

Abstract

The technological evolution has resulted in a series of benefits to the Virtual Reality area. Now it is possible to represent knowledge in an interactive way where visual, haptic and audible aspects are combined, allowing for the improvement of our perception, imagination and manipulation.

Virtual Reality scientists are always improving the interaction with the users using friendly environments and sophisticated tools. Nevertheless, the construction of a virtual environment involves many tasks, such as multi-screen displaying, computer-simulated worlds, stereoscopic techniques, manipulation, navigation, sound, etc.

This dissertation focuses on the construction of virtual environments, and the results of this research is specially directed to researchers of public and private Universities and others Institutions, which have the challenge of constructing a virtual environment.

This work presents a set of contributions towards building a variety of virtual environments. It specifically includes:

- A proposed model for building virtual environments using multiple screens placed at arbitrary positions and orientations.
- A mathematical description for determining the space requirements and building multi-screen environments (CAVEs) of specific dimensions.
- The adaptation of three stereoscopic devices: a Cazes-type stereoscope, a Wheatstone-type stereoscope and a boxed-type stereoscope.
 - o Proposed model for a Cazes-type digital stereoscope and equations for computing the size of the mirrors involved.
 - o Proposed model for a Wheatstone-type digital stereoscope and a mathematical description of the proposed for computing the dimensions of the stereoscope
 - o Proposed model for a Boxed-type digital stereoscope
- Analysis and study of the behavior of sound on combining: "Navigation, 3D objects and 3D sound" and mathematical solutions to problems of coherence of sound.
- A proposed model for building adaptable virtual environments and an analysis of three kind of manipulations

The results obtained in othis research allow for the construction of open and flexible virtual environments, from very simple models to somewhat complex ones