tPad: a transparent display tablet computer

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# ABSTRACT

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## Author Keywords

Contact Augmented Reality, Transparent Portable Devices, tPad, Transparent Displays, Tablets, Active Reading

## ACM Classification Keywords

H.5.2 Information Interfaces and Presentation: User Interfaces: Input Devices and Strategies, Interaction Styles

## General Terms

Design, Human Factors

# INTRODUCTION

Transparent displays allow users to see both digital content and the real world at once. Their recent availability in mobile devices [1, 2] has opened up new interaction possibilities not available with traditional mobile displays. For example, designers have created "design concepts" focused on supporting more compelling mobile augmented reality applications. On the other side, researchers studied mobile transparent displays as a solution to the finger occlusion problem and proposed "back of device" touch input [3, 5], where users interact by touching the display from behind while being able to see their hand fingers.

In this paper we research the interaction possibilities of transparent display mobile devices from the perspective of their actual and possible physical affordances. Actual affordances include *transparency*, *correspondence* and *dual-sidedness*. Transparency is the capacity to see objects through the display. Correspondence is the capacity to determine the physical dimensions of objects right below the display based on the digital content. Dual-sidedness is the capacity to see and interact with the display from either side. Similar to [5] we argue for one extra affordance for future transparent displays, *surface capture*. Surface capture is the capacity of the display to acquire an image of the elements right below or on top the display without the need of external cameras (such as Samsung SUR40 device, aka Microsoft PixelSense).

Our goals include exploring the design space and identifying the interaction techniques for transparent display mobile devices. We divide the interaction techniques between those that are unique to transparent display mobile devices and those which, although explored in other contexts, are a natural fit. We present the tPad, our prototype 7 inch transparent display tablet. Capacity sensors facilitate touch and pen interaction on both sides. Embedded sensors facilitate the detection of the primary interaction side. A camera optionally attached to the tPad simulates the surface capture functionality.

Novel interaction techniques support the usage of the transparent display for *rich* *note taking* and *active reading.* For note-taking, users can trace objects on a physical object, query printed graphs, capture elements behind the display, access alternative views on the flip-side and share content by staking multiple devices. For active reading, users can explore the virtual version of a printed document by simply putting the tPad on top of it – users can annotate, search, invoke rich content (pictures and video). Finally, applications running on opposite sides of the display can access a shared context.

# RELATED WORK

# RESEARCH Approach

# Conclusions

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