Hybrid Interactions in the Car

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ABSTRACT
We present a low fidelity prototyping tool for hybrid interactions on touch-based surfaces with capacitive sensing. Providing physical handles for certain actions on these screens can decrease the visual and cognitive load carried by human drivers, leading to a safer driving experience. Our toolkit allows for the fast and inexpensive simulation of physical interactions on capacitive sensing devices and assists and simplifies the design process of such systems.

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Hybrid Interaction.

ACM Classification Keywords
H5.2 User Interfaces – *Prototyping*.

INTRODUCTION
Capacitive screens are enjoying great popularity within in-car interaction systems due to decreased material costs and their wide acceptance by users. However, one stumbling block remaining is that these interfaces demand a high level of visual attention in the performance of menu tasks. As distraction can lead to hazardous driving situations, resolving this complication is of critical importance. We investigate the use of extending these interfaces with artifacts that support the user through multimodal interaction possibilities. In the automotive research community, these interfaces are considered highly beneficial as they offer more natural-feeling interaction possibilities while reducing distraction.

APPROACH
The toolkit we are currently exploring allows the customization and design of peripheral interactions through tangible user interfaces (TUI) [1] on interactive screens. A tablet computer (as depicted in figure 1) can easily be imagined to be equal in form and size to the central information display (CID) in tomorrow's cars. Recent research projects have exemplified the mechanical possibility of positioning tangible artifacts also on vertical screens [2]. Our implemented toolkit can recognize different objects on capacitive sensing devices (here the Apple iPad) without electronic components. The recognized 3D objects subsequently trigger different GUI elements, offering various interaction possibilities. In an automotive context, this toolkit allows the fast and inexpensive prototyping of user-customized, hybrid interfaces on a low fidelity object.

Figure 1. Tangible low fidelity objects triggering different digital behaviors.

For example, a user who mostly uses the phone book and the playlist feature of the stereo system while driving can attach two distinct physical artifacts to the CID and trigger these actions directly by rotating and pushing them. Due to the rich multimodal feedback from the physical artifacts, the user can *feel* the interaction more directly and naturally. Compared to common touch based interactions, this could result in a reduced visual and cognitive load for the driver. Though the TUIs demand screen space as a tradeoff, more than two thirds of the screen's size is still available for representing additional information like GPS routes or playlists. In light of the reduced screen space, we recommend assigning only frequent actions to tangible artifacts.

CONCLUSION
We believe that prototyping tools as exemplified in this work can be of aid to the flexible prototyping of natural in-car interactions as early ideas can be visualized and tried out quickly and easily during the design process, resulting in substantial advances in making these systems usable and enjoyable.

REFERENCES
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