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Noise Alert

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Abstract: *The Noise Alert Project is a smart system designed to monitor and control noise levels in a specific area to reduce noise pollution. The system uses a sound sensor to continuously detect surrounding sound intensity and sends the data to an ESP32 microcontroller. The program, developed using Arduino IDE and Visual Studio Code (VS Code), compares the detected sound level with a predefined threshold value. When the noise exceeds the set limit, the system activates a buzzer and LED as alert indicators. A metal push button is provided to allow the authorized person to reset or stop the alert. All components are integrated using a Printed Circuit Board (PCB) for stable and efficient performance. This project provides a simple, cost-effective, and reliable solution for maintaining a peaceful environment in places such as schools, hospitals, libraries, and residential areas.*

Keywords: Noise Pollution, ESP32, Sound Sensor, Microcontroller, Noise Monitoring System

I. INTRODUCTION

Noise pollution is one of the major environmental issues in modern society, especially in urban and crowded areas. Excessive noise can cause stress, lack of concentration, sleep disturbance, and even hearing problems. To overcome this issue, the Noise Alert Project is developed as an effective and automated solution to monitor and control sound levels in a particular area.

This project uses a sound sensor to continuously measure the intensity of surrounding noise. The detected sound data is processed by the ESP32 microcontroller, which is programmed using Arduino IDE and VS Code. When the noise level exceeds a predefined limit, the system activates a buzzer and LED to provide both audible and visual alerts.

A metal push button is included to allow the authorized person to reset or stop the alert system. The entire circuit is assembled on a PCB to ensure stability and durability.

The main objective of this project is to reduce noise pollution and maintain a peaceful environment in places like schools, hospitals, libraries, and residential areas.

II. METHODOLOGY

The Noise Alert Project focuses on the design and analysis of a real-time noise monitoring and alert system using the ESP32 microcontroller. The methodology involves sensing environmental sound levels, processing the data through a microcontroller, and generating alerts when the noise exceeds a predefined threshold.

The system is developed by integrating hardware components such as:

- Sound sensor
- ESP32 microcontroller
- LED indicator
- Buzzer
- Metal push button

Printed Circuit Board (PCB)

Software tools such as **Arduino IDE** and **Visual Studio Code** are used for programming and implementation.

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The methodology begins with hardware integration where the sound sensor is connected to the ESP32 to continuously capture environmental noise levels. The ESP32 reads the sensor output and converts it into digital values for processing.

The system is programmed to compare the received sound value with a preset threshold limit defined in the code. When the sound intensity crosses this limit, the ESP32 activates the LED and buzzer to provide visual and audible alerts.

For control and safety purposes, a metal push button is incorporated to allow the authorized user to reset or stop the alert system. The complete circuit is mounted on a PCB to ensure stable connections and reliable performance.

The system is tested under different noise conditions to analyze its accuracy, responsiveness, and stability.

III. MODELING AND ANALYSIS

The Noise Alert Project is designed as a real-time noise monitoring and alert system that detects excessive sound levels and generates visual and audible alerts. The system follows an **Input–Process–Output (IPO) model** for systematic operation.

System Stages

1. Input Stage

Environmental sound waves are captured using a sound sensor module. The sensor converts sound signals into electrical signals (analog or digital values).

2. Processing Stage

The ESP32 microcontroller receives the sensor data and processes it according to the programmed logic written in Arduino IDE and VS Code. The sound value is compared with a predefined threshold limit stored in the program

3. Output Stage

If the detected sound level exceeds the threshold:

LED turns ON (Visual Alert)

Buzzer activates (Audio Alert)

The system ensures continuous monitoring of environmental sound levels and quick response when noise exceeds the threshold. The inclusion of a push button enhances user control and safety. PCB mounting improves system stability and durability.

Materials Used in the Noise Alert Project

Sr. No	Component Name	Quantity	Description
1	ESP32 Microcontroller	1	Main processing unit
2	Sound Sensor Module	1	Detects environmental noise
3	LED	1	Visual alert indicator
4	Buzzer	1	Audible alert indicator
5	Metal Push Button	1	Reset/Stop control
6	PCB	1	Permanent circuit mounting
7	Connecting Wires	As required	Electrical connections
8	Power Supply	1	Provides power to system

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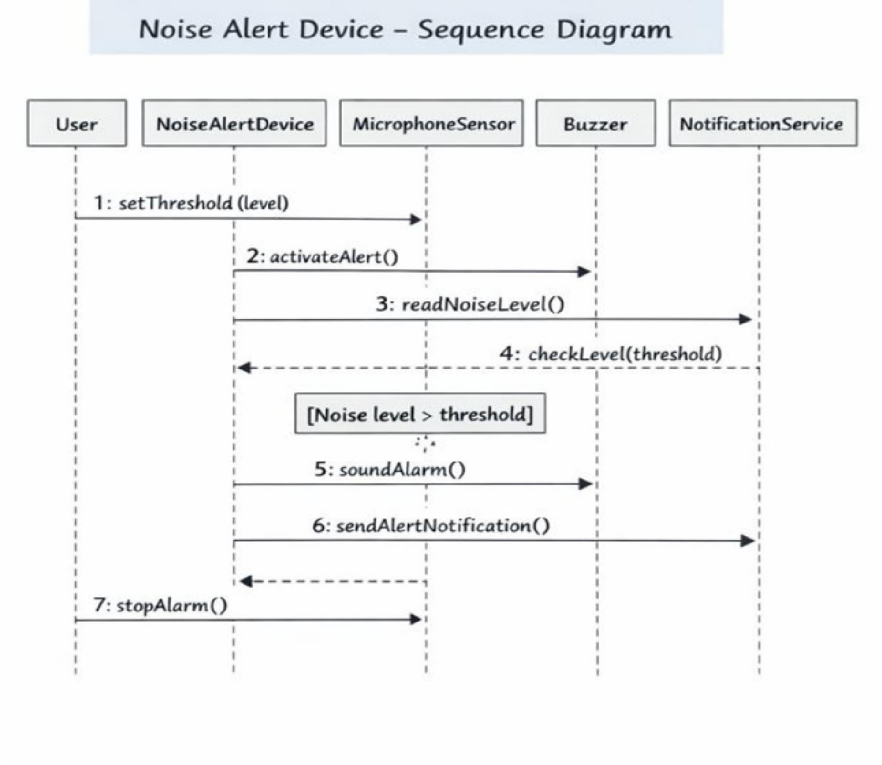
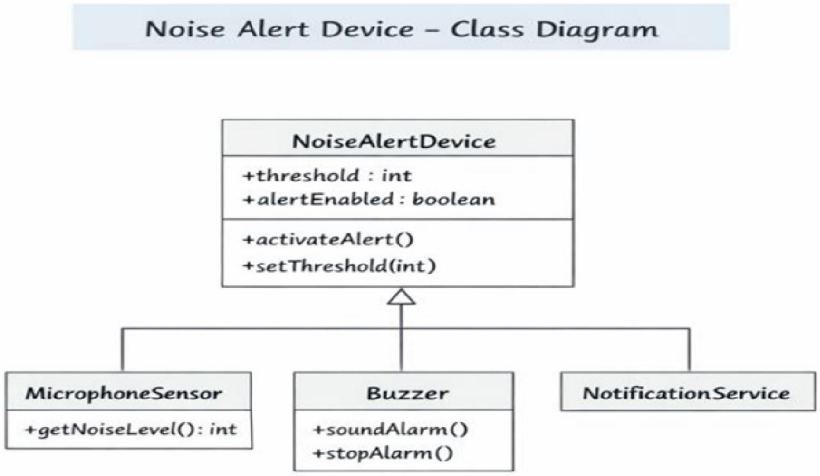
SEQUENCE DIAGRAM-NOISE ALERT



CLASS DIAGRAM-NOISE ALERT



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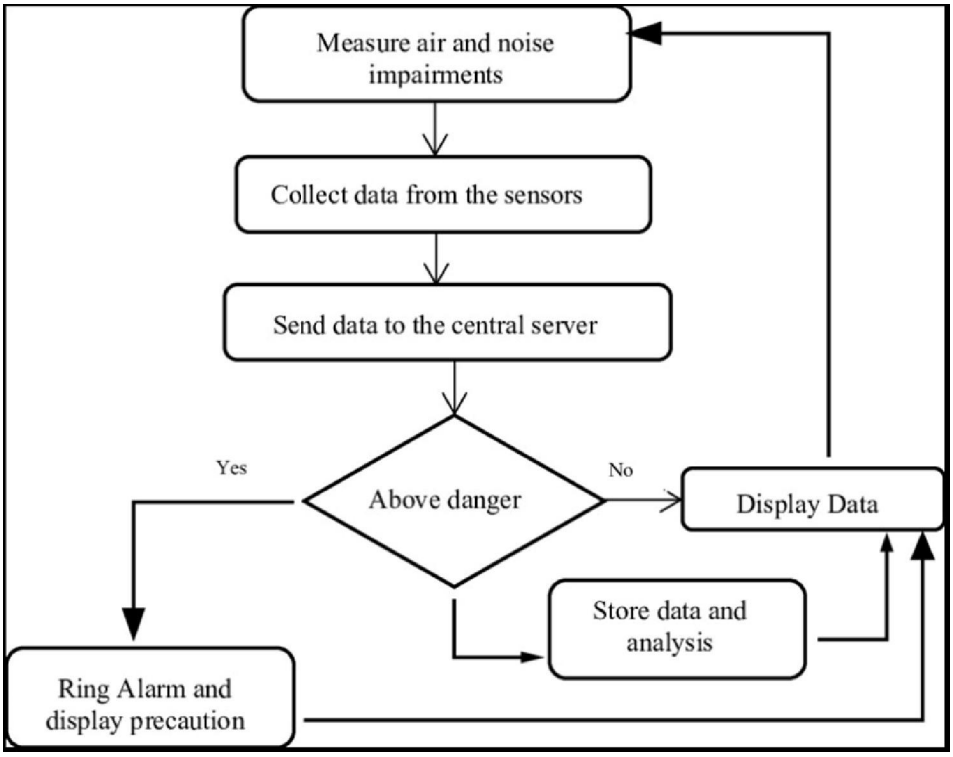
BLOCK DIAGRAM-NOISE ALERT



IV. RESULT AND DISCUSSION

The Noise Alert Project was successfully implemented and tested under different noise conditions. The sound sensor effectively detected environmental sound levels and transmitted the data to the ESP32 microcontroller.

When the noise level remained below the predefined threshold, the system functioned normally without activating any alert. However, when the sound intensity exceeded the set limit, the ESP32 immediately triggered the LED and buzzer, providing both visual and audible warnings.

The metal push button functioned properly to reset or stop the alert system when pressed by the authorized user. The PCB-based circuit design ensured stable connections and smooth operation.

The results indicate that the Noise Alert System is effective in monitoring and controlling excessive noise levels. The accuracy of detection depends on proper calibration of the sound sensor and correct threshold value selection.

Environmental factors such as background noise and sensor sensitivity may influence readings, highlighting the importance of proper calibration.

The use of ESP32 improves processing speed and allows future upgrades such as:

IoT-based notifications

Mobile application integration

Overall, the system is cost-effective, easy to maintain, and suitable for noise-sensitive environments

V. CONCLUSION

The Noise Alert Project successfully demonstrates a simple and effective solution for monitoring and controlling noise levels in a specific area. The system uses a sound sensor to continuously detect environmental sound intensity and an ESP32 microcontroller to process the data and compare it with a predefined threshold value.

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When the noise exceeds the set limit, the LED and buzzer are activated to provide immediate visual and audible alerts. The metal push button allows authorized control to reset or stop the alert system.

The project proved to be reliable, cost-effective, and responsive during testing. The use of a PCB ensures stable connections and long-term durability.

Overall, the system effectively achieves its objective of reducing noise pollution and maintaining a peaceful environment in places such as schools, hospitals, libraries, and residential areas. The system also offers potential for future improvements, including IoT-based monitoring and mobile notification features.

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