Window Seat: Interactive Chairware for Experiencing Virtual Spaces

Keywords
Chair, UI, Handyboard, Camera, Tangible Media, Virtual reality

Abstract
Window Seat is an interactive furniture for navigating and viewing remote locations such as architectural buildings or scaled model. We custom built a rocking chair with interactive armrests serve as an interface to control the two axes movement of a camera in a remote site. A video projector and a mirror are mounted on the chair to display the interior space over to the wall of the user inhabited space to create the immersion of navigation through the space of either a virtual space or the miniature model of a space. That’s inhabitable (unoccupiable by human)

Computational capabilities are increasingly becoming embedded into our built environment. The shift from the visual computing with mouse and keyboard to ubiquitous, invisible, and tangible computing is expanding. Research development in HCI is moving toward tangible media. The concept of tangible media interface such as Bricks is to allow direct control of electronic or virtual objects through physical handles. Research on tangible media has been progressed, but most researchers have used the only table as media. For example, table is used as input device in “bricks” as graspable User Interface (Fitzmaurice, Ishii and Buxton, 1995), “metaDESK” (Ullmer and Ishii, 1997) and “DigitalDesk” (Newman and Wellner, 1992). In other hand we used a rocking chair as input device, so users just can walk and sit on the chair to immerse the interior space of remote location, in case architectural scale model. Making scale models of designs is common practice in architectural design. These models give an easy and better understanding of the spatial and architectural qualities of the design to clients and other stakeholders. A problem of these scale models is that people may have difficulty to imagining being inside the model, or to gain a sense of the interior view. Therefore we designed the project to provide interior view of unoccupiable scale model in our demonstration.

Our “Window Seat” project investigates how a built environment can be perceived and navigated through the interaction with a rocking chair. We are interested in how such daily device or appliances can serve as an input device to provide visual experience of a remote location or an unoccupiable physical space such as architectural scale model, a
virtual space or a nano space under microscope.

Therefore Window Seat is an ordinary peoples’ virtual reality interface because we used daily device unlike VR Interface such as HMD (Chung, et al 1990) or CAVE (Nelra, et al 1992).

The Window Seat is consisted of 5 parts; physical chair as input device, handyboard as control device like a ‘brain’, camera as ‘eye’, projector as display device, and images on the wall for immersive environment (Fig 1). Camera that cannot see in the Fig 1 is located in a remote place, in the case of our demonstration, it is inside an architectural scale model.

For representing two axes-movement (up/down and left/right), we achieved one axis movement by rocking chair and the other movement is achieved by pressure sensors inside of armrest on the chair. When the user control the rocking chair back and forth, the infrared sensor below the seat finds out the range from the floor. At the same time user can press the pressure sensors, these sensors act as switches. These values are transmitted to our brain, Handyboard. According to these values Handy board makes turn servo motors to pan and tilt the camera.

We used two servo motors attached at the right angle to control the pan and tilt of camera; if users control the chair back and forth, camera tilts and if users push the pressure sensors, camera pans to the left or right.

The current view of camera is projected to on the wall (screen). We put the project inside the back of the chair and used mirror reflect image out. Visual image from the project is projected to the mirror house, and then reflected to the front screen on the mirror. By a video projector we can create an immersive illusion for the users through displaying interior space images.

**Fig 1 Design Schematic Diagram**

*Screen:* Users can see the projected images on the screen on the wall in front of chair

*Infrared Sensor:* Beneath the chair an infrared sensor is attached to find range of distance with user’s chair control

*Pressure Sensors:* Inside of chair arms, two pressure sensors is attached

*Book Shelf:* Storing books and easy balancing chair

*Projector:* In the paper wrap, the projector is located, projects images to the mirror

*Mirror House:* To reflect projected images to the front screen
References


Ullmer, Brygg and Ishii, Hiroshi, “The metaDESK: Models and Prototypes for Tangible User Interfaces”, UIST 97. 223-232