

WindowSpaces to share our digital media

Keith Shu, Colin Swindells, Denis Chai

School of Computing Science
Simon Fraser University
Burnaby, BC V5A 1S6 Canada
+1 604 291 4371
{ksshu, swindell, dchai}@sfu.ca

Kori M. Inkpen

Faculty of Computer Science
Dalhousie University
Halifax, NS B3H 1W5 Canada
+1 902 494 2093
inkpen@cs.dal.ca

ABSTRACT

In this paper we describe the WindowSpaces system, designed to facilitate the sharing of digital media between collocated individuals in an ad hoc face-to-face setting. WindowSpaces promotes the seamless sharing of experiences embodied in digital media between multiple participants within dynamical contexts.

Keywords

Digital media, face-to-face, collaboration, wireless network

INTRODUCTION

People share experiences when they look at photographs, listen to music, or read books. At the most basic level of the experiences that we share is the medium for that experience. Books, paintings, music and photographs are all media for the experiences that we share. We collect these things so that we can share them with others. We allow others to experience the media that we do. A bond forms because of these shared experiences. Our interactions are so much a part of our lives that we no longer consciously think about them. But as technology becomes more pervasive, the medium for our shared experiences becomes less tangible. We cannot share experiences in the natural way that we share physical media. A digital medium forces us to think differently about how we organize and share our shared experiences.

WindowSpaces explores this problem by creating an environment rich in digital artifacts that can be shared easily within ad hoc networks. Within this environment we can study different metaphors and techniques that apply to the act of sharing and organizing our digital world. Our work has focused on building the infrastructure to support this interaction and we are now ready to study user reactions to such an environment.

RELATED RESEARCH

Systems such as CODA and BAYOU have tackled the problem of maintaining availability and synchronization in distributed file systems [3,4]. New systems such as JavaSpaces use similar notions of space in a distributed environment to manage simple objects [1]. Huang et al look

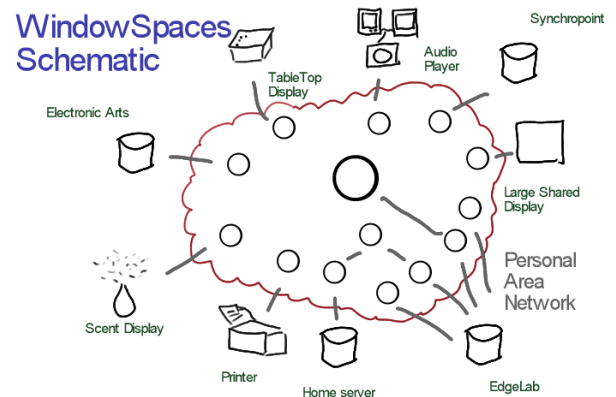


Figure 1: WindowSpaces Concept

at how pervasive computing is changing how we look at common everyday objects as well as how to use these objects in a smart world [2]. Whittaker et al examined how people participated in mobile meetings in the workplace and discussed how technology is noticeably absent in these situations [6]. WindowSpaces addresses the need for fluid exchange of media during such meetings.

SYSTEM

Figure 1 illustrates the WindowSpaces concept. As several people dynamically form groups with their personal devices and other devices within their vicinity, a personal area network (PAN) is formed. For example, several people can meet in a coffee shop to discuss a recent ski trip. Each person may have digital photos, audio clips, etc. that they may wish to share at various times during their conversation. The group has a collective information space (represented as the cloud in Figure 1) and an assortment of spaces representing displays, filesystems, and printers. The information is collectively available regardless of whether it is stored on local or remote devices. Thus, WindowSpaces is a common 'glue' that enables users to seamlessly utilize each other's spaces while taking advantage of locally available resources.

Our WindowSpaces system was built on Sun's JINI network infrastructure. It allows the robust creation of ad hoc networks and support for service oriented processes. WindowSpaces treats users and spaces as services. Spaces are virtual containers that store our digital artifacts. Spaces

abstract the concept of the physical location of our digital media, making it easier to organize and share experiences. Spaces also homogenize how we interact with our digital artifacts. For example, rather than printing a digital artifact, we put our digital artifact into a printing space, which automatically selects the right application to print it. We can apply this same concept to view digital artifacts on a display.

Our initial systems design centered on a robust modular security model, where different security implementations could be interchanged as required. A shell interface was developed. This allowed various design teams to concentrate on the design of a graphical interface by mimicking the operation of the shell interface, without having to worry about the system infrastructure.

INTERFACE DESIGN

Overview

Figure 2 shows a screen capture of our prototype user interface (UI). Our interface focuses around the concept of an active PAN containing a group of people and spaces. Locally accessible people and spaces are grouped into a common group called *Others*. Spaces and people can be quickly added or removed from the active PAN. By default, as people and their devices come on or off the ad hoc network, they are automatically made visible or invisible within the system, respectively.

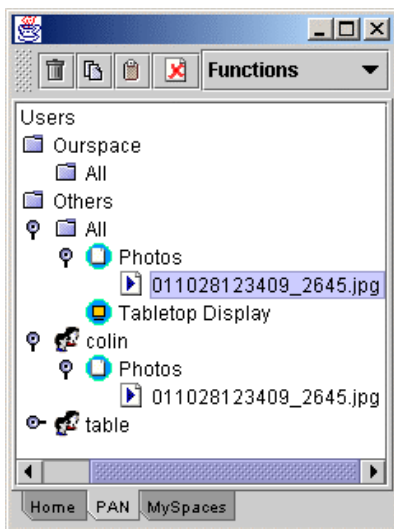


Figure 2: WindowSpaces screenshot

We utilized Java components to build a platform independent system that has been tested on Windows, Linux, and SavaJe operating systems.

Collaborative Interactions

To facilitate collaboration among multiple people, our interface design enables one-to-many and many-to-one relationships. For example, by placing a photo in a shared filesystem space, the photo is simultaneously made available to many people. Several people can also simultaneously place their photos into a shared tabletop display space. The system also abstracts the ownership of

media such that a user can look for photos without knowing the photo's owner. Alternatively, users may browse media organized by user.

RESEARCH DIRECTIONS

We are currently designing a formal user study to evaluate our interface and usability models. We will gain qualitative insights into how different people would use a collaborative environment such as WindowSpaces. We will then refine our interface with the knowledge gained from our user study.

We are in the process of addressing several interface issues. Visualization of the services is difficult not only on small displays, but on large displays where WindowSpaces is the secondary focus. We are exploring continuous zoom management of the information spaces to resolve the screen real-estate issues. This analysis would include improved information search and filtering methods. We are also contemplating synchronization issues associated with shared files. For example, what happens when two or more people try to modify a shared file? How can a user access shared files when working off-line? A more robust file storage system such as CVS may resolve synchronization issues. Finally, we are taking steps to ensure that our system conforms to Weiser's notion of calm computing so that it is unobtrusive in social settings [5]. We intend our system to be peripheral like a wristwatch, not obtrusive like a mobile phone.

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