

Inside-Out Interaction: An Interaction Technique for Dealing with Large Interface Surfaces such as Web Pages on Small Screen Displays

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Abstract

We present an interaction technique which could be used to ease the well-known problem of browsing large interface surfaces—in particular web pages—on small screen devices. A prototype implementation is introduced and discussed, turning some of the traditional notions of direct manipulation inside-out.

1 Introduction

Since the mid seventies, interfaces of *direct manipulation* [Shneiderman, 1983] have come to be characteristic of modern personal computing. It allows users to experience directness, control, and engagement at the interface, and its styles of interaction, its interfaces, and the basic ideas of direct manipulation have proven useful and enjoyable on the desktop.

With the recent advance of mobile information technology however, we argue that a window of opportunity has been opened for challenging the way in which the ideas of direct manipulation have become manifest—and, arguable, sedimented—in the current interaction design for devices with small screen displays, e.g. PDAs and other palmtop-sized devices. Interaction with PDAs typically proceeds by the user holding the device in one hand while the other hand manipulates virtual objects on a touch-sensitive display using a stylus pen. In this paper, through a prototype implementation, we will address and discuss an alternative style of interaction for mobile devices. It is believed that the model it embodies may come to turn one's conception of what interaction with mobile devices is about completely inside-out. This is because we consider the device itself not primarily as a *world of objects* to be manipulated, but rather regard interaction as to manipulate the device itself as an *object in the world*.

2 Problem Area and Application Domain

A well-known concern in the area of mobile Human-Computer Interaction is the issue of the limited amount of screen real estate provided by today's mobile devices on which to display information [Jones et al, 1999]. A particular domain in which this issue becomes explicit is web browsing, where full-size web pages shown on typical 240×320 pixel PDA displays require a substantial amount of scrolling in two dimensions on the part of the user. To avoid resorting to customized miniature web sites, a number of research prototypes have been developed to try to overcome the problems of browsing the web on devices with small screen displays. Many of these implementations draw on and implement various information visualization techniques or make use of filters to reduce the amount of information presented to the user. Throughout these designs, however, the device itself is still conceptually regarded as a self-sufficient *world of objects*, where its user is seen as manipulating objects 'inside' of it.

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3 Prototype Implementation

For our prototype implementation, we on the contrary wanted the physical device itself to be movable and dynamic while the virtual world (i.e. the web page) would remain seemingly fixed in the physical world. Hence, drawing on related research efforts of using spatially aware handheld devices as peepholes [Fitzmaurice et al 1993], we envisioned web browsing with our prototype as a matter of presenting the user with a virtual web page that appears as remaining physically fixed on for instance a table. When the user physically moves the device itself, different parts of the virtual web page become visible, corresponding to the physical location of the device on the table. As this interaction style allows its user to manipulate the device directly as a physical object—where the whole of the device embodies its interactional means—this interaction technique can be related not only to direct manipulation in the sense of providing continuous feedback to incremental action, but also to tangible interaction.

Preliminary user assessments indicate that one interesting aspect of use of our Slide Scroller prototype (see *Figure 1*) is that users do not seem to experience being 'lost', which is frequently the case when scrollbars are used for navigating large surfaces.



Figure 1. The Slide Scroller prototype.

4 Hardware and Software Realization

The prototype implementation consists of a PDA, a taken-apart off-the-shelf optical mouse, batteries, and custom circuitry including a micro processor. This circuitry connects the PDA with the optical mouse sensor, which senses movement on underlying surfaces. For the communication link with the PDA, we make use of the PDA's infrared serial communication port. The software is written for the PocketPC platform using Microsoft Embedded Visual C++ and the GapiDraw graphical SDK.

References

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