

STUDY ON THE VISUALIZATION OF THE IMPRESSION OF BUTTON SOUNDS

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ABSTRACT. *The idea of sound being a normal part of product operation has permeated in society. As a result, a lot of attention has been directed at designing various sounds treated as noise, such as automobile acceleration sounds. Car drivers detect variations in sound characteristics between different buttons, such as the pitch, tone color, loudness and duration of button sounds, and these can affect the desirability of both a car and its audio system. In this study, we focused on the sound design of transient signals and evaluated this design using 11 different button sounds. First, an impression was extracted using the semantic differential method, and the relationship between representation of the wavelet transform and its sound impression was investigated. Following this, we confirmed whether or not the impression changed when a sound that generated a negative impression was processed using an adaptive control into a sound generating a positive impression. On the other hand, hearing is also known to be influenced by vision and tactile sensations. Therefore, we also investigated the relationship between tactile sensation and the time-frequency representation of a sound impression.*

Keywords : Sound and acoustic, Sound design, Adaptive control, Car, Button, Touch, Impression

1. **Introduction.** The idea of sounds being a normal part of product operation has permeated in society. As a result, a lot of attention has been directed at designing various sounds that are treated as noise, such as automobile acceleration sounds and cleaner sounds [1]-[3]. The mechanical sounds generated by the buttons of a car audio's unit have been found to contribute to a user's perception of the car itself [4]. Drivers detect variations in sound characteristics between different buttons, such as the pitch, tone color, loudness and duration, and these appear to have a psychological effect on the driver. The restful, lower sounds, generated by executive cars, give the impression that the button sounds are integral parts of the car's luxury status. To give another example of the relation between the quality of a sound and a person's perception of reality, it may also be possible that, in the sport of golf, some of the characteristics previously thought to relate to tactile sensations at the point of impact of club with ball [5] are influenced more by the sound of impact. Kuwano et al. [6] asked ten subjects to rate the sounds using seven-point adjective scales ranging from "hard – soft", "sharp – dull", "refreshing – not refreshing", "powerful – weak" and "vivid – dead". Strong correlations were obtained between the subjects' perceptions and the psychoacoustic metrics [7] loudness and sharpness of the measured impact sounds. These metrics are widely employed in sound quality evaluations and were