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**PHASE 1:** PROJCT DEFINITION AND DESIGN THINKING.

**FORMAT:** PROJECT 1.

# NOISE POLLUTION MONITORING USING IOT

## OBJECTIVE:

The main objective of this project is to create a platform for public to know the awareness for noise pollution, and to recognize the problem of noise pollution.

## PROJECT DEFINITION:

Noise pollution monitoring is an important tool for protecting public health and well-being. It can be used to identify noise pollution hotspots, to develop mitigation strategies, and to ensure compliance with noise regulations.

Noise pollution monitoring data can be used for a variety of purposes, such as:

- **Identifying noise pollution hotspots:** Noise maps can be used to identify areas where noise pollution is a problem. This information can be used to develop mitigation strategies, such as noise barriers or traffic calming measures.
- **Enforcing noise regulations:** Noise monitoring data can be used to enforce noise regulations. For example, if a business is found to be exceeding noise limits, they may be fined or ordered to take corrective action.
- **Raising awareness of noise pollution:** Noise monitoring data can be used to raise awareness of noise pollution and its impacts on public health and well-being. This information can be used to educate the public and advocate for change.

Here are some examples of how noise pollution monitoring is being used around the world:



The City of London has a network of over 200 fixed noise monitoring stations. The data from these stations is used to create noise maps, which are used to inform the city's noise management plan. The noise maps are also used to develop noise action plans for specific areas where noise pollution is a problem.

The European Union has a directive on environmental noise, which requires member states to monitor noise levels and to develop noise action plans for areas where noise pollution is a problem.

The World Health Organization (WHO) has published guidelines on noise levels, which recommend that the average daily noise exposure should not exceed 65 dB for adults and 55 dB for children.

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Noise pollution monitoring can be conducted in two main ways:

**Fixed monitoring:** This involves installing sound level meters at fixed locations and collecting data over a period of time. Fixed monitoring is used to create noise maps, which can be used to identify areas where noise pollution is a problem.

**Mobile monitoring:** This involves using portable sound level meters to collect data from a variety of locations. Mobile monitoring is used to fill in the gaps between fixed monitoring stations and to collect data from areas that are difficult to access.

Noise pollution monitoring is becoming increasingly important as cities become more crowded and noisy. By monitoring noise levels, we can identify areas where noise pollution is a problem and develop strategies to reduce its impact on human health and well-being.

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## DESIGN THINKING:

### PROJECT OBJECTIVE:

Design thinking is a human approach to innovation that helps teams understand users, challenge assumptions, redefine problems and create innovative solutions to prototype and test. It is a collaborative process that takes into account the needs of the people who will be using the solution, as well as the technical and business constraints.

it is a powerful tool that can be used to make a real difference in the fight against noise pollution. By following the design thinking process, teams can develop innovative solutions that meet the needs of the people who are affected by the problem and that are also feasible to implement

### IOT Sensor Design

To plan the deployment of IOT noise sensors in various public areas to measure noise levels, you should consider the following steps:

1. Identify the public areas where you want to deploy the sensors. This could include parks, playgrounds, schools, hospitals, and other areas where people are likely to be exposed to noise pollution.

### IMPORTANT AREAS:

#### SCHOOLS



#### PARKS



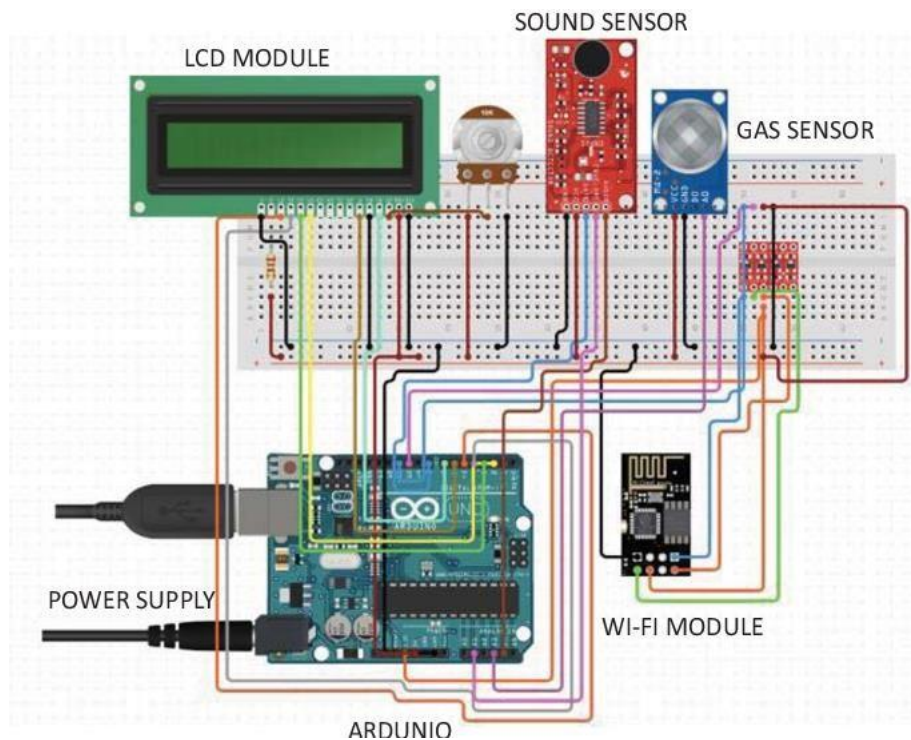
#### TEMPLES



#### HOSPITALS



2. Consider the type of noise sensors you want to use. There are a variety of IOT noise sensors available, each with its own strengths and weaknesses. Some factors to consider include the accuracy of the sensor, its power consumption, and its cost.



3. Determine the number of sensors you need to deploy. The number of sensors you need will depend on the size and complexity of the area you are monitoring. As a general rule of thumb, you should deploy at least three sensors in each area.
4. Select the locations for the sensors. When selecting the locations for the sensors, it is important to consider the following factors:
  - The sensors should be placed away from direct sunlight and rain.
  - The sensors should be placed away from sources of interference, such as electrical equipment and large metal objects.
  - The sensors should be placed in locations where they can be easily accessed for maintenance.
5. Install the sensors. Once you have selected the locations for the sensors, you need to install them. This may involve mounting the sensors on poles or walls, or installing them underground.
6. Connect the sensors to the internet. Once the sensors are installed, you need to connect them to the internet so that they can transmit their data to a central server. This can be done using a variety of methods, such as cellular, Wi-Fi, or Ethernet.
7. Set up the central server. The central server will be responsible for receiving and storing the data from the sensors. You need to set up the server to collect and store the data in a way that is easy to access and analyse.



8. **Analyse the data.** Once the data is collected and stored, you need to analyze it to identify noise pollution hotspots and other trends. This information can be used to develop mitigation strategies and to raise awareness of noise pollution.

By following these steps, you can develop a plan to deploy IoT noise sensors in various public areas to measure noise levels. This information can be used to develop mitigation strategies and to raise awareness of noise pollution.

#### Noise Pollution Information Platform:

A noise pollution information platform is a website or app that provides information about noise pollution, including noise levels in different areas, the impact of noise pollution on human health and the environment, and ways to reduce noise pollution.

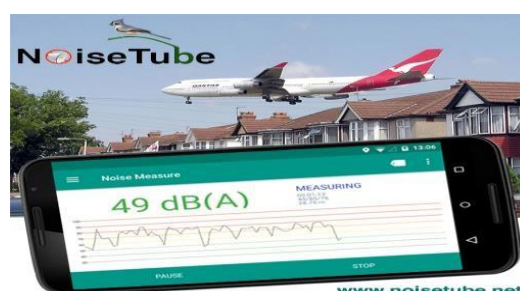
Noise pollution information platforms can be used by a variety of stakeholders, including:

- **Individuals:** Individuals can use noise pollution information platforms to learn more about noise pollution and how it affects them. They can also use the platforms to find out about noise levels in their area and to identify ways to reduce their exposure to noise pollution.
- **Businesses:** Businesses can use noise pollution information platforms to learn about the impact of noise pollution on their employees and customers. They can also use the platforms to identify ways to reduce noise pollution in their workplaces and in the communities where they operate.
- **Governments:** Governments can use noise pollution information platforms to raise awareness of noise pollution and to develop and implement policies to reduce noise pollution.

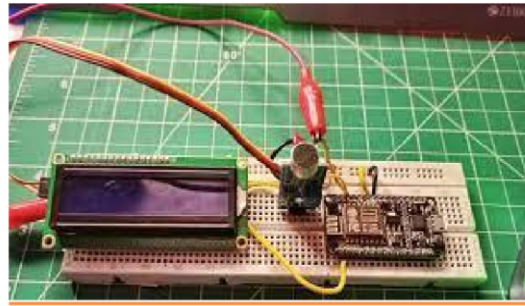
Here are some examples of noise pollution information platforms:

- **Noise Tube:** Noise Tube is a crowdsourcing platform that allows people to collect noise data using their smartphones. The data from Noise Tube is used to create noise maps and to identify noise pollution hotspots.
- **World Health Organization (WHO) Noise Pollution Information Platform:** The WHO Noise Pollution Information Platform provides information about the impact of noise pollution on human health and the environment. The platform also provides tips on how to reduce noise pollution in the home, workplace, and community.

#### **MOBILE APP BASED IMPLEMENTATION:**



## DEVICE BASED IMPLEMENTATION:



## INTEGRATION APPROACH:

There are a number of ways for IOT sensors to send data to the noise pollution information platform. Some of the most common methods include:

- **Cellular:** Cellular networks are a reliable and widespread way to connect IOT sensors to the internet. Cellular networks are also relatively inexpensive, making them a good option for large-scale deployments.
- **Wi-Fi:** Wi-Fi networks can be used to connect IOT sensors to the internet if they are within range of a Wi-Fi access point. Wi-Fi networks are typically faster and more reliable than cellular networks, but they have a shorter range.
- **Ethernet:** Ethernet cables can be used to connect IOT sensors to the internet if they are located near a network switch or router. Ethernet connections are the most reliable and fastest way to connect IOT sensors to the internet, but they are also the most expensive.
- **LORAWAN:** LORAWAN is a low-power wide-area network (LPWAN) technology that can be used to connect IOT sensors to the internet over long distances. LARAWAN networks are typically less expensive than cellular networks, but they have a lower data rate.

The best way to connect IOT sensors to the noise pollution information platform will depend on a number of factors, including the budget, the size and complexity of the deployment, and the specific needs of the platform.

Once the IOT sensors are connected to the internet, they can send data to the noise pollution information platform using a variety of protocols. Some of the most common protocols include:

- **MQTT:** MQTT is a lightweight messaging protocol that is well-suited for IoT applications. MQTT is designed to be efficient and reliable, even on low-power devices.
- **HTTP:** HTTP is a general-purpose protocol that can be used to send data to and from web servers. HTTP is a good option for IOT applications that require a two-way communication channel.
- **COAP:** COAP is a lightweight protocol that is designed for constrained devices. COAP is a good option for IOT applications that need to send data to a server over a low-bandwidth connection.

The specific protocol that is used to send data to the noise pollution information platform will depend on the requirements of the platform and the capabilities of the IOT sensors.

Once the IOT sensors are connected to the internet and the appropriate protocol is selected, the data can be sent to the noise pollution information platform. The platform will then store and process the data so that it can be used to create noise maps, track changes in noise levels over time, and provide information about the impact of noise pollution on human health and the environment.

Here is an example of how IOT sensors could be used to send data to a noise pollution information platform:

1. The IOT sensors are installed in various public areas, such as parks, playgrounds, and schools.
2. The IOT sensors are connected to the internet using a cellular network.
3. The IOT sensors use the MQTT protocol to send data to the noise pollution information platform.
4. The noise pollution information platform receives the data from the IoT sensors and stores it in a database.
5. The noise pollution information platform processes the data to create noise maps and track changes in noise levels over time.
6. The noise pollution information platform provides information about the impact of noise pollution on human health and the environment to users.

This is just one example of how IOT sensors could be used to send data to a noise pollution information platform. There are many other ways to implement this system, and the best approach will depend on the specific needs of the community.

## **CONCLUSION:**

Noise pollution monitoring is the process of measuring, recording, and assessing sound levels in various environments to understand the extent of noise pollution and its potential impact on human health and the surrounding ecosystem.

Noise pollution monitoring is important for a number of reasons. Noise pollution can have a number of negative health effects, including hearing loss, tinnitus, high blood pressure, heart disease, and sleep disturbance. Noise pollution can also have a negative impact on wildlife.

Noise pollution monitoring can be used to identify noise pollution hotspots, to develop mitigation strategies, and to enforce noise regulations. Noise pollution monitoring data can also be used to raise awareness of noise pollution and its impacts on public health and well-being.



IOT sensors can be used to deploy noise pollution monitoring systems in a variety of public areas. IOT sensors can be connected to the internet using cellular networks, Wi-Fi networks, Ethernet cables, or LORAWAN networks. The data from the IOT sensors can be sent to a noise pollution information platform using a variety of protocols, such as MQTT, HTTP, or COAP.

Once the data is received by the noise pollution information platform, it can be used to create noise maps, track changes in noise levels over time, and provide information about the impact of noise pollution on human health and the environment.

Noise pollution monitoring is an important tool for protecting public health and well-being. By monitoring noise levels, we can identify areas where noise pollution is a problem and develop strategies to reduce its impact.