Kinect© as Interaction Device with a Tiled Display

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Abstract. The use of high resolution tiled display has become popular in the scientific community. User interaction with these devices depends on the hardware configuration and the software in use. The variety of hardware configurations and software generates various types of execution modes and interaction in the tiled display, this diversity has resulted in not having a standard for human computer interaction. This paper shows the results of the interaction between users and the tiled display using the Kinect©. The results help us find improvements in hardware configurations of this arrays of displays, applications design and try to find standards in defining user-defined motion gestures.

1 Introduction

The use of high resolution tiled display has become popular in the scientific community. They are used for collaborative work and for the deployment of information and navigation of large data volumes. Current research on human computer interaction in the tiled display is focused on two main points: the perception of information displayed and control applications. User interaction with these devices depends on the configuration of hardware for controlling video wall (visualization server or visualization cluster) and the applications running on it. Applications running on these devices can be of two types: distributed applications or desktop applications.

Distributed applications are developed to take advantage of the hardware features of the visualization cluster. When the application is running on the cluster, it is very common to use the master node (or front-end node) as responsible for the interaction with the application running on the tiled display. These applications are for very specific purpose and user interaction with the device is made from the master node. In this case, the user interaction with the tiled display is limited to a set of basic operations that fulfill the functionality of the application.
Desktop applications take advantage of the operating system’s ability to export graphical interface to tiled display either the case of a visualization cluster or visualization server [TS][NJ]. The scalability of desktop applications depend on the capabilities of operating system and graphics cards. When wing applications running in an extended desktop, the user can work through the master node (for example, in case of using the VNC protocol) or directly on the arrays of displays (for example, when using XDMX). User interaction is with the window manager or the graphical user interface of the operating system. The user interacts with the window manager using mouse, keyboard or combination of both.

The variety of hardware configurations and software generates various types of execution modes and interaction in the tiled display, this diversity has resulted in not having a standard for human computer interaction [YN]. On the one hand the problem is show de information for the users and the other hand the application control. Furthermore, when adding new specific use applications, they are restricted to only user interaction that is in the master node [TS][CC][HH][NJ]. User interaction is limited to the capabilities of the master node. When applications working at a desktop, some interactions mechanism can have a critical impact, for example, mouse manipulation, can cause functionality problems if not cared Fitt’s law [BN1][BN2]. It is possible to take advantage of MOCAP technology, specifically the Kinect®, to provide the user with an intuitive means that permits them to interact with tiled display applications. This approach allows user mobility along the tiled display freeing interaction with the master node and to define a set of gestures to control applications running on the tiled display.

In this paper, we present the results and proposals to use the Kinect® as interaction device with a tiled display. This tiled display is controlled by a cluster of Apple Mac Mini [NC]. Interaction experiments reported in this paper are related to the control of the tiled display desktop through VNC protocol and several special-purpose distributed applications, such as an image viewer, a web browser and ParaView. The applications have been selected to cover the widest possible use case. For interaction with applications, we tested a set of gestures (proposed in other works and added some) [AG][KB], that through Kinect®, are interpreted to perform specific actions on the tiled display or in the desktop of the master node. Tests were conducted to emulate the behavior of the mouse and keyboard. In particular, for the case of interaction with widgets that respond to the keyboard events, such as text fields, we use the technique of virtual keyboards (common in environments of smartphones with touch screens), and we did a comparative metrics based on usability, functionality and effectiveness between the keyboard virtual (stylus based) and 8pen Android keyboard.

2 MOCAP Technologies

The motion capture, motion tracking or MOCAP are terms used to describe the recording process and translating of that motion into a digital model. This