Boom Chameleon: Simultaneous capture of 3D viewpoint, voice and gesture annotations on a spatially-aware display

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Abstract
We review the Boom Chameleon, a novel input/output device consisting of a flat-panel display mounted on a tracked mechanical armature. The display acts as a physical window into 3D virtual environments, through which a one-to-one mapping between real and virtual space is preserved. The Boom Chameleon is further augmented with a touch-screen and a microphone/speaker combination. We created a 3D annotation application that exploits this unique configuration in order to simultaneously capture viewpoint, voice and gesture information. Results of an informal user study show that the Boom Chameleon annotation facilities have the potential to be an effective, and intuitive system for reviewing 3D designs.

CR Categories: I.3.6 [Computer Graphics]: Methodology and Techniques - Interaction Techniques; I.3.7 [Computer Graphics]: Three-Dimensional Graphics and Realism – Virtual Reality

Keywords: 3D navigation, annotation, gesture, voice, spatially-aware display.

1 Introduction and Design Philosophy
Tools for the creation and modification of 3D models have become incredibly sophisticated and powerful. In contrast, the technology for annotating these models has been left far behind, resulting in a gaping discontinuity in the high-technology workflow. An effective annotation system that addresses this gap is likely to prove extremely useful in industry and offers exciting design opportunities for creating a compelling and interactive user experience.

2 Boom Chameleon System
The Boom Chameleon is a novel input/output device that we built consisting of a flat panel display mounted on a mechanical armature that is tracked in 3D space. The display acts as a physical window into 3D virtual environments, through which a direct one-to-one mapping between real and virtual space is preserved, and moving the display in physical space changes the corresponding viewpoint into the virtual world. The virtual viewpoint reacts immediately in response to changes in the position and orientation of the physical display. We have found that coupling virtual space with physical space in this manner provides a very simple and easy method of examining a 3D model, and takes advantage of our everyday intuition and skills in manipulating physical objects.

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In order to capture the information expressed during a design critique, we augmented the Boom Chameleon with a microphone and touch screen overlay. Our design philosophy with the Boom Chameleon was to have annotations that could be created with minimal overhead and user pre-planning. In order to accomplish this we constantly record all streams of annotation data, including viewpoint, voice and gesture information. After recording is complete, users may save or playback the annotation session. Our results suggest that because the user does not need to explicitly engage different annotation tools to record different types of information, a richer and more fluid set of annotations is created when compared with a more modal approach to annotation entry.

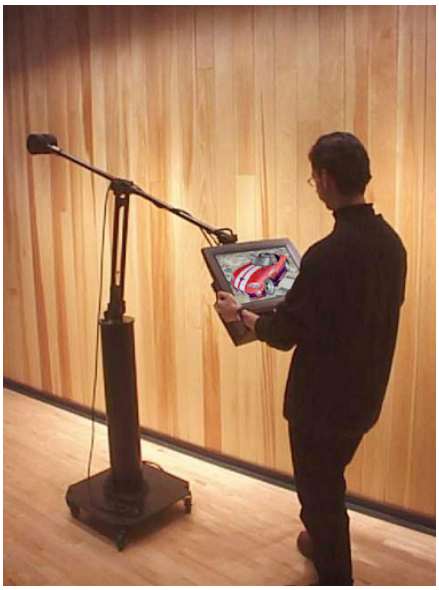

Figure 1. Boom Chameleon prototype.

3 Conclusions
Our work with the Boom Chameleon has demonstrated that our "window on a virtual world" metaphor is an extremely intuitive and easy to operate 3D navigation technique. Although it provides for one specific type of navigation, we nevertheless feel that it could be used effectively in many applications where non-technical users require the ability to inspect virtual 3D objects. Informal studies using our annotation system have shown that users utilized the simultaneous capture of 3D viewpoint, voice and gesture and easily transitioned between the data types. Because of this, we believe that the Boom Chameleon has the potential to be an effective tool during the review of 3D designs.

Reference
Tsang, M., Fitzmaurice, G.W., Kurtenbach, G., Khan, A., Buxton, W.A.S. (2002). Boom Chameleon: Simultaneous capture of 3D viewpoint, voice and gesture annotations on a spatially-aware display. In Proceedings of UIST 2002, ACM Symposium on User Interface Software and Technology, CHI Letters 4(2), 111-120.