Architectural References to Virtual Environments Design

Rodrigo García Alvarado, Juan Carlos Parra, Rodrigo Lagos Vergara, Hernán Barría Chateau

Keywords
Virtual environments, spatial perception, design methodology

1. INTRODUCTION.

Based on a comparison between the perception of digital and real construction, the development of virtual systems and the review of additional sources, this paper states some differences between the design of virtual environments and architectural spaces.

Virtual-reality technologies provide advanced capabilities to simulate real situations, and also to create digital worlds not referred to physical places, such as imaginary landscapes or environments devoted to electronic activities, like entertainment, learning or commerce.

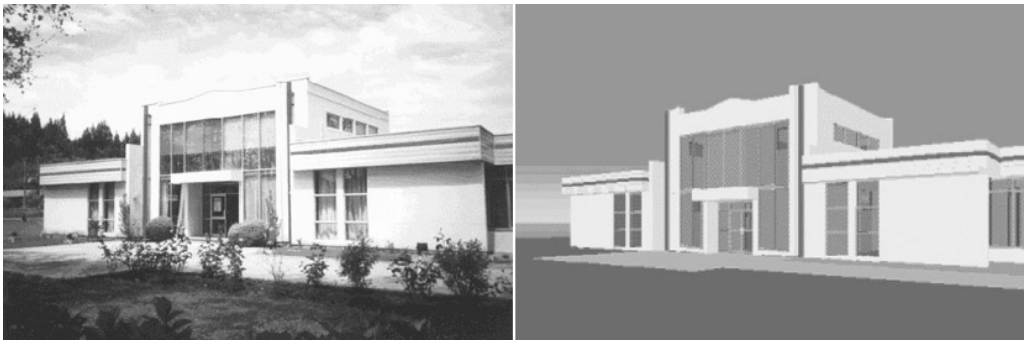
Some on-line services already use 3D-stages, resembling building halls and domestic objects, and several authors [1, 2, 3] have mentioned virtual modeling as a job opportunity to architects. But it will argue in this paper that the design of those environments should consider their own digital characteristics.

Besides, the use of virtual installations on networks impells a convergence with global media, like Internet or TV. Virtual environments can be a 3D-evolution of communicational technologies, which have an increasing participation in culture, reaching a closer relationship to contemporary architecture.

2. REAL/VIRTUAL COMPARISON.

To examine effectivity of virtual systems on architectural representation, our team of researchers carried on a comparison of spatial perception. Freshmen students of architecture toured a computer model of our Faculty of Business; 15 students used HMD-helmet, 15 navigated on screen, and another group visited the building. After that, all of them answered a questionnaire about the experience.

Similar studies [4, 5, 6, 7, 8] have reported a fair understanding of virtual spaces with some reduction of sizes, loss of orientation and technical bias. Our evaluation was based on general descriptions of architectural living [9,10,11, 12, 13]; asking about configuration of rooms and building, proportions, associated feelings, semantic interpretation, constructive elements, urban and geographical context and duration of experience.



The results showed an overall match between perception through real visit and virtual media. Although usually it claims the abstraction of digital models, students correctly identified the material properties, more by deduction than visual information. They also properly inferred the location of building. The main divergence between the two experiences was a low understanding of the spatial organization with virtual media, especially with helmet (20% against 80% of the real visit), and also the intensivity of feelings and time. According to those results, virtual models should supplement information of layout and control emotions to represent buildings accurately. On the other hand, digital spaces show thoughtless of major distribution and a qualitative potential.

3. TECHNICAL DEVELOPMENT.

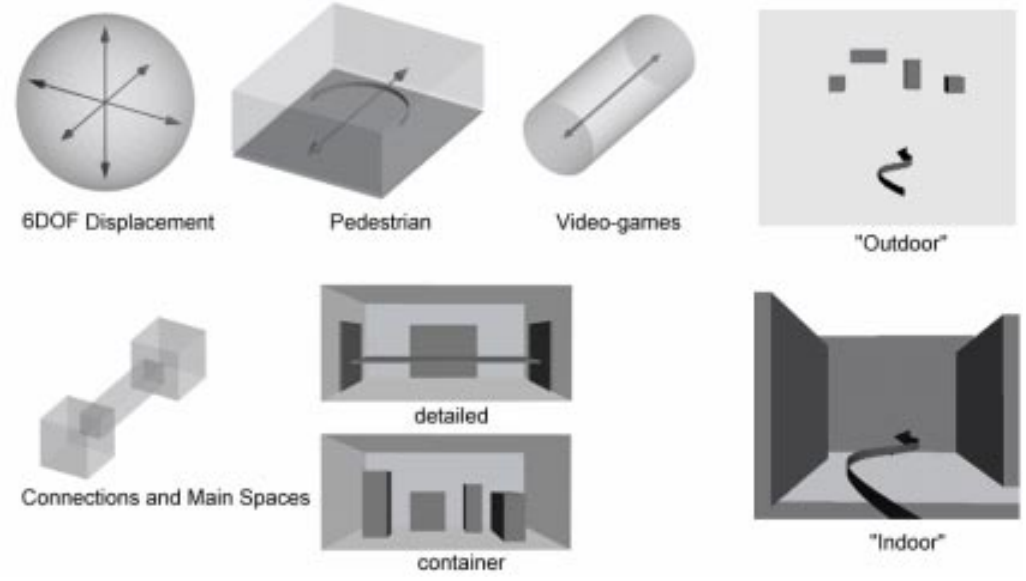
The modeling of a virtual environment involves a 3D-geometry, mapped textures and programmed movements. Occasionally, it adds sounds and physical attributes. Including user interaction with real-time displacement, graphic rendering and manipulation of objects.

The possibilities of displacement induce the shape of environment, for example six-degrees-of-freedom (X,Y,Z translations and turns) allows a spheric surround. Usually the systems enhances front movement (go-ahead and back) and rotation to the sides (left-right), resembling the pedestrian walking, assuming a basement and a horizontal space. Some video-games release lateral turns and increase displacement, getting a cylindrical corridor for quick actions.

The speed of user movement in relation to graphic objects suggests the size of environment. Slow displacement and separated elements look like "outdoor", frequently with horizon. Quick movements and occlusion with large figures appear as "indoor", expecting to find "thresholds" to other spaces.

3D-environments set-up in Internet (like www.activeworlds.com) and electronic entertainments usually have a structure of main spaces and connections. Wide rooms with detailed contour and floors for different activities, sometimes containing minor volumes. Connections are long hallways, not arranging rooms like an aisle of building, but only for rush circulation.

Frequently moving from one place to another is made by selection of files or by quick changes of point-of-view, to accelerate the activity, getting a fragmented living. Also, immersive devices generate a dissociation between the gestures of user and his physical situation and human companies. Virtual installations are initially used with external oral-



guide and well-known backgrounds (castles, skylines or woods), and the experience is described narratively and evaluated in emotional terms.

4. APPROACHES TO VIRTUALITY.

Cultural discussion of virtual media enhance its spatial discontinuity [14], velocity and compressing of distances [15] linguistic potential and sensitivity of images [16]. Some proposals to develop digital spaces embraces; spatial concepts and acoustic references[17], narrative promenades [18], anthropologic concepts [19], landmarks and procedures [20], psychological archetypes and environmental patterns.

In general those approaches regard the *appearance, semantic* and *activity* of digital systems. Similar to the first cognitive concerns when someone arrives into a new environment; *what is it?, what does it means?, what can I do?*. Relating these concepts to architecture, there is a correspondence between the function of building and activity on virtual spaces. The aesthetic composition is targeted to communicate meanings, and the constructive structure is replaced by the visual emphasis of media. That corresponds to decay of arrangement and potentialities showed on comparison and development.

Apparently, the immateriality of digital environments weak spatial organization more than properties of elements. Although they give a sensation

of depth, it is in a close range. Virtual spaces loose sense of adjacency and distribution that is a core part of design of buildings. Then, would be not appropriate to use the same architectural models for electronic activities, or like virtual extension of constructions.

5. GUIDELINES TO DESIGN.

An important order of virtual experience seems to be the timeline, so a method of graphic layout looks not enough to design digital environments, it should combines with an script or story-board. Probably with several courses of action, like an algorithm of data-management, but integrated in a 3D-geometry.

This spatial, narrative and interactive strategy must also consider several differences to physical design. Predominance of internal views, separation or crossing of elements, and complex shapes without constructive regulations. Integrity of design from the whole to minor objects, finishings and operations, including sounds and increasingly other senses in a multimodal coordination. Avoiding saturation that produces confusion, but using redundancy to reinforce perception. Instead of human body like reference to dimension spaces and objects, in the virtual environments the memory looks as basis of visual lecture, semantic interpretation and motor action. Although some abstract compositions are shown as examples of virtual worlds, recognition of elements and basic perceptions (like hierarchy, figure and ground) are important for operative environments. Finally, an architectural sensibility could contributes to define meaningful and attractive spaces for virtual activities.

Like a practical test we are developing a "*center of news*"; a virtual place for daily information. Combining visual display of broadcast, flexibility of newspaper and global possibilities of Web-sites, with 3D-reproductions of some happenings (traffic crashs or sportive events). This proposal doesn't have a building alike, then it's require to design spaces and procedures, exploring a way to build new worlds.

REFERENCES

1 **Zampi, Giuliano and Lloyd Morgan, Conway.** Virtual Architecture**. Ed.Batsford, London,1995.**
2 Bermudez, Julio and King, Kevin; **Architecture in Digital Space**. In proceedings of ACADIA'95, University of Washington, Seattle, 1995.
3 Anders, Peter. **Envisioning Cyberspace**. Ed. Mc Graw-Hill, New York, 1999.
4 Henry, Daniel and Furness, Tom. **Spatial Perception in Virtual Environments: Evaluating and Architectural Application**. In IEEE; 1993.
5 Hale, Joseph and Dittmar, Mary Lynne. **Virtual Reality as Human Factors; Design Analysis Tool for Architectural Spaces.** In Report NASA/Marshall Space Flight Center, Alabama; 1996.
6 Pinet, Celine. **Design Evaluation Based on Virtual Representation of Spaces** In proceedings of ACADIA'97, University of Cincinnati, Cincinnati, 1997.
7 HCIL. **Spatial Perception in Perspective Displays**. In Report of Human-Computer Interaction Lab, Virginia, 1997.
8 Ruddle, Roy; Payne, Stephen and Jones, Dylan. **Navigating Large-Scale Virtual Environments**. In Presence Vol.8 N 2, MIT -Press, Massachusetts, 1999.
9 Zevi, Bruno. **Saber ver la Arquitectura**. Ed. Poseidón, Buenos Aires, 1956.
10 Hesselgren, Sven. **Los Medios de Expresión de la Arquitectura**. Ed. Universitaria, Buenos Aires, 1964. trans. of Ed. Almqvist & Wiksell, Stockohlm, 1954.
11 Arheim, Rudolf. **La Forma Visual de la Arquitectura**. Ed. G. Gili, Barcelona, 1978 trans. of Ed. UCLA, Los Angeles, 1977.
12 Norberg-Schulz, Cristian. **Existencia, Espacio y Arquitectura**. Ed. Blume, Barcelona, 1975, trans. of Ed. Studio Vista, London, 1975.
13 Meissner, Eduardo. **La Configuración Espacial**. Ed. U. Bío-Bío, Concepción, Chile, 1984.
14 Manzini, Ezio. **Artefactos**. Ed. Celeste, Madrid, 1992, trans. of Ed. Domus; 1990.

15 Virilio, Paul. **Cibermundo; la politica de lo peor.** Ed. Catedra, Madrid, 1997.
16 Queau, Philippe. **Lo Virtual, virtudes y vértigos**. Ed. Paidos, Barcelona, 1993.
17 Bridges, A.; Charitos, D. and Rutheford, P. **Wayfinding, Spatial Elements and Spatial Support Systems in Virtual Environments**. In "CAAD Towards New Design Conventions", Ed. University of Bialystok, Bialystok, 1997.
18 Bermudez, Julio. **Defining Architectural Experiences**. In proceedings of ACADIA'95, University of Washington, Seattle, 1995
19 Anders, Peter. **Anthropic Cyberspace: Defining Electronic Space from First Principles**. In proceedings of III Congreso de Gráfica Digital, Ed. Universidad de la República, Montevideo, 1999.
20 Darken, Rudy. **Designing for Wayfinding in Virtual Environments**. In presence Vol. 7 N 2, Ed. MIT Press, Massachusetts, 1998.

Rodrigo García Alvarado, Juan Carlos Parra, Rodrigo Lagos Vergara, Hernán Barría Chateau
DIPRODE 990801-3, Universidad del Bío-Bío
Avda. Collao 1202, Concepción, Chile.
rgarcia@ubiobio.cl