

## Joint Virtual Reality Conference of ICAT, EGVE and EuroVR, 2012

Current and Future Perspectives of Virtual Reality, Augmented Reality and Mixed Reality: Industrial and Poster Track





**Keywords:** Virtual reality, augmented reality,  
mixed reality, industrial applications

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**Current and Future Perspectives of  
Virtual Reality, Augmented Reality and  
Mixed Reality: Industrial and Poster  
Track, 17-19th October, 2012  
Madrid, Spain**

Edited by  
Angélica de Antonio (Universidad Politécnica de Madrid)



ISBN: 978-84-695-5470-8

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Technical editing Diego Riofrío  
Madrid, 2012

# A Mobile System for Collaborative Design and Review of Large Scale Virtual Reality Models

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**Abstract.** Several tools and research prototypes have been developed with the goal of improving the visualization, manipulation, design and review of 3D virtual reality models. However, most of the interactive technologies deployed in real world engineering contexts are still difficult to use. We present a novel virtual reality system specifically designed to support the needs of engineering teams working at oil platforms. CEDAR (Collaborative Engineering Design And Review) is based on multitouch and accelerometer input, and was designed and evaluated in close cooperation with researchers and engineers of a large oil industry company. The system allows the navigation, reviewing and annotation of 3D CAD (Computer-Aided Design) models in a mobile, collaborative context.

**Keywords:** virtual reality, interface design, collaborative interfaces.

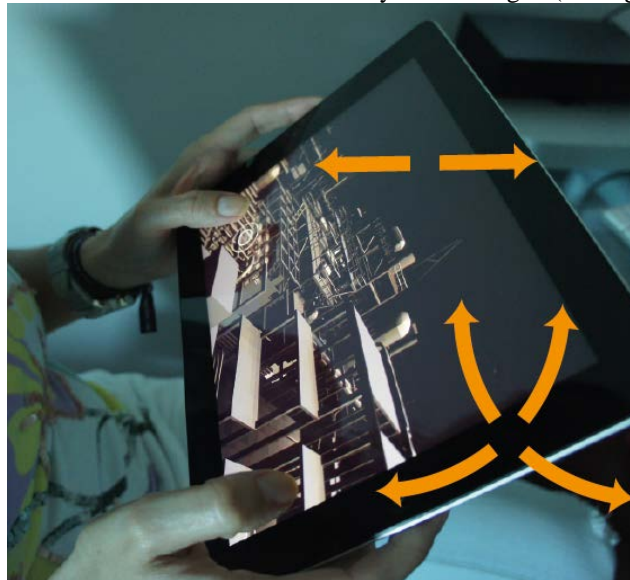
## 1. Collaboratively Reviewing 3D CAD Models

Virtual Reality (VR) user interfaces have revolutionized the way we work thanks to many aspects, including the combination of different input modalities [1]. On the other hand, multitouch technology has become mainstream and tablet-based multitouch has emerged as a mobile interaction style standard, especially due to the success of products such as the iPad.

Despite these significant advances, most of the VR tools deployed in real world design and engineering contexts are still regarded as being difficult to use, especially when engineering teams need to collaboratively visualize and review large scale 3D CAD (Computer-Aided Design) models. This is precisely what happens with the oil platform industry, which necessarily involves large teams that review, manipulate and discuss around large CAD models, which are sometimes difficult to visualize and navigate through. In this paper, we argue that the manipulation of CAD models can benefit significantly from the so-called natural interaction techniques [2]. More specifically, we present a new mobile-base system that employs multitouch and accelerometer inputs. This tablet-based solution can be useful for engineering teams that are interested in design and review tasks. This new VR multimodal interface was

designed to support those tasks in a mobile context of usage (e.g. one engineer at the offshore oil platform, another engineer at the central office in the mainland). The system allows the navigation, reviewing and annotation of 3D CAD models in a mobile, collaborative context, coupling a fast OpenGL-based framework with an efficient communication protocol. Annotations are performed by touching on a specific 3D point relevant to any of the engineering objects.

There are two variants of the CEDAR mobile user interface: multitouch-only and multitouch coupled with accelerometer-based input. The multitouch-only user interface uses two “joysticks”, which are used to navigate through the 3D platform. The left button is used to control the displacement along the Z-axis (i.e., moving forward or backwards), the right button is used to simultaneously control the X and Y position of the camera (i.e. where the user is looking at). In the second version, we replaced the right “joystick” button with accelerometer-based input, so that users can move forward or backwards using the left button, but can simply tilt the tablet device left/right or up/down in order to control where they are looking at (see Figure 1).



**Figure 1.** The multitouch + accelerometer-based (MT+A) interface uses a “joystick” at the left side of the screen, but adds the accelerometer to control where the user is looking at.

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