# The Escritoire: Remote Collaboration in a Task Space

Mark Ashdown & Peter Robinson, University of Cambridge Computer Laboratory, UK

Introduction

The term *person space* can be used to describe the sense of presence between group participants in a videoconference that can see each other's facial expressions and gaze directions, and the term *task space* can be used to describe copresence in the domain of the task being undertaken. The videophone was introduced in the 1960s, but videoconferencing is still not commonplace. We argue this is because, for many tasks, a task space is much more useful than a person space, and the audio channel of a telephone call would more usefully be augmented with a graphical space in which the speakers can share data such as documents and images.
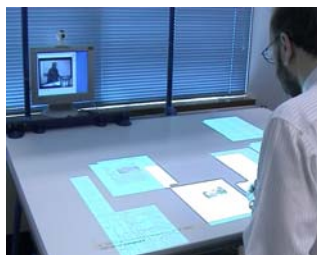
We have created a system called the Escritoire that presents the user with a horizontal desk-sized display on which documents are displayed life-sized. Two or more Escritoire desks can be linked to allow users to collaborate.
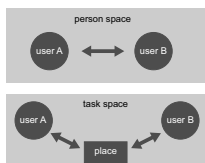

Foveal Display

To create a display that is as large as a desk but can also display a life-sized document at a legible resolution, we have combined two projectors to create a foveal display. The desk fills much more of the user's visual field than a conventional monitor and allows her to arrange many items so they can be quickly glanced at to identify them, and quickly grabbed and brought to the fovea if they are needed.
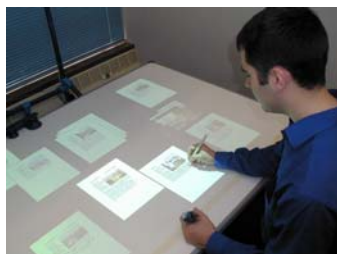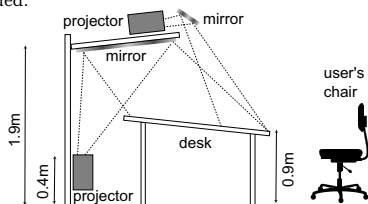

User Interface

We have combined an accurate desk-sized digitizer with a less accurate ultrasonic whiteboard pen to get simultaneous input with two hands. The more accurate pen is for the dominant hand. We have implemented three cursor options: no cursor, cross hair, and trace. The cross hair allows one user to point out locations to another, and the trace allows richer gesturing in the graphical task space.
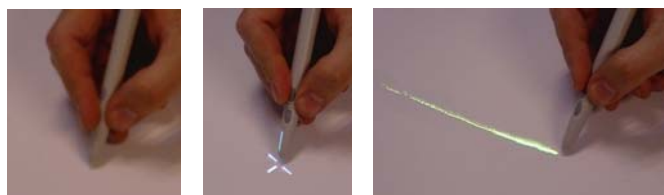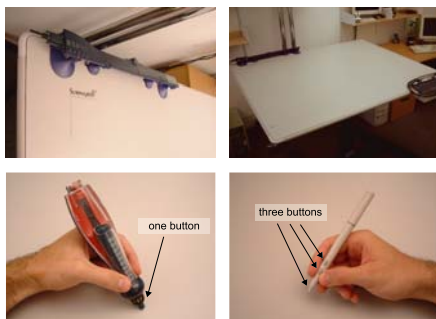

Network

We have split the Escritoire into a client and a server which are connected by TCP/IP. Multiple stateless clients connect to a single server to allow participants to collaborate in a WYSIWIS (What You See Is What I See) manner.
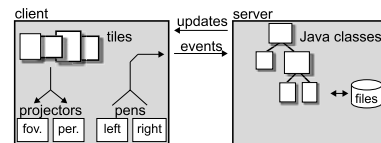
The system-dependent client written in C++ simply displays an ordered list of *tiles*, which are bitmaps. The system-independent server written in Java processes the classes behind the tiles. We have Java classes for images, PDF documents, VNC clients, and piles that allow documents to be grouped and browsed. The protocol between the two automatically switches from server-push to client-pull mode.
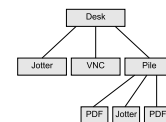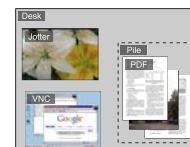
User Tests

To test the collaborative system we used pairs of participants who were located at the University of Cambridge Computer Lab, and Thales Research about 100 miles away. The participants worked together to find the best house from a group of houses. The participants were linked by a DSL link delivering 256kbps which was shared between the audio, video, and desk channels.

Results

All of the participants immediately understood the concept of interacting through the desk while conversing over the video conference link. After they used the desk system on their own they did not need any extra training to use it for remote collaboration. Although in single-user tests users preferred to have no cursors, in these collaborative tests they preferred the pen traces. When questioned about the usefulness of the three communication channels available to them, users said the audio and desk channels were very useful, but found the video channel much less useful. Two participants would have liked a different assignment of functions to pens, and two would have liked private workspaces where they could make notes that would not be seen by the other person.

Conclusions

The desk of the Escritoire provides an interface that is more like manipulating papers on a real physical desk than the conventional desktop metaphor. Users required minimal training to use the system, and no extra training to use it for collaborative work, which indicates the inherent usability of the interface. They found pen traces distracting when working on their own, but found them very useful when working collaboratively - the traces allow users to gesture to each other in the task space that they share, and provide continual lightweight feedback that allows one user to stay aware of the actions of another. Further user testing could determine an optimal assignment of functions to pens that would allow the two-handed techniques that are most useful..

References

Mark Ashdown and Peter Robinson, The Escritoire: A Personal Projected Display, in Proceedings of WSCG 2003, Pilsen, Czech Republic, February 2003.

Mark Ashdown and Peter Robinson, Experiences Implementing and Using Personal Projected Displays, Procams workshop at ICCV 2003, Nice, France, October 2003.

Mark Ashdown, Personal Projected Displays, PhD Thesis, University of Cambridge, to appear early 2004.

http://www.cl.cam.ac.uk/Research/Rainbow/

http://www.mark.ashdown.name/

UNIVERSITY OF CAMBRIDGE

THALES
Thales Research, UK