HAPTIC INTERACTIONS FOR AUDIO NAVIGATION

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Recent studies in haptics have shown that force-feedback interfaces can improve user efficiency and accuracy while decreasing the cognitive load required to accomplish computer tasks. One specific musical application that may benefit from these devices is the task of audio navigation as found in digital sound editing software since current users rely heavily on the keyboard and mouse while performing editing tasks.

This thesis consists of three major phases. The first phase involves analyzing current interaction methods used in editing digital audio. This work looks at how users currently use editing interfaces and identifies specific aspects of the interaction that cause usage difficulties. The second phase includes need-finding and technology exploration. This process provides insights leading to the development of a haptic scrubbing interaction model with which users can feel tactile sensations mapped to audio characteristics while hearing and seeing representations of the original sound.

The third phase involves experiments to collect user performance data. In the first experiment, users were asked to locate the onset of a tone under conditions in which it was difficult to locate visually. With haptic feedback mapped to the spectral content of the tone, users were able to target the tone 20.8% more quickly and 52.7% more accurately than without haptic feedback. Additionally, each trajectory of movement was recorded and these revealed a consistency in user behavior for both the haptic and non-haptic conditions. The second experiment was a short pilot study in which users were asked to locate

pitch information based on haptic feedback. Like the first experiment, the second one showed that haptic feedback can help users substantially in audio scrubbing tasks. These findings suggest that the incorporation of haptic devices into sound editing systems may provide significant benefits to the user.

Through these phases, the research presented here explores the need to carefully study and analyze interaction methods toward the development of improved user experiences. By isolating problems in current interactions, understanding how they may be resolved, applying the known benefits of haptic technologies, and obtaining results of user tests, future applications may benefit greatly from the incorporation of haptic devices.

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