

Interactive Projection

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1 Abstract

Projectors are becoming very compact, and this is driving an evolution in their functionality. The handheld projector in this work is capable of stabilized projection under hand-jitter, and allows the user to interact with projected information. The ideas anticipate current handheld devices, such as cellphones and PDAs, being augmented with projectors to supplement or even replace the built-in screen with a larger, projected display. The method of interacting with a projection demonstrates a new medium for WIMP functionality. The work goes further still in showing how handheld projection supports a new type of interaction for multiple users, who can share a pooled display in which individual projections are intelligently combined.

2 Introduction

Information display is such a prevalent part of everyday life that new ways to present data can have significant impact. The possibilities for making innovative displays with projectors are fairly unexplored because a projector has traditionally been a static-placement and power-hungry device. That is not the case anymore. Cutting-edge devices like tiny projector-keyboards are already showing the possibilities as projectors shrink in size. This work demonstrates how a projector can be a handheld device, and how our everyday surroundings can be transformed into both a display surface and a medium for interaction with the projected data.



Figure1: Two users, each with a handheld projector, interact via a pooled display in which individual projections are intelligently combined

The goal of the project is to change perceptions about projectors. The prototype device makes it possible to visualize personal, handheld projectors for use in the near future. Add a method for interaction with the projected data, and this becomes an innovative addition to the existing array of handhelds. Projection does have limitations because of

interference with ambient light and the unsuitability of some display surfaces. Furthermore, this prototype enables only mouse-style interaction, not text-entry. But interactive projection still opens up a range of new possibilities in a little explored area of the human-computer interface.



2: View of handheld projector.

3 Innovations

Stabilized Projection: An immediate requirement for a handheld projector is to stabilize the projection on the display surface, therefore removing the effect of hand-jitter. This handheld device includes a camera that determines the position of the projector relative to the surface, enabling continual modification of the projected information, so that it appears static on the surface even though the projector itself is moving. The position recovery is supported by an inertial sensor and laser pens on the device.

Interactive Projection: The core innovation is a technique for tracking an independently moving cursor across a stabilized projection on a display surface. A touch-pad or thumb wheels on the projector could move the cursor across the projection, but this would increase the device size, and it would be a clumsy interaction that might require two hands. This project shows how to track a cursor across the stabilized projection by a natural, one-handed pointing motion of the projector.

Hardware: The handheld projector includes a projector, a camera, an inertial sensor (gyro/accelerometer board), and four laser pens. The device also has click buttons for user interaction. All components are commodity items, but a projector augmented with this range of components is currently an unusual and novel device.

4 Conclusion

The new technique of interactive projection shows how to extend passive projection of information to become an interactive experience, with navigation and update of the projected data. Our goal has been to indicate some of the possibilities as the boundaries between physical and digital worlds blur, making the everyday environment into both a display surface and a medium for interaction.