Reducing Distraction, Increasing Attention
USING TACTILE-ACOUSTIC DEVICES

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ABSTRACT

Tactile-acoustic devices represent a class of sensory augmentation technology that is typically considered as an assistive device for increasing access to movie or music soundtracks when hearing is limited or unavailable to an individual. **However, the use of the skin as an input channel for critical information when the visual and auditory channels are engaged represents a new area of research for this technology.** The paper presents preliminary arguments and motivation for expanding research into sensory augmentation with tactile-audio devices into automotive applications as a means to increase safety and awareness for drivers.

Transferring gaming results to real-world driving scenarios

DRIVER DISTRACTION & ATTENTION

Driving represents one of the most attention-intensive everyday activities we all engage in, and the technology we can now use to improve safety and awareness actually place additional demands on our limited visual and auditory attention resources:

- GPS
- Email
- Phonecalls
- Texts
- Ambulance sirens
- Internet access
- Radio alerts
- Media player controls

Though these devices help us better navigate and keep connected while on the road, they serve to further distract us from the critical attention levels needed just to maintain our basic driving skills, and represent a growing problem for all drivers. **Sensory augmentation of visual and audio information through the tactile senses represents an excellent opportunity to begin exploring ways to support this increasing influx of information that is presented to drivers.** By leveraging the ability of the skin to receive and process information that is intended for our eyes and ears, we can start to offload some demands placed in our eyes and ears to the body.

RESEARCH GOALS

Results of previous research that show that the body can interpret a signicant amount of information about sound through vibrations, including detecting emotional content of music[3], musical timbre[4] as well as the gender and intentionality of speech. Other forms of audio cues that are not directly based on sound have also been shown to be effective for providing critical information to drivers[1]. **Using the TAD system as a tool for investigating and implementing tactile audio and audio-cues together in combinations and congurations will potentially reduce driver distraction and increase awareness of their environment.** Additional factors that will be explored and validated include:

- Size, placement, and configuration of transducers
- Access and integration of audio and non-audio signals
- Optimize combined audio and cue signals
- Augmentation vs substitution of signals to the tactile modality
- Quantitative measures on attention and distraction
- User response to qualitative studies

NEXT STEPS

Next steps include:

- Integrating the TAD system into driving simulator
- Modifing and adapting the system for automotive application
- Applying audio-cue content to the signal pool

The auto-TAD is being used in actual driving scenarios now, and has begun to take shape as a robust experimental device that will be used in the upcoming research projects. In addition to testing and modifying the prototype, signal processing studies will be conducted independently to provide a broader understanding of the combined sound and audio-cue signals that can support the hypotheses that tactile displays can improve driver safety, increase attention, and reduce distraction.

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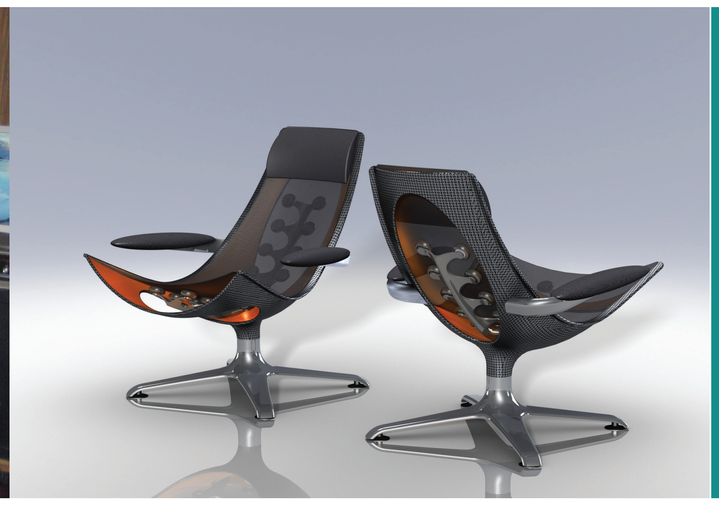

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