

Strategic Business Relevance:

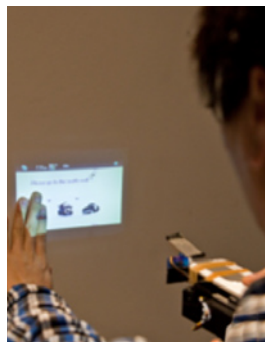
Projector enhanced personal devices have recently gained a lot of popularity especially thanks to the miniaturisation of projectors and their integration into every-day devices such as: mobile phones, cameras, camcorders and tablet PCs. We have been investigating how the design of such affect users and we present some first design guidelines.

Mobile projector phones are predicted to grow to 20 million units by 2015. Their major advantage is the multi-display capability; yet, in most designs, the projector lens is fixed on the device displaying orthogonally to the screen and preventing users from concurrently using both displays. Additionally, no specific interaction techniques have been developed to interact with projection spaces.

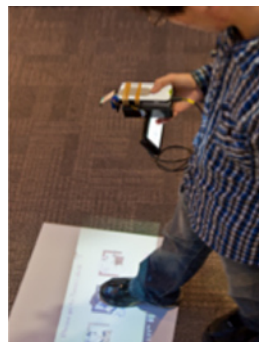
We propose a mobile steerable projection system utilising pico-projectors in order to dynamically reconfigure the placement of the projection area compared with the screen. Our results show how different configurations are best suited for different uses. In addition, we conducted a pilot study on potential interaction techniques.



Floor projection allows the user to follow arrows rather than read a map on their phone's screen.



"Touch" is one way to interact with the projection on the wall (above) and on the floor (right).



Core Research: User Interactions for Breakthrough Services

This research addresses the ways in which users interact with portable and mobile devices (and other devices in their physical and logical environment) in order to enable new types of personalised and highly contextualised services.

The steerable projection research forms part of the low-level research for this program, with the aim of developing novel interaction techniques for mobile devices.

Virtual Centre of Excellence
in mobile and personal
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For more information see:
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Evaluation Summary

Our experiments show that using a steerable projection is a successful way to improve the current fixed angle design between the mobile phone's screen and the projection space.

Two studies were conducted to investigate how steerable projection can overcome problems due to the non-alignment of the screen and the projected display. From the results of these studies we present design guidelines for such devices.

Different alignments for different applications

In this study, 18 users (6 as individuals and 12 as pairs), were asked to choose the most suitable alignment out of 3 options for 3 different types of applications. The three possible orientations were: 0° (wall), 30° (desk) and 50° (floor), where each is the angle between the phone's screen and the projection.

The participants were very interested in the new possibilities offered by embedded pico-projectors. The preferred angle was the 30° angle and not the 0° angle currently offered by manufacturers. In the navigation application, no participants actually used 0° as their preferred angle.

Participants suggested that they should be able to define preferred alignments depending on applications, and that the system should automatically reconfigure the alignment. They also really enjoyed projecting on the floor, especially when on-the-move.

Pilot study for interaction technique

We implemented different types of interaction technique to allow interaction with the projection space. Two were aligned interaction on the projected image (i.e. the camera and projector are aligned), by either touching the projection with one's hand or stepping on it in the floor's projection case. While the "stepping" interaction seemed very intuitive and enjoyable, the "touching" interaction seemed complex as the user had to get close enough to the projection space in order to reach it, which involved considerably reducing the size of the projection and the accuracy of the touch.

Design Guidelines

- The current alignment between the screen and projection, chosen by manufacturers, is not suitable for all types of applications.
- Different alignments of the screen and projector are more adapted for different applications, which is achievable by the use of steerable projection.
- Floor projection should be considered for on-the-move applications such as navigation.
- Both displays can be used simultaneously for different types of information.
- "Touch" is not a good way to interact on a wall but works on floor projection.
- "Waving" can be explored as a way to navigate through ordered content.