

## **Inspiration of Sound Experience**

Our project is inspired by the intriguing concept of translating the experience of seeing colours while listening to music. It all began with the curiosity of exploring how to convey the phenomenon of synesthesia – the intertwining of senses – specifically in relation to interpreting colours in music. While this connection cannot be scientifically validated, it sparked a shared interest within our group to delve deeper into this fascinating realm. We believe that emotions play a crucial role, and our exploration revolves around the concept of synesthesia.

Composed of individuals with a background in music and a shared passion for visual arts, our group was naturally drawn to this subject. It is this intersection of our interests and talents that has motivated us to pursue this project idea further.

## **Framework of our Research**

For our project approach, we have chosen to concentrate on the Hearing Impaired Community, aiming to comprehend how we can enhance their musical experience. Our initial step involves conducting Desk Research to address several key questions: understanding the varying levels of hearing loss, identifying suitable avenues for engaging with this community, and formulating tailored research questions for individuals with and without hearing loss. Additionally, we will explore case studies showcasing innovative approaches to musical experiences and music creation.

Our interviews will be guided by the objective of ensuring that our design approach is accurate and genuinely beneficial to hearing-impaired individuals. To gather relevant data, we will collaborate with esteemed institutions such as the Royal College of Music and the Helen Hamlyn Center.

## **Desk Research of Hearing Loss**

Through some research, I found that there are different levels to how individuals with hearing challenges interact with sound and music. While some of these people would still have partial ability to hear the music or certain frequencies of it, other members of the hard-of-hearing community might not be able to hear it at all, which led me to my research about sound vibrations.

While reading some interviews conducted with such individuals, all of them have stated that despite their difficulties, they still enjoy music in a very creative and interesting way, through the vibration of the sound, through visuals and for many of them, through emotional connection.

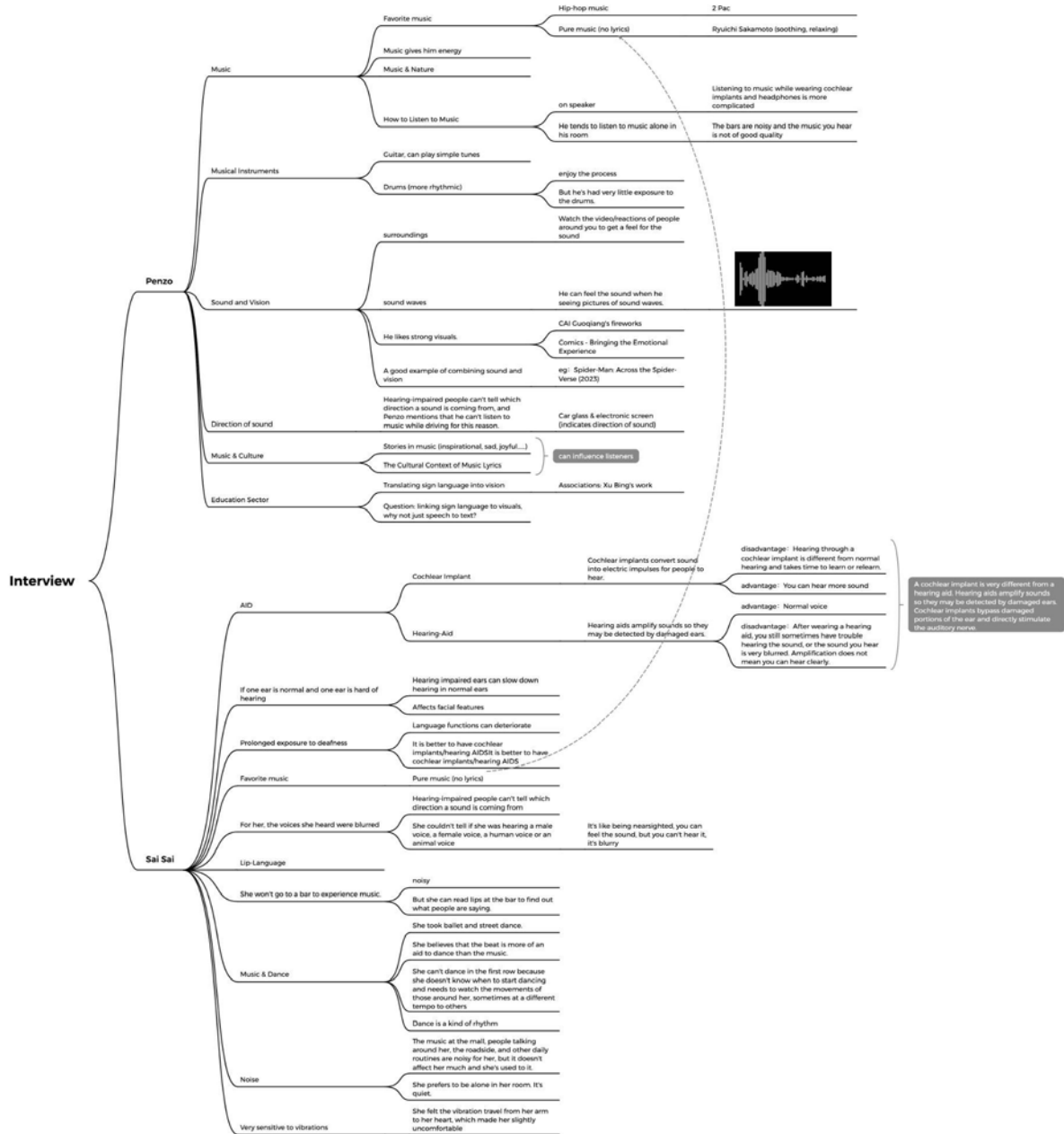
Many of them, in those interviews, have shared that they would often go to concerts and clubs, go up to the speakers or close to them and either place their hands and feel the music or stand and let the vibrations go through their body, making it so that they can enjoy the piece that is being played.

That got our team thinking a lot about vibrations of sound, merged with visuals and how we could design a product that could enhance those senses.

Keeping that in mind, our team wanted to conduct our own interviews. Each member drafted questions and searched for organisations that could help us carry out those interviews. We researched places such as the Royal College of Music, the Helen Hamlyn Centre and the DeafRave organisation.

# Interview Insights from Individuals

On February 1st and 2nd, 2024, we conducted interviews with two RCA students who have hearing impairments. Below is the transcript of our interview.





We have noticed that even with the use of hearing aids or cochlear implants, the sounds they hear are still blurry.

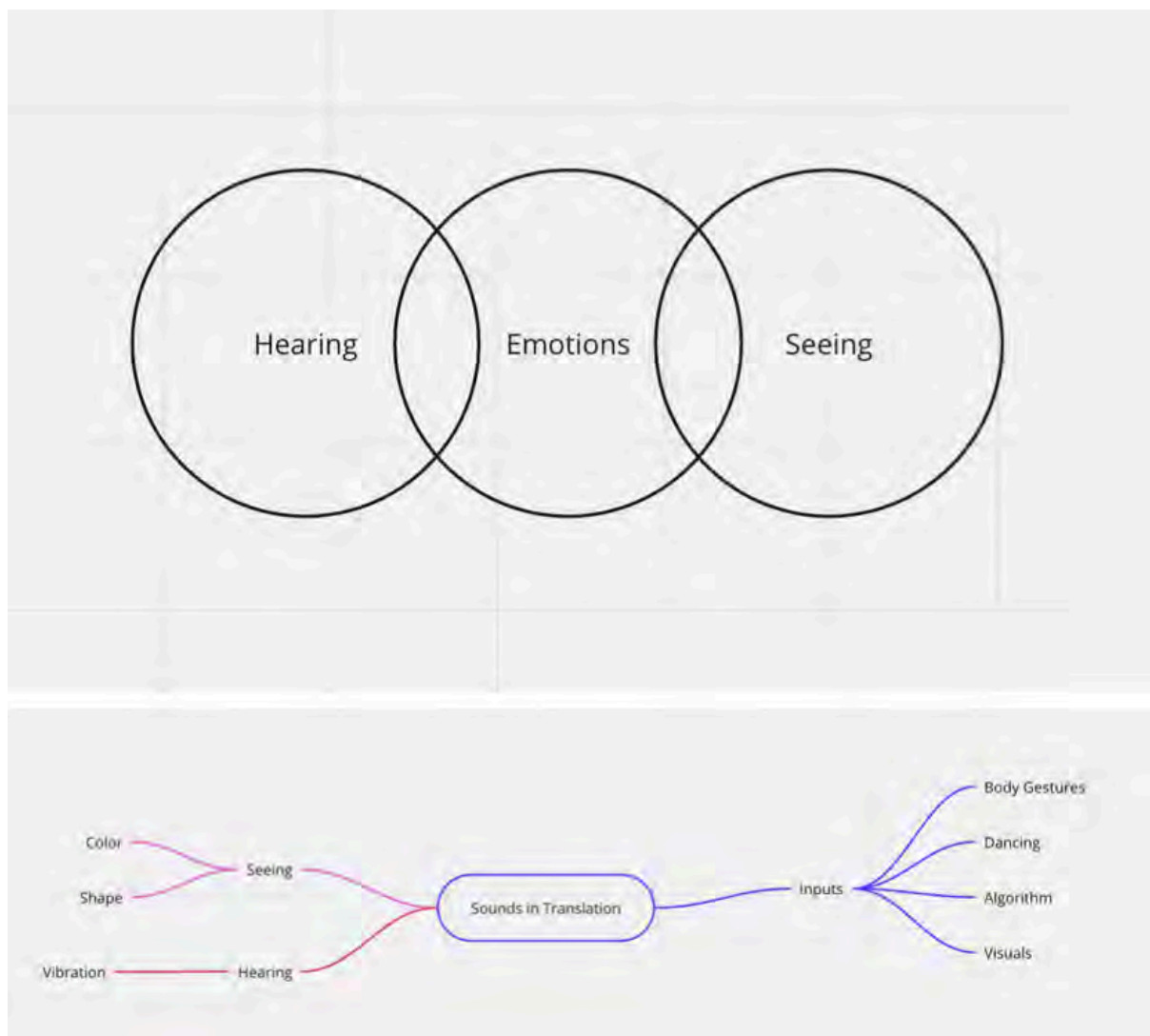
The girl mentioned it is similar to how someone with nearsightedness sees vague shapes in the distance without being able to identify them specifically. She cannot determine the source of sound and is unable to distinguish between male or female voices, human speech or animal noises. Consequently, it becomes challenging for them to enjoy music as individuals with normal hearing do.

However, they still have preferred genres and artists and can perceive emotions conveyed through music. This leads us to wonder if there are any methods we could employ to enhance their musical experience, such as visualising sound.

## Ideation and Idea Statement

We recognized vision and hearing as the two most common sensory abilities that shape our perception of the world, prompting us to explore how these two sensory experiences could intersect.

Through our discussions, we discovered that emotions serve as the intersection between these two sensory experiences and can be expressed through various forms such as body gestures, dances, and more. (refer to Figure 1)



Our ideation process originated from fundamental inquiries regarding the translation of music beyond its auditory elements. Synthesising insights from interviews and desk research, including the cultural and emotional significance of music for individuals with hearing loss, their heightened abilities in other senses, and the diverse ways sounds are perceived within the hearing-impaired community, guided our exploration. Inspired by the theory that all five senses possess spectrums, we discerned an opportunity to amplify other sensory experiences to empower individuals with hearing loss to create music and express themselves in innovative ways.

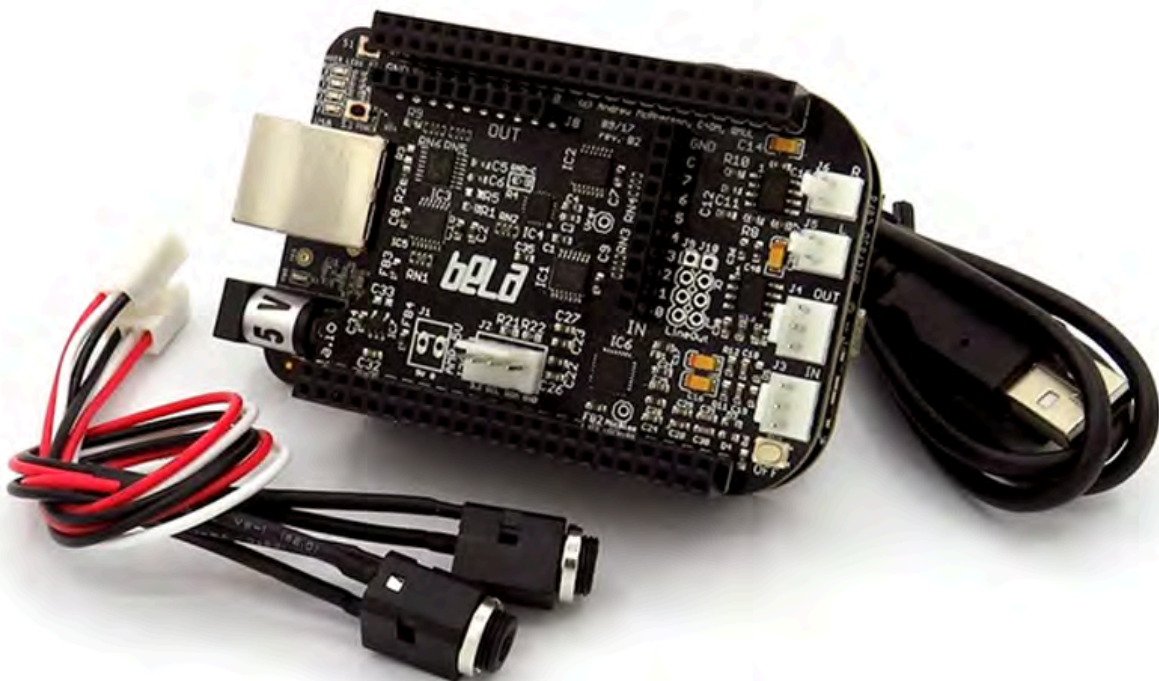
Exploration of various sensory components led us to envision diverse concepts aimed at enhancing the musical experience for individuals with hearing loss. From electronic paints facilitating users to draw musical notes on their skin to scanners translating colours into sounds, each idea was tailored to cater to the unique needs and preferences of the target audience. Delving into the realm of natural sounds, we contemplated ways to map them with organic elements like water and leaves to create immersive acoustic experiences. Additionally, we explored the potential of AI prompts to assist musicians in transforming their concepts into music videos. Our ideation process prioritised inclusivity and innovation, aiming to empower individuals with hearing loss to engage with music on their terms.

Central to our ideation was the concept of a digital sound bank, envisioned as a software platform capable of recording sounds and translating them into vibrations and colours. This platform would break down the components of a soundscape, providing users with a visual reference to compose music based on their understanding of sound. With a diverse database encompassing visualisations of music and user-generated organic sounds, the platform aimed to democratise music creation for individuals with hearing loss. Complemented by an exhibition or Insta page where volunteers could compose music based on their interpretations, our proposal sought to foster a community-driven approach to music composition and appreciation.

Through our ideation process, we aimed to harness technology to bridge the gap between auditory experiences and visual expressions, offering a new paradigm for musical creation and enjoyment among individuals with hearing loss. Our approach prioritised collaboration, innovation, and inclusivity, seeking to empower individuals with hearing loss to engage with music in novel and meaningful ways.

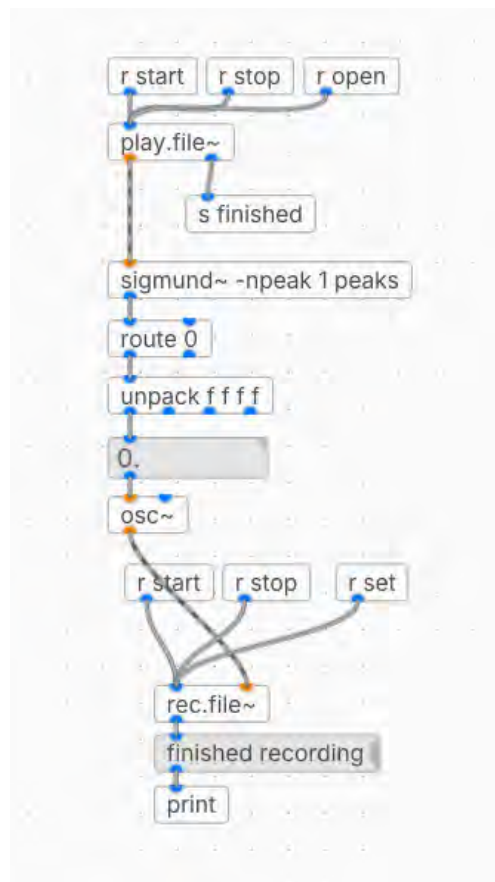
## Mechanism of Our Works

The mechanism for our work is inspired from sensory experience. The physical component consists of sound exciters which can be attached to any surface to turn it into a speaker. This allows for sound to be translated through any surface when implemented into both an exhibition installation for audience interaction but also can be used in a more personal setting with a computer monitor and table set-up. The surface exciters are attached to an audio specialised Bela computer which is attached to a monitor which displays the interactive UX design of the Sound Bank. Using Python coding, the Bela computer acts as a converter for sounds to translate the sounds in the bank into translated vibrations which are communicated through the surface exciters.



## How We Translated the Sounds

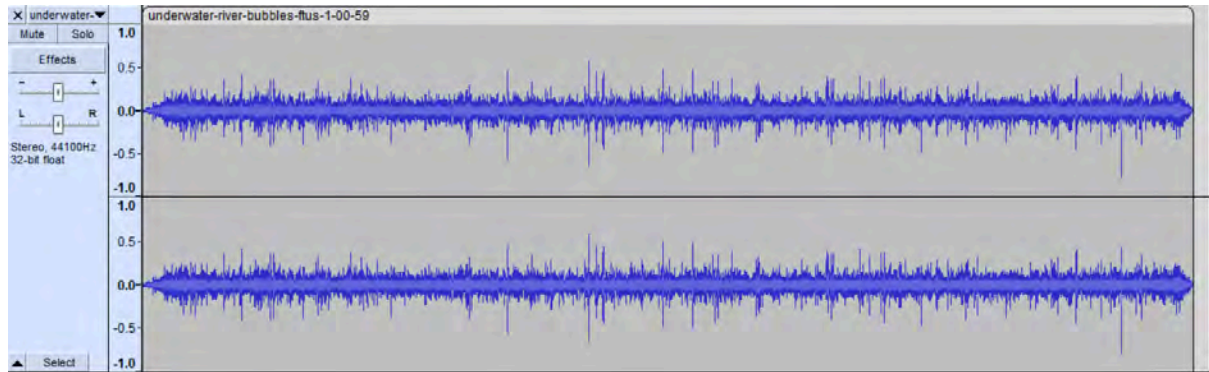
The initial step of translating the sounds involved audio collection. The focus of this project is to focus initially on natural soundscapes and individual organic sounds - this can be expanded in future with further sounds being added to the bank, there is potential to look at instruments and how this bank can be used as a tool to identify the difference in musical instrumental identity. However with the initial focus on natural sounds, we collected nature soundscapes and organic sounds produced from mundane environments. Once collected, the highest sound frequencies are extracted. This is done through a process on PlugData and Audacity which produces sound samples with the highest frequency being prioritised. Once extracted, these highest frequency sounds can be communicated through the Bela computer and sound exciters to produce unique vibration samples. The bank is able to offer sound samples in three audio translations: the original sample, the highest frequency sample (creating an access point for individuals who can only hear higher frequencies noise, whilst also being a source of exploration for those curious about frequency science), and the vibration translation communicated through the Bela and surface exciters. This is alongside the visual translation which produces a multi-sensory experience. The translation of sounds provides a unique experience to explore sound and audio experience in new and exciting ways, whilst providing a space for discussion, exploration and experimentation.



Translation code process.



Original Sound Collection:



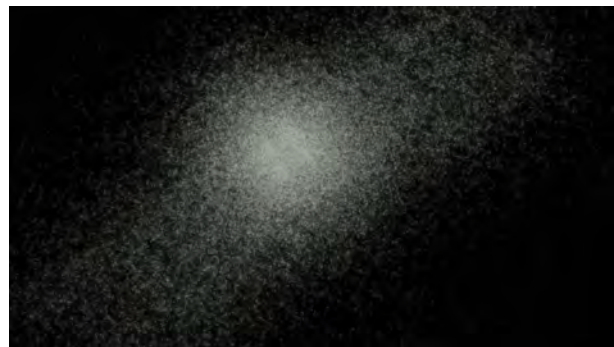
Translated to Highest Frequency:



## Visuals of the Sound Visualisation

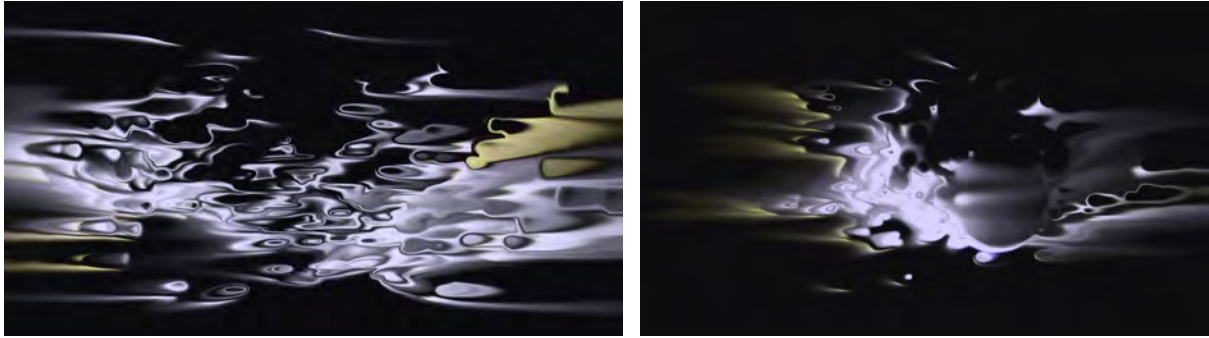
So how do we convert sound into visuals? Here, we used a software called TouchDesigner. Our team members collected various sounds individually, which I then imported into TouchDesigner to transform them into data. This data controlled the changes in graphics.

Additionally, we performed 3D modeling and incorporated these models into the file for a more immersive experience that closely aligns with the sensations brought by sound. We created several samples. Below is the design process.



This video presents a beautiful summer night with insects chirping.

Video link : <https://www.youtube.com/watch?v=hUnHDjMDwds>



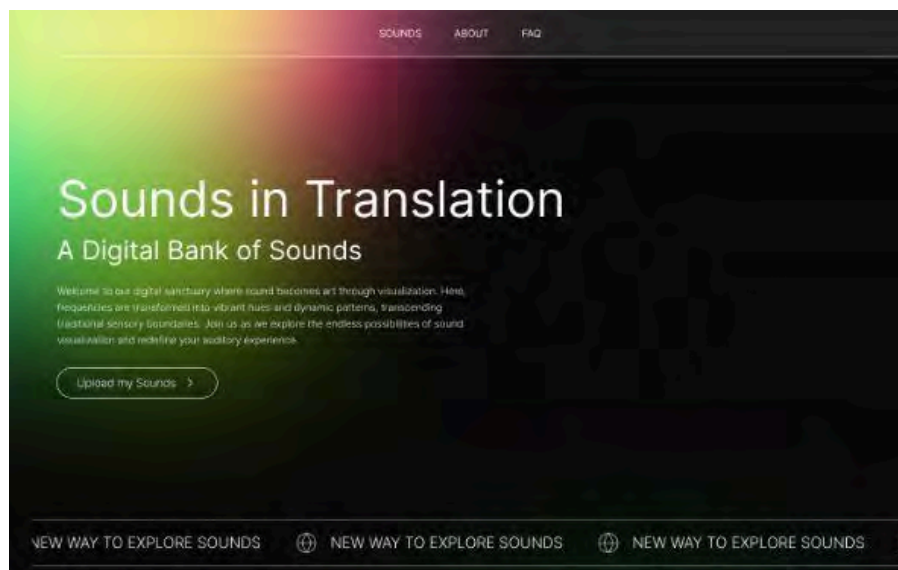
This video presents the effect of heavy rain falling on the roadside.

Video link: <https://www.youtube.com/watch?v=A65e6HyZ5CA>

In the future, we also plan to create more samples to present sound in a visual way. And to create a platform for sound and visual communication.

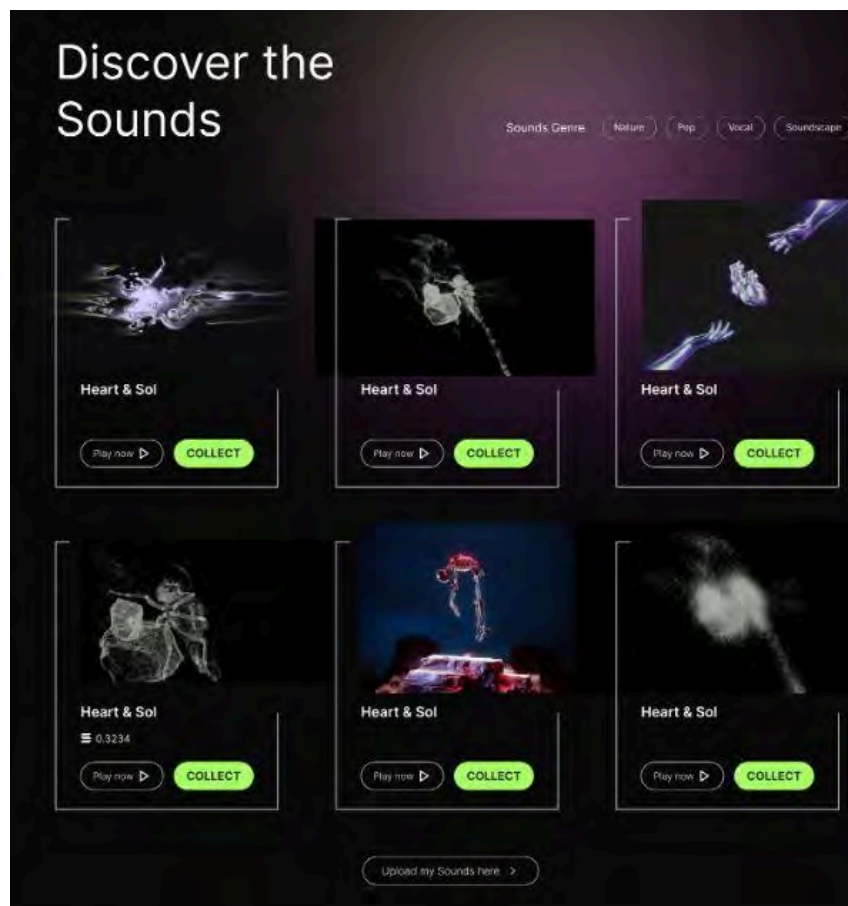
## UI of Web Platform

Our digital sound bank's user interface (UI) offers a straightforward experience for users to engage with sounds in a visually captivating manner. Users can easily upload individual sounds or entire soundscapes collected from nature. Our artist team then transforms these sounds into interactive 3D motion visuals, enriching the platform with dynamic representations of auditory experiences. Through our UI, general audiences can explore how sounds manifest visually and even collect these transformed representations for further enjoyment.



Landing Page

Looking ahead, our platform is set to evolve with a focus on enabling user-generated content. This functionality will empower users to upload their own sounds, which will then be translated into visuals, scents, or vibrations through the platform's prompts. By embracing user-generated content, our platform aims to foster creativity and collaboration, offering a diverse array of sensory experiences for users to discover and share. There is a rich scope of ideas for the future further development of the platform, with potential to put a further emphasis on developing a community through the additional element of an online forum. This could be implemented through adding the ability to write comments under each sound upload, encouraging discussion on how these different multi-sensory experiences make us feel, providing opportunity for connection and conversation. This could be furthermore enhanced with the addition of interactive coding features, such as a drawing pad function created via P5.js, encouraging users to draw and articulate visual interpretations of sound and vibrations to be shared with other people across the platform.



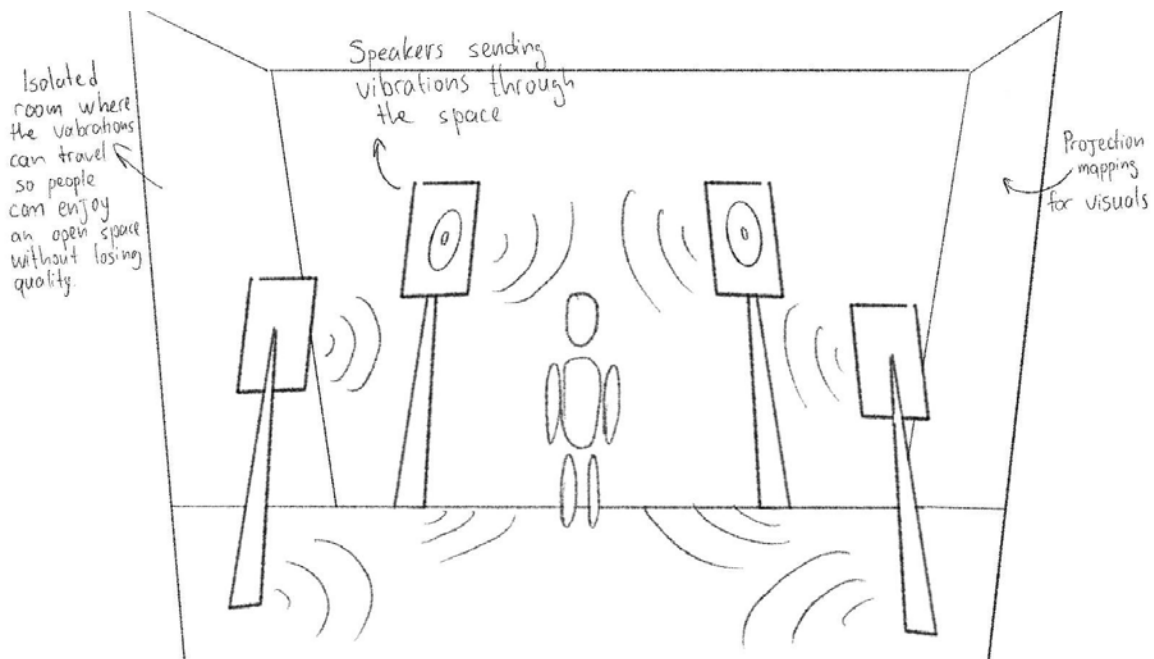
Sound Archive Page

## Exhibition Proposal

Everyone on the team was very keen on carrying out a workshop or creating an installation to explore the technology we have found and interacted with. I started drafting ideas of what that could look like, drawing inspiration from places such as The Sphere in Las Vegas and the installations by Moritz Simons.

I sketched how a bigger-scale installation of our work could work.

Making use of bigger exciter speakers in a room where the viewer would be able to experience the full range of the vibrations while being fully immersed in visuals projected all around them.



We also planned a smaller-scale installation, which could allow us to test our findings and how individuals would interact and feel about it.

