The Shared Design Space

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Abstract

The Shared Design Space is a novel interface for enhancing face-to-face collaboration using multiple displays and input surfaces. The system supports natural gestures and paper-pen input and overcomes the limitations of using traditional technology in co-located meetings and brainstorming activities.

CR Categories: H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems— [H.5.3]: Collaborative computing—Computer-supported cooperative work

Keywords: Augmented Reality, Tabletop Environment, Sketching, Design Room, Design Environment

1 Overview

The project is part of the research project "Office of Tomorrow", a collaborative tabletop environment, designed for presentations and discussion meetings. In this installation we particularly focus on a novel ubiquitous environment for sketching, drawing, and brainstorming. The application incorporates multiple devices and novel interaction metaphors to create an easy-to-use environment. The installation offers a cooperative and social experience by allowing multiple face-to-face participants to interact easily around a shared workspace, while also having access to their own private information space and a public presentation space. The installation itself consists of two modules:

1. An Interactive Table, which combines the benefits of a traditional table with all the functionalities of a touch sensitive digital table and display.

2. A Digital Whiteboard, consisting of an optically tracked rear-projection-screen that displays digital content and captures user gesture input. Combined with the Interactive Table, data can be seamlessly transformed from all presentation sources to the presentation wall.

Both devices can be used simultaneously and combines input and output on one surface. Based on these two devices, we implemented several novel interaction metaphors. Moreover, we combined the usage of traditional input devices (e.g. laptops) with digital pen input using real and virtual paper. Users can create imagery (e.g. scenario sequences, scribbles, 3d content) on their own personal computers, move them to the Interactive Table for discussion, and present them to the audience by using the Digital Whiteboard. The combination of digital information and real paper is realized by using the Anoto pen and its paper technology. Anoto-based pens are ballpoint-pens with an embedded camera that tracks the movements simultaneously. The pen has to be used on a specially printed paper with a pattern of tiny dots. In our setup, we use this technology to combine real paper with digital augmented content. Participants can make annotations on digital content that is projected on the top of the paper surface. The paper itself is tracked by using computer vision techniques and special ARTag markers [Fiala 2004]. Special control elements on the paper allow a copy of the digital data to be made to the private spaces of the collaborators. Thus, once one participant finishes making an annotation, he or she can send it to the other's workspace on the Interactive Table and they can modify it accordingly. While one participant is writing on real paper, the collaborators get a "digital copy" projected on their own paper and all modifications by the first participant are projected onto the paper sheets of his/her collaborators.

Figure 1: Videos, images, and 3d objects can be projected on the paper and be combined with annotations made with the digital pen.

The Shared Design Space allows people to communicate as they normally would around a table and points to a future where computers will be able to naturally support face-to-face meetings and creative design sessions. More details (papers, pictures, movies), illustrating our system in action, can be found online at: `http://www.coeno.org`.

References

FIALA, M. 2004. Artag revision 1, a fiducial marker system using digital techniques. Tech. Rep. NRC 47419, National Research Council of Canada.