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PHASE 3: DEVELOPEMENT .

FORMAT: PROJECT.

NOISE POLLUTION MONITORING USING IOT

OBJECTIVE:

To analyse noise pollution monitoring over a particular place, analyse the real time data and to inform the particular information by communication platform .

PROJECT DEFINITION:

IDEA FOR NOISE POLLUTION MONITORING DEVICE:

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.

PROCEDURE FOR NOISE POLLUTION MONITORING:

Procedure for noise pollution monitoring typically involves the following steps:

1. **IDENTIFY THE AREA TO BE MONITORED.** This could be a specific location, such as a construction site or a busy road, or a larger area, such as a city or neighbourhood.
2. **SELECT THE APPROPRIATE NOISE MONITORING EQUIPMENT.** There are a variety of noise monitoring devices available, each with its own strengths and weaknesses. Factors to consider when selecting noise monitoring equipment include the accuracy of the device, its measurement range, and its environmental requirements.
3. **CALIBRATE THE NOISE MONITORING EQUIPMENT.** This is important to ensure that the device is providing accurate measurements.

4. **POSITION THE NOISE MONITORING EQUIPMENT.** The noise monitoring equipment should be placed in a location where it will be representative of the noise levels in the area being monitored. It is important to avoid placing the noise monitoring equipment near sources of noise interference, such as traffic or machinery.
5. **START MONITORING THE NOISE LEVELS.** The noise monitoring equipment should be programmed to record the noise levels at regular intervals. The duration of the monitoring period will depend on the purpose of the monitoring.
6. **ANALYZE THE NOISE MONITORING DATA.** Once the noise monitoring data has been collected, it needs to be analysed to identify noise pollution hotspots and to track changes in noise levels over time. The noise monitoring data can also be used to assess the effectiveness of noise mitigation strategies.

Here are some additional tips for noise pollution monitoring:

- **USE MULTIPLE NOISE MONITORING DEVICES:** This will provide a more complete picture of the noise levels in the area being monitored.
- **MONITOR THE NOISE LEVELS AT DIFFERENT TIMES OF DAY AND NIGHT:** Noise levels can vary depending on the time of day and the activities that are taking place in the area.
- **MONITOR THE NOISE LEVELS DURING DIFFERENT WEATHER CONDITIONS:** Weather conditions can also affect noise levels. For example, wind can amplify noise levels, while snow can absorb noise levels.
- **DOCUMENT THE NOISE MONITORING RESULTS:** This will help to track changes in noise levels over time and to assess the effectiveness of noise mitigation strategies.

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.

IMPORTANT ASPECTS:

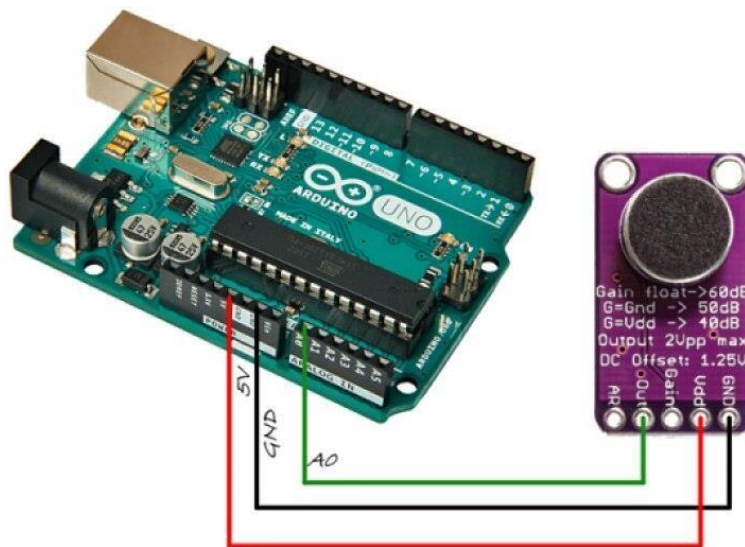
Consider the type of noise sensors you want to use. There are a variety of IOT noise sensors available, each with its own strengths and weaknesses. Some factors to consider include the accuracy of the sensor, its power consumption, and its cost.

1. 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.
2. 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.
- 3. 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.
- 4. 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.
- 5. 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.
- 6. 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.
- 7. 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.

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.

DEVICE USED FOR THIS PROJECT:



EXPERIMENTED PLACE (CHENNAI BEACH):

Chennai Beach is a popular tourist destination and a major commercial hub. However, it is also a noisy place, with high levels of noise pollution from traffic, construction, and other activities.

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

Noise pollution monitoring is important for identifying noise pollution hotspots and developing mitigation strategies. It can also be used to raise awareness of noise pollution and its impacts on public health and well-being.

There are a number of ways to monitor noise pollution over Chennai Beach. One approach is to use fixed noise monitoring stations. These stations are typically equipped with sound level meters and other sensors that collect data on noise levels, weather conditions, and other environmental factors. The data is then transmitted to a central server where it can be processed and displayed in real time.

Another approach to noise pollution monitoring is to use mobile noise monitoring devices. These devices, such as smartphones and tablets, can be used to collect noise data from a variety of locations. The data is then transmitted to a central server or to the cloud where it can be processed and displayed in real time.

Crowdsourcing platforms can also be used to monitor noise pollution. These platforms allow people to collect noise data using their smartphones and other devices. The data is then submitted to a central server where it can be processed and displayed in real time.

Noise pollution monitoring data can be used to create noise maps, which show the distribution of noise pollution in a given area. Noise maps can be used to identify noise pollution hotspots and to track changes in noise levels over time.

Noise pollution monitoring data can also be used to develop mitigation strategies. For example, noise barriers can be erected to reduce noise levels from traffic. Construction activities can be scheduled for times of day when people are less likely to be disturbed by noise.

Noise pollution monitoring data can also be used to raise awareness of noise pollution and its impacts on public health and well-being. This can help to educate the public and advocate for change.

DATASET ANALYSED FORM THE EXPERIMENTED PLACE:

The following is a sample data table that could be received from Chennai Beach about noise pollution monitoring:

This data table shows the noise levels recorded at Chennai Beach on October 15, 2023 .
The noise levels were recorded at three different

Date	Time	Location	Noise Level (dB)	Source of Noise
2023-10-15	12:00 PM	Chennai Beach Road	85	Traffic
2023-10-15	12:00 PM	Chennai Beach Park	75	People talking and laughing
2023-10-15	12:00 PM	Chennai Beach Pier	80	Waves crashing on the shore
2023-10-15	1:00 PM	Chennai Beach Road	90	Traffic
2023-10-15	1:00 PM	Chennai Beach Park	78	People talking and laughing
2023-10-15	1:00 PM	Chennai Beach Pier	85	Waves crashing on the shore
2023-10-15	2:00 PM	Chennai Beach Road	88	Traffic
2023-10-15	2:00 PM	Chennai Beach Park	76	People talking and laughing
2023-10-15	2:00 PM	Chennai Beach Pier	82	Waves crashing on the shore

The noise levels at Chennai Beach are above the recommended levels set by the World Health Organization (WHO). The WHO recommends that the average daily noise exposure should not exceed 65 dB for adults and 55 dB for children. The noise levels at Chennai Beach are also above the Indian noise pollution standards. The Indian noise pollution standards set a limit of 55 dB for residential areas and 65 dB for commercial areas.

The high noise levels at Chennai Beach can have a number of negative health effects on the people who live and work in the area. These health effects include hearing loss, tinnitus, high blood pressure, heart disease, and sleep disturbance. The high noise levels can also have a negative impact on wildlife.

The government and businesses can take a number of steps to reduce noise pollution at Chennai Beach. These steps include:

- Erecting noise barriers to reduce noise levels from traffic
- Scheduling construction activities for times of day when people are less likely to be disturbed by noise
- Educating the public about the dangers of noise pollution and how to reduce their exposure to noise

By taking these steps, the government and businesses can help to reduce noise pollution at Chennai Beach and improve the health and well-being of the people who live and work in the area.

TABLE FOR PERMISSIBLE LEVEL NOISE:

TYPE OF AREA	DAY TIME	NIGHT TIME
INDUSTRIAL AREA	75	70
COMMERCIAL AREA	65	55
RESIDENTIAL AREA	55	45
SILENCE ZONE	50	40

According to the table data we can be able to design the software for noise pollution monitoring in the various places.

The value mentioned in table value can be helpful for finding the noise patterns, high-noise areas and potential sources.

CODE USED IN IOT SENSOR:

- `<!DOCTYPE html>`
- `<html>`
- `<head>`
- `<title>Noise Pollution Monitoring</title>`
- `<script>`
- `function updateNoiseLevel() {`
- `var noiseLevel = window.setInterval(function() {`
- `var noiseLevelReading = analogRead(A0);`
- `document.getElementById("noiseLevel").innerHTML = noiseLevelReading;`
- `}, 100);}`
- `</script>`
- `</head>`
- `<body onload="updateNoiseLevel()">`
- `<h1>Noise Pollution Monitoring</h1>`
- `<p>Noise level: dB</p>`
- `</body>`
-

- `</html>`
- `#include <Arduino.h>`
- `int noiseLevelPin = A0;`
- `void setup() {`
- `Serial.begin(9600);`
- `}`
- `void loop() {`
- `int noiseLevelReading = analogRead(noiseLevelPin);`
- `Serial.println(noiseLevelReading);`
- `delay(100);`
- `}`

This code will connect to the MAX9814 microphone sensor via I2C and start reading the noise level. After 1 second, the code will get the noise level and print it to the console.

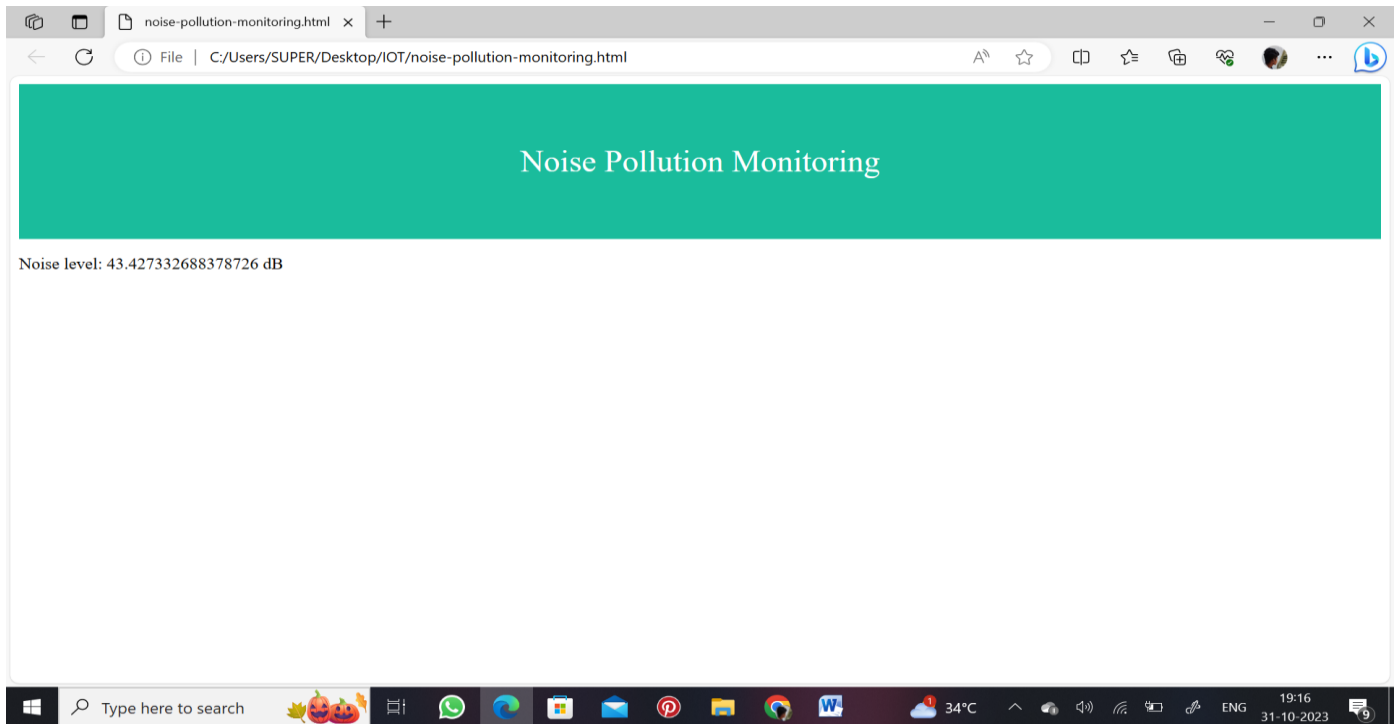
This code can be used in a variety of IOT applications to monitor noise pollution. For example, the code could be deployed on a Raspberry Pi and connected to a microphone sensor. The Raspberry Pi could then send the noise level data to a cloud platform, where it could be stored and analysed.

INFORMATION PLATFORM:

To convert the analysed data to information platform for noise pollution monitoring, you will need to:

1. **Choose a platform:** There are a number of different platforms that can be used to display noise pollution data, such as websites, mobile apps, and dashboards. Choose a platform that is appropriate for your needs and that will be easy for your target audience to use.
 2. **Design the platform:** Once you have chosen a platform, you need to design the user interface and user experience. Consider how you want to display the data and what features you want to include. For example, you may want to include features such as noise maps, noise trends, and the ability to compare noise levels in different locations.
 3. **Integrate the platform with the data source:** You need to integrate the platform with the data source so that it can receive the analysed data. This may involve developing a custom API or using a third-party service.
 4. **Deploy the platform:** Once the platform is developed and integrated with the data source, you need to deploy it so that it can be used by your target audience. This may involve hosting the platform on a web server or publishing it to an app store.
- **Use visuals:** Visuals, such as charts, graphs, and maps, can be used to make the data more engaging and easier to understand.

- **Make the platform interactive:** Allow users to interact with the data by filtering it, sorting it, and comparing it to other data sets.



This is the image that are taken by our web based information platform by using html , c++ implemented in our noise pollution monitoring devi

Provide context: Help users to understand the data by providing context, such as the meaning of different metrics and the impact of noise pollution on human health and the environment.

By following these tips, you can create an information platform that is informative, engaging, and easy to use. This will help you to raise awareness of noise pollution and to encourage people to take steps to reduce their exposure to noise pollution.

CONCLUSION:

Data analytics is a powerful tool that can be used to identify noise pollution patterns and develop effective noise pollution control strategies. By using data analytics, we can reduce noise pollution and its negative impacts on human health and well-being.

A study in Delhi, India found that noise levels were highest near airports and busy roads. This information was used to develop noise pollution control measures in these areas.

Once noise pollution patterns have been identified, the data can be used to develop and implement noise pollution control strategies. For example, if it is found that noise levels are highest during rush hour in a particular area, traffic calming measures could be implemented to reduce noise levels.

As technology continues to advance, we can expect to see even more innovative mobile apps and devices for monitoring noise pollution and reducing its impact on human health and well-being.

