# Sound Sensor

# Noise Alert

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# Abstract

High noise levels are having an impact on both our children's ability to learn, and our long-term health. The main problem being that people lack an awareness of just how loud “too loud” is. Society’s pressures can help establish this baseline, but it is rather ineffective in certain situations. In those situations, a visual representation of sound is exactly what you need.

## Introduction

If you were told to explain to someone what it means to be “too Loud” how would you do it? This is a subjective question, dependent on one general factor and two more specific

considerations. The general factor is that noise is too loud if it physically hurts your ears which is rather obvious. The two more specific or niche factors are: a) the environment you're in, and b) the person perceiving the noise. A good example of this can be seen when comparing a busy cafeteria to a quiet library. In the cafeteria, noise levels can be significantly higher, but speaking "normally" in a library would and often is considered "too loud."

The challenge is that people come from different backgrounds and experiences, which influence how they perceive acceptable sound levels. With adults this isn't a particular problem as "loud" people tend to not be roaming around libraries or study halls. However, this becomes especially problematic in classrooms or environments with children. In a mixed group, asking children to use "inside voices" tends to have largely mixed results. Children's inside voices are based off their current life experience which means that you end up with children of varying sound levels. Children also have a monkey see monkey do mentality. Meaning that the children will be as loud as the loudest child. This can create an environment where it is hard to learn. Importantly, this is not out of malice — it's simply a lack of awareness. Children often don't realize just how loud they are being. This can hamper children's ability to grow and learn as loud children are "kicked" out of class or disciplined for something that they thought was totally fine. And other children suffer from their classmates being loud as they have a hard time tuning them out.

## Problem Statement

The underlying issue here is the lack of awareness when it comes to sound, specifically sound levels. Whether it's in daily life, classrooms, or workplaces, people may not fully recognize when they're being too loud, especially in a group setting as the sounds stack on top of

one another. In classrooms, excessive noise can disrupt learning, creating challenges for both teachers and students. In workplaces, unrecognized loud environments can contribute to Noise-Induced Hearing Loss (NIHL) over time. These issue affects everyone, and it's crucial to address it before it leads to more severe consequences.

## Solution

This is where NAME-OF-PRODUCT comes into play. NAME-OF-PRODUCT is a sound level monitoring device that provides real-time visual feedback using a stoplight-style system. It features green, yellow, and red LEDs, corresponding to "go," "warning," and "stop" respectively. This visual feedback system is essential because it allows users, especially children, to quickly understand whether their noise levels are too high.

The design of the device is intended to be subtle, visible only when sound levels exceed the set threshold. Users can easily adjust the sensitivity of the device to match their specific environment, whether it’s a classroom, workplace, or home. The device is designed to be multifunctional and user-friendly. The way that the sensitivity works is that the decibel level of the sound being picked up by the microphone is converted into an electrical analog signal. Depending on how loud the noise picked up by the microphone will determine how high the analog symbol that is fed to the Arduino is. This signal is then compared to the thresholds that have been previously set using the buttons on the device.

## Technical Data

Currently, we have a bare-bones prototype, essentially a proof of concept. This simple setup is designed to ensure that our idea works in real-world applications. The prototype includes an Arduino UNO R4 MINIMA BOARD, which acts as the central processor for inputs and outputs. The system uses a microphone to detect ambient sound levels, which are then compared to a threshold defined by the user via buttons on the side of the device. If the sound

exceeds the threshold, LEDs light up accordingly. The device is powered through a USB-C port, with plans for future integration of a rechargeable battery.

## Software

PRANAY

## Planned Trials

We plan to test the device in various environments, including classrooms, workplaces, and homes. We expect it to perform well in classrooms and workshops. In homes, parents can use the device to teach children appropriate sound levels for different activities. In classrooms, teachers often have limited means of disciplining students for noise. Our device could help teachers encourage positive behavior regarding sound levels. In workplaces, the device will help both workers and management understand when noise levels are dangerous and could contribute to hearing loss.

## Why the Noise Alert

Our product stands out for several reasons. Unlike other niche devices on the market, NAME-OF-PRODUCT is affordable, versatile, and can be used in a wide range of settings. It provides a multi-purpose solution, helping households manage noise, preventing hearing loss in workplaces, and assisting teachers in guiding children toward proper noise etiquette. The goal is for this product to be inexpensive so that teachers and schools can purchase them on their limited budget. This will open the door for our future products as we develop good relations and repertoire with teachers and schools.

## Social Impact

The widening gap between the upper and lower classes has led to children from diverse backgrounds with different expectations of acceptable behavior. In schools, this can create disruptions, especially in classrooms where children may not realize how loud they are. A librarian at an elementary school who often sees this problem firsthand says, "Children no longer know how to be quiet. A lot of children are no longer taken places like church where they are expected to sit and be still. It is nice to have a visual device so that children can monitor how loud they are getting and adjust or ask their classmates to adjust their volume."(Cooper) Providing teachers with tools like Noise Alert could help create a more conducive learning environment without resorting to punitive measures.

## Product Future Plans

With more funding and input from users, we plan to expand the functionality of Noise Alert. One potential enhancement is Bluetooth connectivity, allowing the device to send alerts to users' phones when noise levels exceed the threshold. Additionally, we plan to make the device more compact, potentially small enough to fit in a pocket. This would make it easy to carry and use in various environments, including concerts, shops, or workplaces. A portable version of the device would be valuable in helping individuals monitor and protect their hearing in noisy environments. According to the American Speech-Language-Hearing Association, hearing damage can begin at 85 decibels, much lower than the pain threshold, which is around 130 dB according to Hyperacusis focus.

## Conclusion

The lack of awareness surrounding noise levels and it’s impact on our long term health, and learning capabilities is a serious problem. Allowing this injustice to continue is irresponsible of us as parents, teachers, and employers. Noise Alert can and will fix these problems by

visually representing sound in a simple yet effective medium.  Thereby give us information that we can use to make informed decisions to better our health and learning capabilities.

# Reference Page

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