

Interactive Interior Spaces in Cars using e-textiles

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Abstract

This paper introduces e-textiles (i.e. fabric-based sensors, circuits and actuators) to the design space of human-vehicle interaction (HVI) to enrich user experience within car interiors. Through this research, we aim to introduce a new modality to in-car interactions through e-textiles and design user interfaces for drivers and passengers according to user experience goals.

Introduction and Literature Review

- Today, novel interaction technologies create many opportunities for designing valuable and attractive in-car user interfaces
- A user interface is essential to the way people perceive the driving experience
- Many papers have discussed the effects of adding tactile feedback for less distracting in-car interactions in human-driven cars
- Values such as the playful, engaging, aesthetic and pleasant aspects of UX are less regarded in the existing UIs
- Vehicle interiors are primarily made out of fabric, this is be an excellent opportunity to embed seamless, less focus-demanding interactions by employing e-textiles techniques
- Improving user experience and overcome issues related to other user interfaces is the main concern of this research

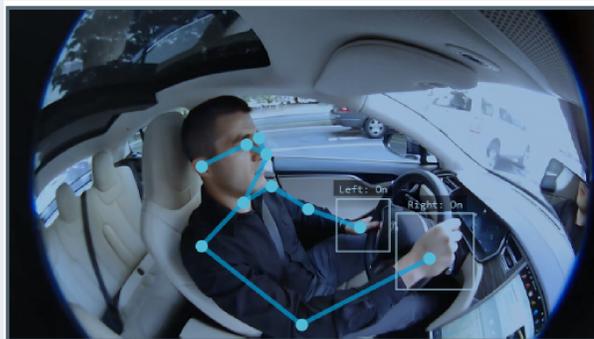


Figure 1: A view of HVI environment for a driver[1]

Methodology

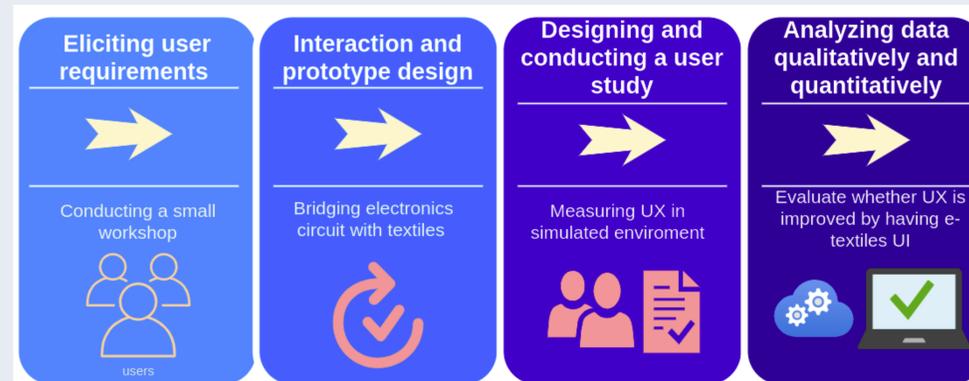


Figure 2: Steps of conducting research

Design concept

- Car interior fabrics could be used for e-textile sensors or soft actuators for in-car interactions
- Textile components (e.g. fibers, yarns, leathers) are integrated by with electronic components (LilyPad Arduino, input/output sensors) to make e-textile UIs
- Using e-textile user interfaces, the drivers or passengers would be able to conduct secondary and tertiary tasks (e.g. Controlling media player through fabrics of interior car)
- Other Applications of e-textile UI could be of particular value and interest to passengers with some physical disabilities such as vision impairment, people who are hard-of-hearing or people who have a speech-impairment because these UIs would be in the vicinity of their hands
- We address this gap in order to determine how to design practical and useful interfaces by using e-textiles to enhance the user experience



Figure 3: Drivers or passengers interaction with e-textile UIs

Calm technology

- Technology should require the smallest possible amount of attention
- A calm technology will move easily from the periphery of our attention, to the center, and back
- The periphery is informing without overburdening

E-textiles

- The prototype of this research is going to utilize e-textiles techniques
- An e-textile is a fabric developed with electronics and may be embedded with sensors, batteries, LEDs and hands-free computing devices
- Some of the techniques for e-textiles are screen-printing with conductive ink, embroidery with conductive thread and thermosealing with conductive fabric

UX factors

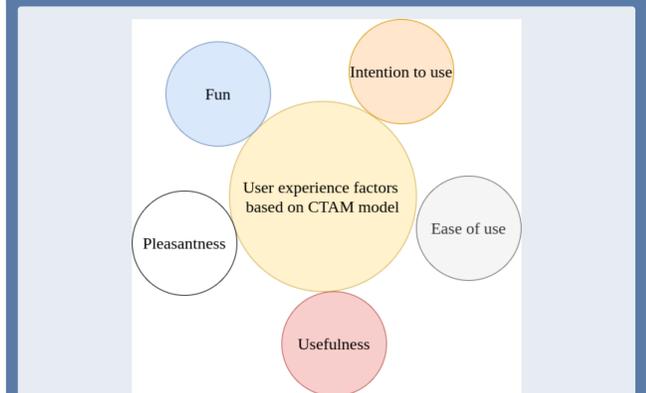


Figure 4: UX factors for quantitative analysis

References

- [1] Lex Fridman et al. Mit advanced vehicle technology study: Large-scale naturalistic driving study of driver behavior and interaction with automation. *IEEE Access*, 7:1–23, July 2019.