Chalmers University of Technology

Final project proposal-Synthesized sound effects

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1   Introduction

This project explores how sound design can shape psychological perception in horror film contexts. Unlike traditional film scoring that supports visuals, we treat sound as a central narrative force, particularly suited to genres involving surrealism and psychological horror.

We chose the Cthulhu mythos as a conceptual anchor—not for its narrative, but for its emphasis on the "indescribable" and the unseen, which aligns with sound's capacity to express fear beyond the visual realm. Guided by psychoacoustic theory, we designed two contrasting video clips with different sonic objectives.

The first clip amplifies an already eerie atmosphere using layered ambient sound and subtle audio cues to intensify the viewer's sense of unease. The goal was to test whether sound effects can enhance an existing horror setting. The second clip, in contrast, transforms originally lighthearted visuals into a disturbing experience, using unsettling sounds and vocal manipulation to create psychological tension. This tests whether sound alone can shift the emotional tone of a scene.

We developed a targeted questionnaire to assess how these strategies influenced perceptions of tension, immersion, and alienation. The results affirm that sound plays a crucial role in shaping the emotional landscape of visual media.

First video: https://www.youtube.com/watch?v=YgiWKDMnKY8
First questionnaire: https://www.wjx.cn/vm/PDMYV16.aspx
Second video: https://www.youtube.com/watch?v=1_4EHwkiH-Q
Second questionnaire: https://www.wjx.cn/vm/rcdBU5K.aspx

2   Design of Sound Effect

2.1   First Video Clip

2.1.1   Sound Design Concept and Preparation

The first video clip adopts a Lovecraftian horror style, using a dark corridor and minimal visual action to create psychological tension rather than visual scares. While the original audio includes subtle horror elements like murmurs and echoes, they are sparse. Our sound design enhances this atmosphere with carefully layered effects that maintain the horror tone without overpowering it.

We recorded whispered phrases and breathy syllables to mimic ghostly voices or hallucinations, using a directional mic in a quiet indoor space to minimize noise. Additional sounds from Freesound.org were chosen for their timbre and emotional impact—such as static noise, distant knocking, and low drones—to enrich the soundscape.

We used reverb in REAPER to mimic large or ambiguous spaces, aligning with Fastl and Zwicker's psychoacoustic framework Zwicker and Fastl, 1999, which shows that long reverb tails reduce clarity and enhance emotional immersion.

Low-pass filters were applied to whispers and drones to evoke distance or unnatural origins. This follows Blumstein et al. Blumstein et al., 2010, who found that non-linear or filtered sounds can heighten arousal due to their similarity to alarm calls.

We used fade-ins and fade-outs to introduce sounds subtly. According to psychoacoustic research Zwicker and Fastl, 1999, such gradual changes exploit temporal masking, influencing emotion without drawing conscious attention.

2.1.2   Editing Timeline and Implementation

To implement our sound design plan, we mapped out a precise timeline of audio insertions aligned with specific moments in the video.

At **00:50**, we inserted a layer of faint ghostly whispers blended with background radio static. This sound was not present in the original clip and was positioned just under the volume threshold

of the ambient tone. The whisper gradually fades in, remains for several seconds, and fades out completely.

At **01:30**, we applied a reverb effect to an existing "ding" sound already present in the original video. By extending its decay and adding spatial diffusion, the modified sound created a stronger impression of emptiness and reverberant space. This treatment emphasized the supernatural undertone of the scene , allowing the sound to resonate longer in the listener's perception.

Between **02:18 and 02:27**, we layered whispered speech over the original dialogue. The ghostly voice was gradually amplified until it masked the line "stay with us," blending into the existing vocal track in a way that created the impression of auditory hallucination or external manipulation.

At **03:18**, we applied reverb and gradual amplification to the female character's utterance of "ben," making it feel more distant and ethereal. Simultaneously, we introduced an additional layer of ghostly whispering that also increased in volume. The two sound elements—processed dialogue and supernatural voice—were designed to merge by **03:35**, just as the male character opens the door. This convergence created an impression of haunting or possession, sustaining the psychological tension throughout the scene transition.

After the door opens at **03:35**, we added a low-pitched, indistinct vocal layer resembling a deep chant. The sound had no clear melody or language and was processed with subtle reverb to enhance its spatial character. It was gradually faded in and sustained until the end of the clip.This sound was inspired by Lovecraftian horror, where threats are often undefined and psychological. The chanting aimed to suggest the continued presence of an unseen force beyond the visual frame. Its ambiguous structure and low frequency helped maintain tension and reinforce the theme of unknowable terror without disrupting the original atmosphere.

2.2 Second video Clip

2.2.1 Sound Design Concept and Preparation

The second video clip, originally a dialogue-based comedy about "nonbelievers being punished," was re-edited to tell a darker story of a parasitic creature gradually revealing itself and breaking free from its human host.

Our redesign involved three main steps: removing the laugh track and adding horror-style music to set a sinister tone; distorting the voice to highlight the character's transformation; and using string glissandi and aggressive bowing to heighten tension during key moments. We also incorporated custom-recorded sounds—like instrumental effects and breathing—alongside open-source audio such as rat squeaks and snake hisses to enhance the Lovecraftian atmosphere.

2.2.2 Editing Implementation

In the first step, we aimed to shift the video's tone from humorous to unsettling by removing canned laughter and adding a new background score made of ambient spatial effects and isolated piano notes.

To reflect the confined setting, we compressed the spatial audio to evoke claustrophobia and intensify feelings of entrapment. This contrasts with typical ambient design, which suggests openness. The minimalist, repeated piano notes further added tension by disrupting harmony and creating an anxious undercurrent.

Together, the spatial compression and piano cues enhanced the horror atmosphere by triggering psychological responses tied to confinement, pitch instability, and repetition—producing a visceral sense of fear and unease.

In the second step, we distorted the speech of the man in the yellow shirt during three key dialogue moments at **01:44**, **02:13** and **02:27**. This process was carried out using Reaper. To achieve the desired effect, we applied a combination of audio plugins, including ReaPitch, JS: Tremolo, ReaVerb, and ReaEQ.

- ReaPitch was used to raise pitch and formants ("Formant Shift (Full)" set to +3), making the voice sharper and more unnatural, resembling a small creature. The wet mix was increased to emphasize this effect.

- The JS: added slow (3 Hz), subtle (-2 dB) volume modulation, creating vocal instability and evoking emotional disturbance or mechanical failure, which induces unease.

- ReaVerb simulated a confined space using full stereo width (1.00) and a wet level of -12.0 dB, adding echo and spatial blur to enhance a sense of eeriness and enclosure.

- ReaEQ applied a 500 Hz high-pass filter to remove warmth and boosted 1–3 kHz to sharpen the voice and highlight distress-related frequencies, increasing discomfort.
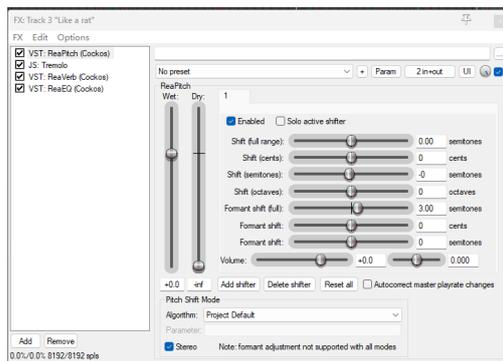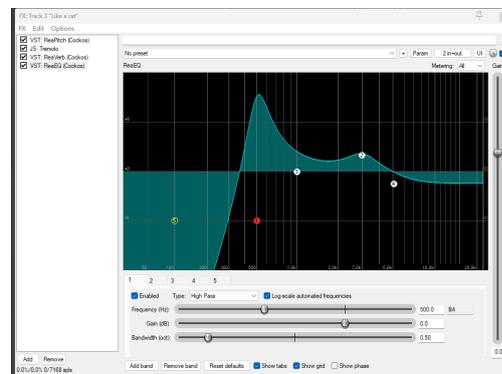
(a) ReaPitch setting interface
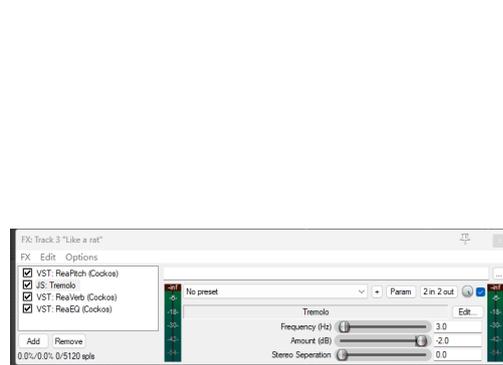
(b) JS: Tremolo setting interface
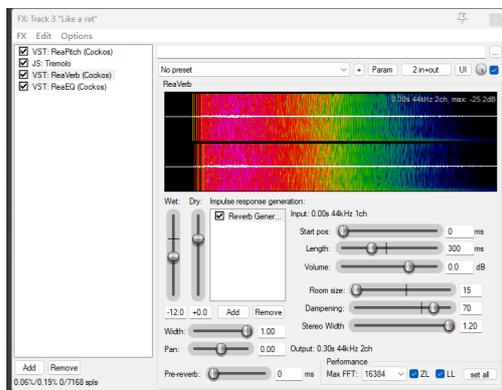
(c) ReaVerb setting interface

(d) ReaEQ setting interface

Fig. 2.1. Plugin setting interfaces for sound design

Drawing on the concept of sound-affect contagion—how background sounds influence emotional perception—we added rat screeches, snake hissing, and hornet buzzing to the dialogue. Rat screeches, especially in the 2–8 kHz range, evoke chaos and fear, suggesting an unseen threat. Snake hissing symbolizes danger and temptation in the yellow-clothed man's speech. At 02:27, hornet buzzing intensifies spatial threat, evoking pain and collective danger.

In the third step, we added monster flashback segments at 01:05, 01:26, and 01:49, using glissando and string scratching to heighten suspense. Inharmonic tones and high-frequency noise (2–8 kHz) induce discomfort, disorientation, and even physical defensive responses like flinching. These effects, synced with visuals, create strong psychological impact.

Together, these elements—background music, vocal effects, and horror sound design—reshape the original video into a psychological horror experience.

3 Questionnaire Design

3.1 Theory

In this project, we have built a basic framework for understanding horror sound effects with the help of our previous analyses in the field of psychoacoustics. Although the analysis of psychoacoustic parameters is not the core of this project, we still use it as a theoretical reference for sound design, and accordingly construct a questionnaire tool for audience feedback in order to systematically assess the psychological effects of sound in creating a horror atmosphere.

In our previous study, we used Artemis software to analyse a number of typical horror sound sources, including footsteps, whispers, screams, wood cracking and so on, focusing on four key parameters: sharpness, frequency content, roughness and reverberation time.) These parameters are all considered to be closely related to the emotional response of the hearing system:

- Sounds with higher sharpness tend to be perceived as more tense or aggressive, especially when high-frequency energy is dense and spikes are distributed in higher densities, triggering significant attentional responses and discomfort;

- Roughness is related to the irregular tonal amplitude of the sound and is often used to create a sense of fear or nausea;

- Extremely high frequencies, when combined with very low frequency components, create an unnatural hearing impression, enhancing strangeness and uncertainty;

- The overall length of the reverberation time and its frequency dependence can directly affect spatial perception, with low-frequency reverberation more likely to bring about a sense of oppression and a feeling of claustrophobia.

Relying on the above theory, we constructed a structured questionnaire to capture the audience's perception of and reaction to sound processing effects. The questionnaire was designed around three core dimensions:

1. Overall Immersion and Atmosphere Perception: Inspired by the psychoacoustic theories of 'spatial extension' and 'intensity of sensory stimulation', we set up questions about immersion, such as 'Did the sound enhance your immersion in the scene? ' etc. These questions were designed to examine the effects of reverberation, stereo positioning, and sound layout on the audience's mental boundaries.

2. Mood and rhythmic match between sound and image: Considering the importance of audio-visual matching for perceptual consistency, especially in the handling of tempo changes (e.g., slow-paced rendering vs. sudden scares) in horror films, we included a number of questions on pacing, contrast, and accuracy of emotional conveyance, to assess the viewer's judgment of whether the sound effects were too abrupt or insufficient.

3. The effect of sound effects, background music and spatial treatments on the psychological response of the audience: The questions in this section were designed to be directly characterised against psychoacoustic parameters, subdivided into three categories of elements: the sound effect itself (e.g. footsteps, whispers, screams, etc.), the background music, and the spatial sensory processing (reverberation, echoes, etc.). Audience members were encouraged to describe the subjective feelings brought about by each of these three types of sound, in order to explore the role of different sound elements in constructing a horror atmosphere.

The final questionnaire aims to bridge the gap between the physical properties of sound and subjective psychological perception, establishing a preliminary model for mapping between subjective feedback and objective parameters. This will not only help to analyse the perceptual effects of specific designs, but also provide methodological references for a subsequent, more systematic sound testing framework.

3.2   Results

A total of 25 valid responses were collected for this questionnaire, with 10 male and 15 female participants, showing a relatively balanced gender distribution. In terms of age, the majority of respondents fell within the 21–30 age group. However, the sample also included one respondent under 15 and two over 50, which adds diversity to the dataset. This range in age provides the potential to observe how different age groups may perceive or respond to sound effects in horror-themed content, though the primary focus remains on younger viewers.

Regarding viewing habits in Figure 3.1, most participants reported limited exposure to horror films, with only a small proportion identifying themselves as enthusiasts or having a strong interest in the genre. This may influence their sensitivity to the role of sound in building suspense or fear. As shown in the Figure 3.2, most respondents reported only noticing the sound effects, with relatively few paying close attention or critically evaluating the sound design within the clips. This suggests that for general audiences, sound effects subtly shape the emotional experience, even if they are not consciously analyzed. Therefore, the feedback from this group—who are not regular horror viewers and have limited awareness of sound effects—can be seen as more representative of a natural audience response. Their reactions reflect a raw and intuitive impression of how added sound effects altered the atmosphere of the video clips.
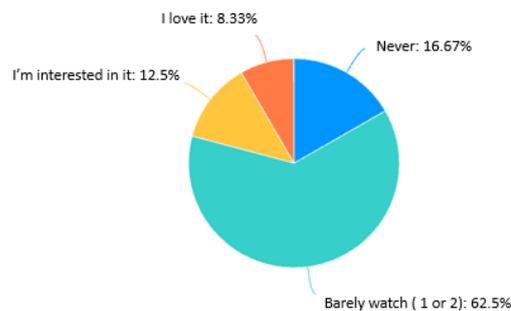
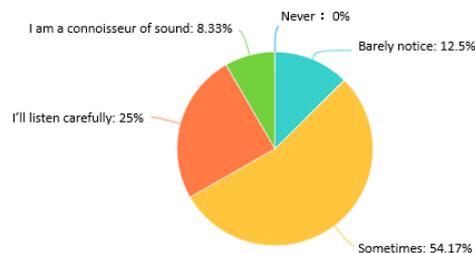**Fig.** 3.1. Viewing Habits in Participants

Fig. 3.2. Results of Noticing the Sound Effects

We designed two video clips for this study: the original footage for the first video appears in the first section, and the second video's original footage appears in the second section. After viewing the edited versions with added sound effects, the majority of participants reported feeling more tense compared to when they watched the original, unedited clips.

As shown in the Figure 3.3, the edited versions with sound effects created a much stronger sense of horror than the original footage. However, since the two videos had different focuses, the first clip aimed to assess whether sound effects could enhance an already frightening atmosphere, while the second focused on whether sound effects could generate fear, and whether sound or visuals had the stronger impact. The result Figure 3.4 shows that most participants agreed that sound effects significantly contributed to the overall horror effect. In our creative approach, we chose the Cthulhu mythos as the thematic foundation for our sound design. Cthulhu horror is characterized by its emphasis on the indescribable and the unknown, so we attempted to express this abstract fear through sound rather than direct visuals. Interestingly, we did not inform participants in advance that the theme was Cthulhu-related, but some still asked about it during the survey. Upon learning that it represented a fear of the "unnameable," many agreed that the sound design effectively conveyed this ambiguous and disturbing atmosphere.
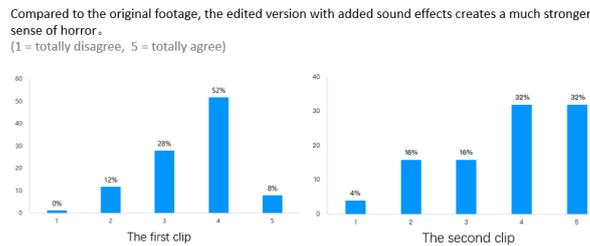

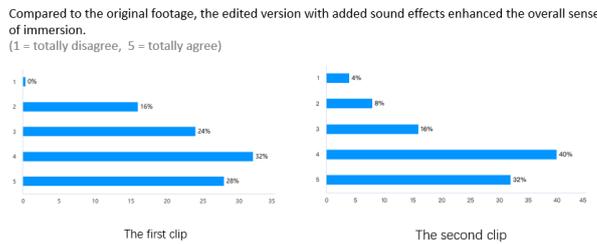**Fig.** 3.3. Comparison Result: Edited vs. Original Footage in Horror Perception

Fig. 3.4. Immersion Comparison: Original vs. Sound-Enhanced Footage

The Figure 3.5 shows that for the first video, participants generally felt that background music, sound effects, and overall atmosphere all contributed equally to the sense of tension. This may be because the original clip already carried a somewhat eerie tone, making the changes less immediately apparent during a first viewing. However, many participants did comment that the added sound and music fit well with the visuals, indicating a strong perceived coherence between audio and image in the edited version.
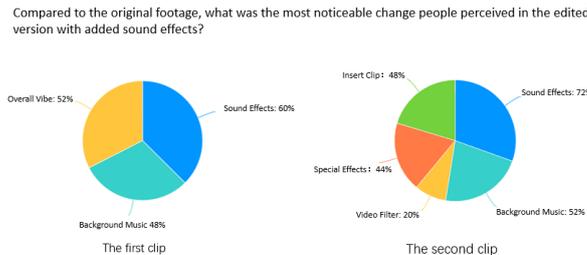

Fig. 3.5. Most Noticeable Changes Perceived After Adding Sound Effects

In contrast, for the second video, the effect of sound stood out much more clearly. Although

we had also added horror-style filters and some extra visual elements to complete the narrative, the majority of respondents felt that the sound effects played the most significant role in creating a sense of fear. This suggests that sound design had a direct and powerful influence on the audience's emotional response. Following this, As shown in the Figure 3.6, most respondents agreed that sound effects had a substantial—and in many cases, decisive—impact on the mood and tone of the videos. This reinforces our assumption that sound plays a central role in shaping the audience's experience.
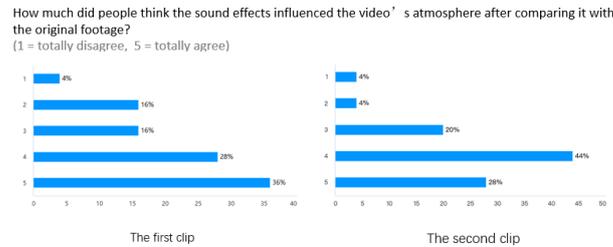

Fig. 3.6. Audience Evaluation of Sound Effects' Impact on Atmosphere

Lastly, The Figure 3.7 affirm our core hypothesis: that well-designed sound effects, when guided by psychoacoustic principles, can significantly enhance the emotional and narrative impact of audiovisual content. This also highlights that sound design is not merely a technical layer, but a critical artistic tool in cinematic storytelling.
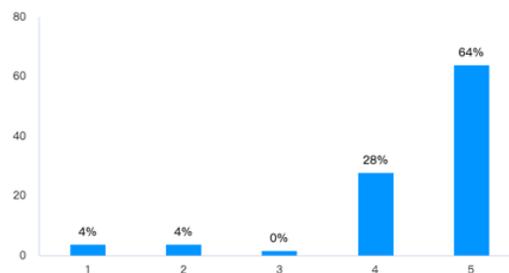

Fig. 3.7. Audience Opinions on the Expressive Power of Sound Effects

Based on the survey results, it is evident that sound effects play a crucial role in enhancing the atmosphere and expressive power of video content. Whether reinforcing existing fear or transforming comedy into horror, sound proves to be a powerful emotional driver. These findings validate the core aim of our project—to use sound design to evoke deeper audience reactions and elevate the immersive experience of the videos.

4 Group members' contributions

In this project, all team members participated fully in every part of the process. The film selection was completed by Xin and Minghui. After discussion, the film was divided into two groups with different focuses for sound design. Yuxin and Shulin formed one group, while Xin and Minghui formed the other. Each group was fully involved in film editing, sound design, questionnaire design, and result analysis. The team worked together with a united effort to complete the project.

References

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Zwicker, E., & Fastl, H. (1999). *Psychoacoustics: Facts and models* (2nd). Springer-Verlag Berlin Heidelberg. https://link.springer.com/book/10.1007/978-3-540-68888-4