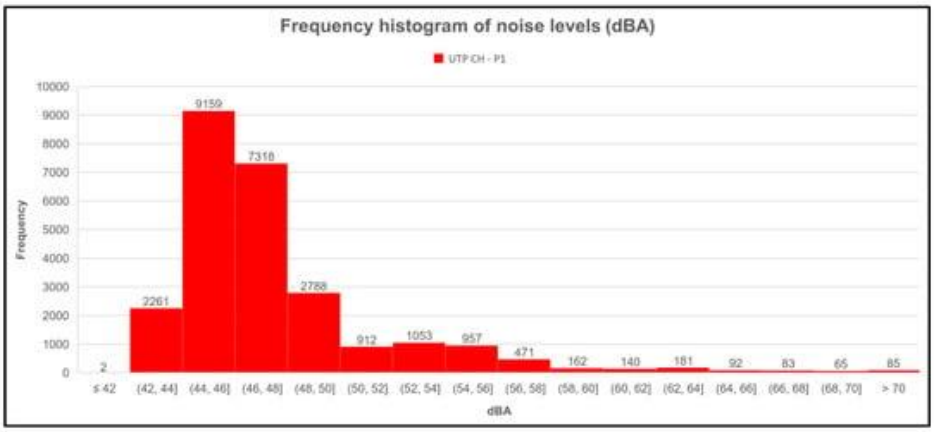
4. RESULTS

The data being provided by serial communication between Arduino and Raspberry Pi is tabulated and an excel sheet is being prepared in which we have seen different readings,we are using this data and with the help of MySql database is being created so that it is being uploaded into cloud and by means of Internet of Things we can se the data and the pics captured can be seen in future.

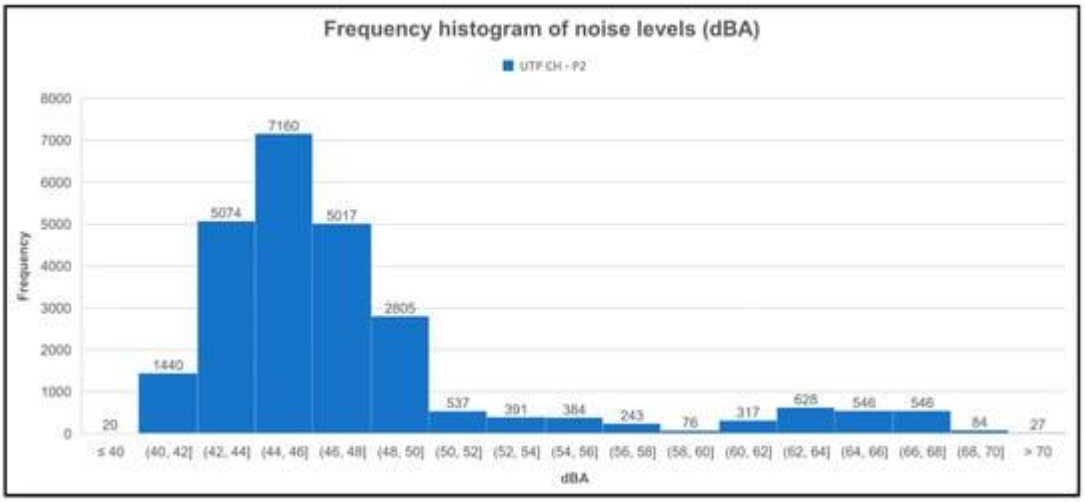
.. It should be noted that for the analysis of the data, negative values were filtered, and different time intervals were selected for the different days because the negative values indicated that there was a technical failure in the prototype, and because of the failures, there were certain periods of time in which the sound levels were not measured, or the data were not saved. This is possible because the prototypes also stored and performed measurements on non-preset days.
The selected data ranges considered the following criteria:

- Cannot be a negative value
- For 9 March: 9:30 a.m. to 8:30 p.m.
- For 11 March: 8:20 a.m. to 6:35 p.m.
- For 14 March: 10:15 a.m. to 8:25 p.m.
- For 15 March 8:15 a.m. to 10:00 p.m.
- For 16 March 8:00 a.m. to 9:10 p.m.

Figure below show the frequency histograms generated with the Microsoft Excel tool for each measurement point. Frequency histograms are made to graphically summarize a set of data distributions to find a pattern or characteristics of interest. shows that for the first point (UTP CH-P1), which was one of those located in FISC, the range between 44 to 46 dBA ha the highest frequency, and the lowest frequency was the range of decibels below 42 dBA.



Histogram of sound level frequencies of the first measurement point (UTP CH-P1).



Histogram of sound level frequencies of the second measurement point (UTP CH-P2).

5. CONCLUSION

A system to monitor noise parameters using Arduino microcontroller, WSN and IoT is proposed to reduce noise pollution. Through the use of technologies such as WSN and IoT it develops a way to monitor various sources and reasons for generation of noise pollution

It is estimated that this process will be well received in the market as it can be a central system for all monitoring activity. Thanks to the intelligent monitoring of the environment and the efficient, low-cost embedded system presented by the various models within this paper. In the proposed architectural work of various modules were discussed. The system for monitoring the noise pollution of the Internet and the concept of the Internet of Things has been tested with the help of two parameters. This model is often extended to look at developing cities and industrial areas to monitor pollution. In order to monitor the human health in pollution, this model provides a competent as well as cost-effective solution. The flexibility of the sensor nodes that are to be integrated with different type of sensor were tested and utilized in this operation It encourages new technologies and successfully upholds the concept of a healthy lifestyle. The system allow users to monitor the quantity of pollution in their surrounding using this system.

REFERENCES:

[1] D. Ganeshkumar, V. Parimala, S. Santhoshkumar, T. Vignesh, M. Surendar, 2020, Air and Sound Pollution Monitoring System using Cloud Computing, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) Volume 09, Issue 06 (June 2020).

[2] Rajat Sankhe, Pravin Shirodkar, Avinash Nangare, Abhishek Yadav, Prof. Gauri Salunkhe, 2017, Iot Based Air and Sound Pollution Monitoring System, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) ICIATE – 2017 (Volume 5 – Issue 01).

[3] K. Cornelius, N. K. Kumar, S. Pradhan, P. Patel and N. Vinay, "An Efficient Tracking System for Air and Sound Pollution using IoT," 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS), 2020, pp. 22-25, Doi: 10.1109/ICACCS48705.2020.9074301.

[4] A. K. Saha et al., "A raspberry Pi controlled cloud-based air and sound pollution monitoring system with temperature and humidity sensing," 2018 IEEE 8th Annual Computing and Communication Workshop and Conference (CCWC), 2018, pp. 607-611, Doi: 10.1109/CCW C.2018.8301660.

[5] N. Nowshin and M. S. Hasan, "Microcontroller Based Environmental Pollution Monitoring System though IoT Implementation," 2021 2nd International Conference on Robotics, Electrical and Signal Processing Techniques (ICREST), 2021, pp. 493-498, Doi: 10.1109/ICREST51555.2021.9331020.

[6] S. S. Alam, A. J. Islam, M. M. Hasan, M. N. M. Rafid, N. Chakma and M. N. Imtiaz, "Design and Development of a Low-Cost IoT based Environmental Pollution Monitoring System," 2018 4th International Conference on Electrical Engineering and Information & Communication Technology (iCEEiCT), 2018, pp. 652-656, doi: 10.1109/CEEICT.2018.8628053.

[7] P. Patil, "Smart IoT based system for vehicle noise and pollution monitoring," 2017 International Conference on Trends in Electronics and Informatics (ICEI), 2017, pp. 322-326, doi: 10.1109/ICOEI.2017.8300941. [8] S. D. S. S. P. M. S. “Air and Sound Pollution Monitoring System Using IoT”. International Journal on Recent and Innovation Trends in Computing and Communication, vol. 5, no. 6, June 2017, pp. 175 -, doi:10.17762/ijritcc. v5i6.741. [9] Nitin Jangid, Surbhi Singh, R. J. P. D. (2021). AIR AND SOUND POLLUTION MONITORING SYSTEM USING IOT. Design Engineering