

# Visual End User Configuration of Hybrid User Interfaces

Christian Sandor  
Department of Computer  
Science, Columbia University  
500 West 120th St., 450 CS  
Building  
New York, NY 10027, USA  
sandor@cs.columbia.edu

Blaine Bell  
Department of Computer  
Science, Columbia University  
500 West 120th St., 450 CS  
Building  
New York, NY 10027, USA  
blaine@cs.columbia.edu

Alex Olwal  
NADA, The Royal Institute of  
Technology  
Teknikringen 14  
100 44 Stockholm, Sweden  
alx@kth.se

Surabhan Temiyabutr  
Department of Computer  
Science, Columbia University  
500 West 120th St., 450 CS  
Building  
New York, NY 10027, USA  
st234@cs.columbia.edu

Steven Feiner  
Department of Computer  
Science, Columbia University  
500 West 120th St., 450 CS  
Building  
New York, NY 10027, USA  
feiner@cs.columbia.edu

## ABSTRACT

Hybrid user interfaces are a promising paradigm for human-computer interaction, employing a range of displays and devices. However, most experimental hybrid user interfaces use a relatively rigid configuration. Our demo explores the possibilities of end users configuring the setup of a hybrid user interface, using novel interaction techniques and visualizations, based on a shared augmented reality.

## Categories and Subject Descriptors

H.5.1. [Information Interfaces and Presentation]: Multimedia Information Systems—*Artificial, augmented and virtual realities*; I.3.6 [Computer Graphics]: Methodology and Techniques—*Interaction Techniques*

## General Terms

Human Factors

## Keywords

Hybrid User Interfaces, End User Programming, View Management, DWARF

## 1. INTRODUCTION

In hybrid user interfaces [3], information can be spread over a variety of different, but complementary, displays, and users interact through a potentially equally varied range of interaction devices. In

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Figure 1: Relationships between physical and virtual objects in AR. (mock up)

the unplanned, everyday interactions that we would like to support, we would not know in advance the exact displays and devices to be used, and how they would be configured, or even the users who would be involved. In fact, all of these might even change during the course of an interaction. To make this possible, our demo explores how end users might control: *Which* information is displayed on which screen, and at what size, orientation, and position it is presented. *What* input devices control which information. *Who* can see which information. *How* information objects behave dynamically.

## 2. DEMO DESCRIPTION

Our demo has two parts:

1. A running hybrid user interface that can be simultaneously manipulated by several attendees. Several input devices are used to interact with virtual objects on multiple displays.
2. An augmented reality configuration tool that is presented on head-worn displays. This component allows a user to adjust

the characteristics of the hybrid user interface in the ways mentioned in Section 1.

For example, two interacting users might be engaged in the following simultaneous interactions: *Zoom*: One user employs a physical dial to adjust the zoom-factor of a virtual model projected on a tabletop surface. *Rotation*: A second user manipulates a 6DOF-tracked device to rotate a virtual object on a shared display screen. *Share*: The first user shares information that is displayed on his personal hand-held display by copying its contents onto the shared screen.

We control and visualize these relationships through information overlaid on the world using see-through headworn displays. Compared to earlier examples of hybrid user interfaces [3, 4], our focus is the control of the relationships by the end user. To realize this scenario, we build upon several previously developed technologies [1, 2].

### 3. REFERENCES

- [1] M. Bauer, B. Bruegge, G. Klinker, A. MacWilliams, T. Reicher, S. Riss, C. Sandor, and M. Wagner. Design of a component-based augmented reality framework. In *Proceedings of ISAR 2001*, 2001.
- [2] B. Bell, S. Feiner, and T. Höllerer. View management for virtual and augmented reality. In *Proceedings of UIST 2001*.
- [3] A. Butz, T. Höllerer, S. Feiner, B. MacIntyre, and C. Beshers. Enveloping users and computers in a collaborative 3D augmented reality. In *Proceedings of IWAR 1999*, 1999.
- [4] J. Rekimoto and M. Saitoh. Augmented surfaces: A spatially continuous work space for hybrid computing environments. In *Proceedings of CHI 1999*, 1999.