

Lab 1: Sapphire Sounds

Wes Brown

CS 411W

Thomas J. Kennedy

6 October 2025

Version 1

**Table of Contents**

1 Introduction..... 2

2 Sapphire Sounds Product Description ..... 2

    2.1 Key Product Features and Capabilities .....3

    2.2 Major Components (Hardware/Software).....3

3 Identification of Case Study..... 4

4 Glossary ..... 5

5 References..... 6

**Listing of Figures**

No table of figures entries found.

**Listing of Tables**

No table of figures entries found.

## **1 Introduction**

Noise disputes in shared living environments are often difficult to resolve due to reliance on subjective complaints. This can result in false accusations, unresolved tensions, and overall tenant dissatisfaction. Currently, there is no widely adopted method for monitoring and verifying noise disturbances that is both objective and privacy conscious. Sapphire Sounds addresses this problem through a mobile and web application that works with a non-invasive noise sensor. The sensor measures sound levels without recording audio. When high noise levels persist, the system generates time-stamped reports to help property managers resolve disputes fairly. Tenants can also monitor their own noise history, receive real-time alerts, and earn rewards for maintaining a quiet environment. By providing clear and unbiased data, Sapphire Sounds supports more peaceful and cooperative shared living spaces.

## **2 Sapphire Sounds Product Description**

Sapphire Sounds is an application available for both mobile and web that pairs with a small noise sensor. This sensor measures the decibel levels of nearby audio but does not conduct any recording. If these decibel levels reach a high-level threshold for an extended period, the Sapphire Sounds application will generate a report citing the times and noise levels. These reports provide property managers valuable insight into helping resolve noise complaints fairly. Additionally, Sapphire Sounds provides tenants features such as viewing their own noise level history, receiving real-time alerts when their property becomes too loud, and earn rewards for maintaining appropriate noise levels. Sapphire Sounds promotes peaceful shared living by producing clear, unbiased data.

## 2.1 Key Product Features and Capabilities

Sapphire Sounds is a mobile and web application with a companion compact noise-detection sensor. The system measures the intensity of sound in decibels (dB) and does not record audio, preserving privacy while objectively logging noise complaints. After a period of sustained high decibel levels detected by the sensor, a full report is generated with timestamps and decibel levels which help facilitate the resolution of complaints. Innovations include:

- **Privacy-First Monitoring:** the system only collects sound intensity and never records audio which ensures tenant privacy while still tracking disturbances.
- **Data Driven Dispute Resolution:** Replaces subjective complaints with clear, time-stamped decibel logs which gives property managers and their tenants objective evidence for disputes.
- **Positive Reinforcement:** Rewards are offered to tenants who maintain acceptable levels which in turn promotes respectful community behavior. Rewards are redeemable within the mobile or web application.
- **Smart Alerts:** The use of real-time alert notifications to tenants gives time to make corrections and repeated violations escalates to landlords/property managers which allows for early self-correction.

## 2.2 Major Components (Hardware/Software)

The software is comprised of three major parts: a frontend to interact with the application, the backend that will serve the requests from the user and other components, and the database. For the frontend, Sapphire Sounds will use React JS to view logs, alerts, and reports and be deployed to Firebase. The software for the backend will be made up of Express JS and be deployed to

Render.com for production which will handle sensor data, noise analysis, user authentication, and provide notifications to users. As for the database, which will be run by PostgreSQL and deployed to Clever Cloud, will serve all the necessary data including user accounts, administration, reports, and reward tracking.

The hardware components of Sapphire Sounds will utilize a Raspberry Pi Zero which will act as the controller for the collected sensor data and will transmit via WIFI. The sensor itself will be a I2C Decibel Sound Level Meter which measures real-time noise levels and will interface directly with the Raspberry Pi.

### **3 Identification of Case Study**

Sapphire Sounds is a product being developed for use with landlords, property managers, and their tenants. For tenants, users will be able to monitor their space's noise levels which in turn will promote a positive relationship with their neighbors. With consistent streaks of low noise levels tenants can earn redeemable rewards as positive reinforcement. As for property managers and landlords, there is a benefit of having a reliable mechanism to monitor overall noise levels for their properties, investigate complaints in a fair manner, and a simplified way to address any concerns or incidents.

In the future, Sapphire Sounds could see secondary users, or those not intended as the original target audience, to use the app as a utility. For example, landlords and property managers could use the app to help gauge the respect and responsibility of a tenant application before approving a lease. Additionally, companies of smart home systems could package Sapphire Sounds with their existing product and provide an all-in-one solution.

#### 4 Glossary

- dB (Decibel): A unit to measure the intensity of sounds.
- Noise Event: An occurrence when decibel thresholds are reached for a specific duration.  
Used for reporting.
- Noise Sensor: A physical device that monitors sound levels without recording audio.
- Report: A structured report generated by the system, detailing the noise event.
- Threshold: A predefined decibel level, which if exceeded, will trigger a noise event
- Tenant: A resident or occupant of a shared or multi-unit housing space using the system to manage and monitor noise activity.

## 5 References

American Public Health Association. (2021, October 25). *Noise as a public health hazard*.

<https://www.apha.org/policy-and-advocacy/public-health-policy-briefs/policy-database/2022/01/07/noise-as-a-public-health-hazard>

Minut. (n.d.). *Minut*. <http://www.minut.com/>

RentEye. (n.d.). *RentEye*. <http://www.renteye.com/>