Direct and Indirect Multi-Touch Interaction on a Wall Display

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ABSTRACT
Multi-touch wall displays allow to take advantage of co-located interaction (direct interaction) on very large surfaces. However interacting with content beyond arms' reach requires body movements, introducing fatigue and impacting performance. Interacting with distant content using a pointer can alleviate these problems but introduces legibility issues and loses the benefits of multi-touch interaction. We introduce WallPad, a widget designed to quickly access remote content on wall displays while addressing legibility issues and supporting direct multi-touch interaction. After briefly describing how we supported multi-touch interaction on a wall display, we present the WallPad widget and explain how it supports direct, indirect and de-localized direct interaction.

Key Words
Multi-touch; large display; direct interaction; indirect interaction; de-localized interaction.

ACM Classification Keywords
H.5.2 Information Interfaces and Presentation (e.g. HCI): User interfaces.

INTRODUCTION

Multi-touch wall displays make it possible for one or more people to interact with computing systems on an unprecedented scale. Co-localized touch-based interaction with the displayed content contributes to a high feeling of directness, but interaction with remote content can quickly become tiring and inefficient due to the required body movements. Objects of interest might be hard to perceive and reach if at the opposite end of the display, for example. Moving closer might help perceive them, but the objects might still remain out of arm's reach. Other users might also be standing on the way, or one might not want to move for some reason. These problems are even more acute when using legacy applications originally designed for smaller screen sizes: desktop applications heavily rely on widgets that can not be moved easily (e.g. menus, toolbars and scrollbars) and that are automatically placed in locations far from ideal on large displays, for example.

Specific techniques are direly needed to properly support multi-touch interactions with legacy and modern applications on large displays. Previous work has investigated the combination of direct and indirect interaction [7], techniques to bring remote objects within arm's reach [2, 3] and interaction at a distance through an on-screen portal [10] or a mobile device [5]. However each of these solutions provides only partial answers to the above issues and multi-touch interaction at a distance in a multi-user context introduces additional challenges. In this paper, we present WallPad, a widget designed to address all of the above issues and the limitations of the current state of the art. WallPad supports elegant creation through a simple gesture, easy access to remote content, and precise direct, indirect and de-localized multi-touch interaction with it.

After a description of the context and our original motivation for this work, we present WallPad and its different features before presenting and discussing previous works related to multi-touch interaction on large displays.

CONTEXT AND MOTIVATION

Most Virtual Reality rooms built in the 1990s and 2000s were based on a large stereoscopic display. They typically used a 3D tracking system to support interaction with the virtual world, and a mouse and a keyboard to interact with the operating system and auxiliary 2D applications. At the time of their design, these VR rooms were clearly technologically advanced and considerable amounts of money were spent to realize them. But as interactive surfaces have become more and more popular in other contexts, the lack of support of their wall display for touch-based interaction certainly contributes to a diminished interest in them today. Our motivation for this work was the desire to upgrade an existing VR room to support multi-touch interactions.

Despite the many hardware and software technologies available for multi-touch interaction, supporting it in a VR room actually remains quite a challenge. The room configuration is often the result of different trade-offs and so cannot necessarily be easily changed. The screen is seldom flat and the image often produced by a carefully calibrated multi-projector system, for example. Ideally, one would like the hardware and software additions for multi-touch sensing to be cheap, easy to set up and with

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