NOISE DETECTION AND NOTIFYING SYSTEM HARDWARE MODEL FOR NOISE PREVENTION

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ABSTRACT: *This paper explains a global issue of noise pollution and solution for it. We the students of computer engineering developed a model named as Noise detection and notifying system which will bring awareness in the human beings. The Noise Detecting and Notifying System is designed to monitor and detect environmental noise levels in real-time, providing instant alerts when noise exceeds predefined thresholds Utilizing advanced acoustic sensors and microcontroller-based systems, this system measures. ambient sound levels in various environments, such as homes, offices, or public spaces. When noise levels surpass a set limit, the system triggers a notification, which can be sent via mobile application, SMS, or sound alarms, depending on user preferences. The system aims to enhance the quality of life by promoting noise awareness and enabling timely interventions to reduce noise pollution, improve productivity, and ensure regulatory compliance in noisesensitive areas. It can be further integrated with IoT devices for remote monitoring and data analysis, helping authorities or individuals take corrective actions effectively.*

KEYWORDS: *Noise pollution, Noise Detection, Acoustic sensors , Microcontroller-based system. The Noise Pollution Monitoring System is an IoT-based setup that uses sound sensors and a microcontroller to measure noise levels in real time, display them on an LCD, and send alerts via the Blynk app. It helps track and manage environmental noise for safer, smarter spaces.*

1. INTRODUCTION

A Noise Detecting and Notifying System is a smart solution that monitors environmental sound levels in realtime using microphones. It measures noise in decibels (dB) and compares it against a preset threshold defined by users or regulations. When the noise exceeds this limit, the system sends alerts via mobile apps, emails, or direct notifications to concerned authorities. This helps in taking timely action to prevent disturbances. The system also logs noise data over time, allowing users to analyze patterns and identify recurring issues. It's widely used in urban areas to control noise pollution and improve living conditions. In workplaces like factories or construction sites, it protects workers from harmful noise exposure. Hospitals and schools benefit from maintaining quiet environments for healing and learning. It can also be integrated into smart city or building systems for holistic environmental management.

2. METHODOLOGY

2.1. METHODS WE USED TO BUILD THE MODEL

2.2. EXPERIMENTS AND SOLUTION

Noise Detection and Notifying System is organized in standard phases for efficient working of a model. There are various software and hardware components needed for construction of a model . It is important for the developer to choose perfect and essential microcontroller for efficient working of a model . Noise Detection and Notifying System is designed to monitor ,manage and control noise levels .

3. MATERIALS AND METHODS

3.1 SOFTWARE AND HARDWARE COMPONENTS

Arduino IDE for writing , compiling and uploading code to the ESP8266 microcontroller.
Blynk App(Mobile) for visualize noise levels , receive alerts and interact with the system remotely.
Blynk Library (Arduino) enables communication between the ESP8266 and the Blynk platform via virtual pins.

ESP8266 Board Package required in the Arduino IDE to support the ESP8266 microcontroller. Analog sound sensor. 12C convertor and ESP8266 these hardware components are required.

3.2 USE OF EACH COMPONENT AND ITS METHOD

- Requirements Gathering - Define Noise Thresholds: Determine what noise levels (decibels, dB) are considered excessive or abnormal for the specific environment (e.g., residential area, workplace, etc.). - Define Notification Types: Decide how the system will notify users (eg, mobile notifications, email alerts, visual alarms). - Hardware Selection: Choose appropriate sensors (e.g., sound level meters, microphones) and consider their sensitivity and range.
- System Design Components: - Noise Sensor: A microphone or sound level sensor that measures ambient noise levels. - Microcontroller/Processor: Responsible for data collection, processing, and decision-making (e.g., Arduino, Raspberry Pi). - Notification Module: This can be a mobile app, email system, or IoT device to send alerts when noise levels exceed a predefined threshold. - Power Supply: Ensure a stable power source, such as battery or mains power.
- Data Collection and Analysis. - Real-Time Monitoring: The system continuously monitors sound levels in real-time using the noise sensor. - Noise Level Analysis: The microcontroller processes the analog signal from the sensor, converts it into a digital signal, and calculates the decibel level. - Noise Threshold Comparison: The system checks whether the noise level exceeds the preset threshold (e.g., 70 dB in a quiet residential area). 4. Notification Mechanism - Alert Generation: If the noise level exceeds the threshold, the system triggers an alert. - Mobile App Notification: If the system is connected to a mobile app, a notification is sent via an API (e.g., using Firebase Cloud Messaging or push notifications). - Email/SMS Notification: If needed, an email or SMS can be sent to the users using services like Twilio or SendGrid. - Visual Indicator: In a physical setup, a light or buzzer can indicate high noise levels.

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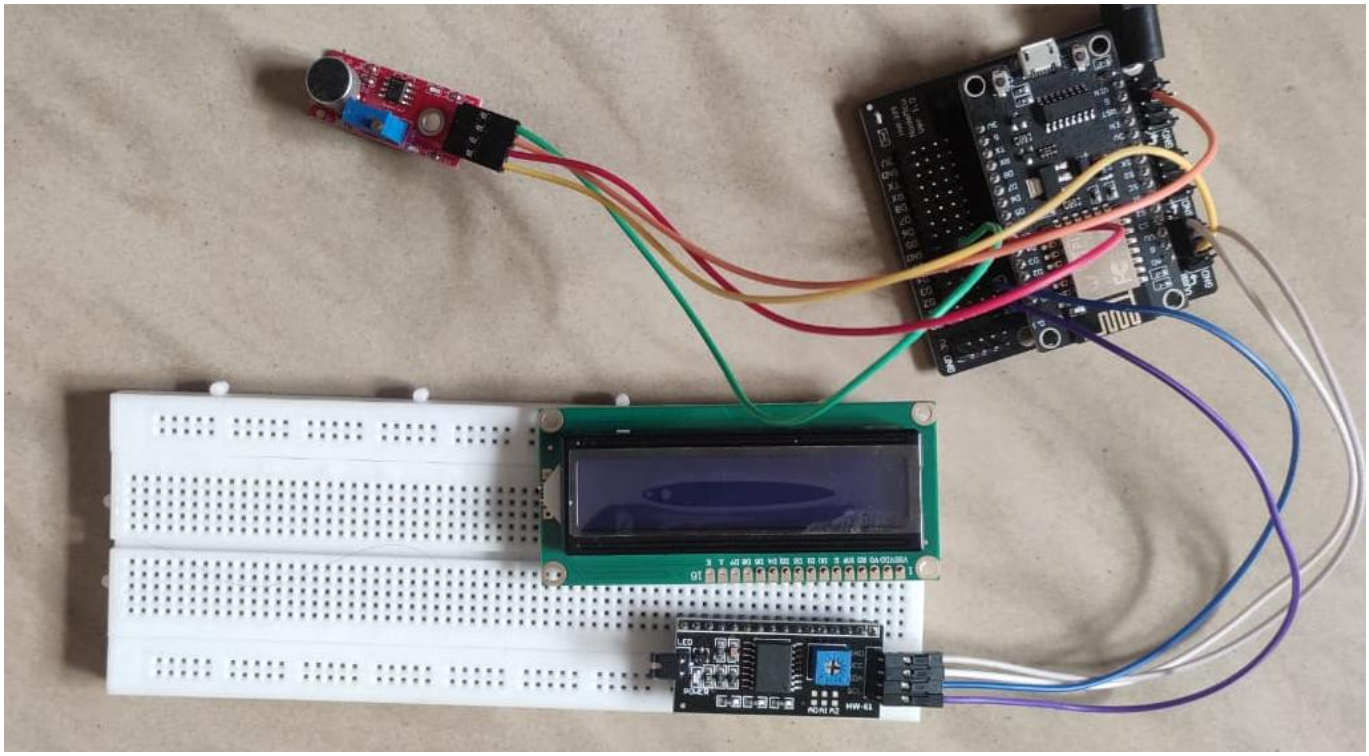
4. System Architecture and Diagram



5.APPLICATIONS

- **Hospitals and Healthcare Facilities.**
  Ensures quiet zones for patient recovery and reduces stress caused by excessive noise.

- **Schools and Educational Institutions.**
  Supports a focused learning environment by monitoring and controlling disruptive sounds.

- **Industrial Workplaces**
  Protects workers from harmful noise exposure and assists in compliance with occupational safety standards.

- **Construction Sites**
  Monitors machinery and site noise to prevent violations of local noise regulations.

- **Smart Cities**
  Integrates with urban monitoring systems to manage noise pollution and improve livability.

- **Public Spaces and Events**
  Controls sound levels during concerts, rallies, or festivals to avoid disturbances in surrounding areas.

- **Libraries and Study Zones**
  Maintains silence in designated areas by alerting users when noise levels rise.

- **Hotels and Hospitality**
  Enhances guest experience by ensuring quiet environments in rooms and common areas.

- **.Transportation Hubs (Airports, Stations)**
  Monitors ambient noise to improve passenger comfort and reduce stress.

6.ADVANTAGES OF THE MODEL

Real-Time Alerts Instantly notifies users when noise exceeds safe limits, allowing quick action. 2. Health Protection Helps reduce stress and hearing damage by managing noise exposure. 3. Data Logging Records noise levels over time for analysis and reporting. 4. Wide Application Useful in homes, hospitals, schools, factories, and public spaces.

7.DISADVANTAGES OF THE MODEL

Sensor Accuracy Low-cost microphones may give unreliable readings 2. False Alerts Harmless sounds can trigger unnecessary notifications. 3. Power & Connectivity Needs stable power and internet for real-time alerts. 4. Privacy Issues Continuous sound monitoring may raise privacy concerns.

8.RESULT

8.1 TESTING AND ACCURACY

Testing was conducted with a variety of users , ranging from children to senior citizens , to ensure the system ability and its accuracy.

8.2USER EXPERIENCE AND FEEDBACK

User feedback indicates that the system was easy to use, functions are easily understand . Anyone at any time at any place the system is applicable, right from the students to adults everyone can operate it without any difficulty.

9.CONCLUSION

A Noise Detecting and Notifying System plays a crucial role in managing and mitigating the impact of noise in various environments, whether residential, industrial, or urban. By continuously monitoring noise levels and sending real-time alerts when thresholds are exceeded, the system provides immediate feedback, enabling prompt responses to reduce disturbances and prevent noise-related issues. This system enhances quality of life by ensuring quieter, more comfortable spaces, especially in residential areas where noise pollution can significantly impact well-being. In industrial and commercial settings, it contributes to operational efficiency, detecting machine malfunctions early and assisting in predictive maintenance to avoid costly downtime. Additionally, it aids in regulatory compliance by ensuring noise levels remain within acceptable limits, thus avoiding potential legal issues.

10.REFERENCE

- General IoT Frameworks: Vanitha, Sridhar, and Dhivakar's work on "Automation of Noise Detection Using Internet of Things" (2021) is frequently cited for establishing basic automated workflows.
- Real-Time Monitoring: Marques and Pitarma (2020) detail "A Real-Time Noise Monitoring System Based on Internet of Things for Enhanced Acoustic Comfort and Occupational Health", emphasizing the link between noise levels and occupant health
- Smart City Applications: Badruddin et al. (2020) introduced the NOMOS system, a specialized IoT model for urban noise monitoring.
- Books & Articles "Practical Electronics for Inventors" by Paul Scherz (explains basic circuits and sensors). "Machine Learning for Audio, Speech, and Language Processing" (for learning about audio classification models).
- Online Resources: Hackster.io: For project ideas and tutorials on sound detection systems. Instructables: Step-by-step guides on building sound detection systems using various microcontrollers.