Abstract

Sound is intricately woven into our daily lives, exerting a profound influence on the comfort of our environment. There are research dedicated to designing sound for the purpose of enhancing comfort. Examples of such research include the design of sounds for mechanical products like automobiles, the development of alert signals to evoke attention in emergency situations,and the broader field of sound environment design, encompassing the intentional shaping of acoustic environments. The aim of sound environment design is to create environments with acoustics that are more comfortable than those found in reality. Beyond sound environment design, there is also research to design environments. Examples include research in light environment design, focusing on creating pleasant lighting environments, as well as color environment design, aimed at designing environments with pleasing color schemes. In light environment design, illumination level for safety and pleasantness are quantified and systematized based on factors such as illuminance, brightness, and color temperature. In color environment design, the Color Harmony Theory quantifies and systematizes the emphasis or harmony between elements through the contrast of C colors in the Munsell color system, providing a numerical framework for understanding their mutual interactions. In sound environment design as well, the design of acoustic environments can be achieved by considering factors such as sound pressure level and frequency. However, while effective in removing unpleasant sounds, it may not necessarily contribute to the addition of new sounds in sound environment design.

The objective of this study is to investigate the feasibility of representing both pleasantness and unpleasantness on a single axis. If it proves possible to represent both pleasantness and unpleasantness on a single axis, it is conceivable that this could be beneficial not only in removing noisy sounds but also in aiding the addition of new sounds in sound environment design.

To investigate the feasibility of representing both pleasantness and unpleasantness on a single axis, the first step involves confirming the effectiveness of a model for calculating sensory pleasantness. Subsequently, the consideration will extend to whether the same model can be used to explain sensory unpleasantness as well. Finally, based on the obtained results, the study will reflect on whether it is possible to represent both sensory pleasantness and unpleasantness on a single axis. The model utilized in this study is the Aures model for sensory pleasantness. The Aures model is capable of calculating sensory pleasantness based on roughness, sharpness, tonality, and loudness. Artificial sounds will be employed in the experiments. The assessment was carried out through Thurstone‘s method of paired comparison. Two experiments were conducted, one focusing on pleasantness and the other on unpleasantness. The correlation between experiments results and

Aures model result was investigated.

The correlation between the experiment about pleasantness and the results of the Aures model was 0.2346. The correlation between the experiment about unpleasantness and the results of the Aures model was -0.2142. The observed decrease in correlation may be attributed to differences in the impact of roughness, sharpness, tonality, and loudness on sensory pleasantness compared to the findings in the Aures study. In the Aures model of sensory pleasantness, an increase in roughness, sharpness, and loudness is associated with a decrease in sensory pleasantness, while an increase in tonality is associated with an increase in sensory pleasantness. The results of the experiment showed little difference in sensory pleasantness between pure tones and bandpass noise, and the bandpass noise was not perceived as unpleasant. However, the Aures model evaluated bandpass noise as unpleasant. However, given that sensory pleasantness is known to be influenced by roughness, sharpness, tonality, and loudness in previous studies, it is conceivable that improving the correlation may be achieved by investigating the specific impact of each factor on sensory pleasantness and adjusting the parameters of the Aures model accordingly.

The correlation between the experiments about pleasantness and experiments about unpleasantness was -0.9542. From the aforementioned observations, although there was a low correlation between the Aures model and the experimental results, it is conceivable that sensory pleasantness and unpleasantness can be represented on a single axis.