AN INTERACTIVE ARCHITECTURAL REPRESENTATION

The Exploration of Video Game Technology in Architecture through Applicable Models

By

Mohamed Hany El-Sebaie

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Architectural Engineering

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Title of Thesis:

An Interactive Architectural Representation: The Exploration of Video Game Technology in Architecture through Applicable Models

Key Words:
Architectural representation; Real time rendering technology; Virtual reality; Video game

Summary:

The research investigates the role of Video Game visualization in architectural representation and demonstrates the effectiveness of interactive visualizations in portraying the embedded, experiential dimension of spatial perception. The research also provides guideline for best practices of the new media in architecture by building a simple virtual-space experiment which uses most of the important aspects of human-space interpretation and interaction.

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To my ever-supporting wife and mother, to my father and all my family members, who gave me the model of life that I live by; beautiful open and trusting one. I dedicate all of my work to them.

Table of Contents

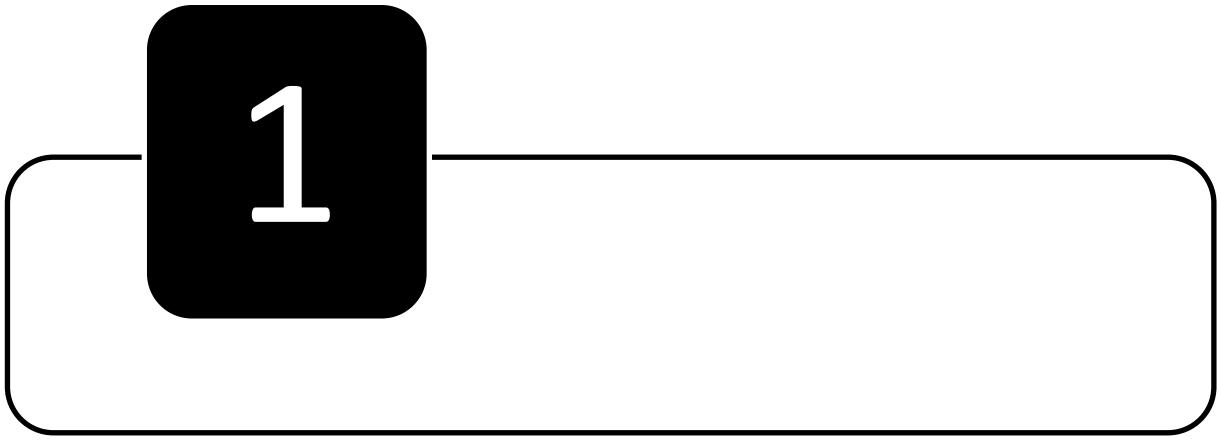
List of Figures

Abstract

Architecture has just started to explore the emerging potential of real-time rendering (video game) technology. This thesis argues that such technology provides for an improved sense of "being there," compared with previous architectural three-dimensional representation methods. Current methods typically put users in the role of spectators who passively examine the space in the represented architecture. The new interactive medium enables users to be more actively involved with the representational environment, which in turn makes for a better understanding of its spatial, experiential effects. The sort of viewer involvement specific to this research is the ability to actively interact with the virtual environment in a manner similar to the movement capability of real-life presence.

In order to demonstrate the potential of an architectural representation method that allows for movement through space, this thesis will investigate current philosophical and practical discourse, as well as directly experiment with the technology by building a demonstration. Recent theoretical and philosophical discussions of digital technology and real-time rendering raise a variety of arguments, both positive and skeptical, about how we may encounter physically non-existent environments. Several philosophical bases for the discourse will be investigated, such as Merleau-Ponty's theory of the perception of space. Merleau-Ponty tries to restore the cognitive role of the body against a philosophical tradition begun with Descartes that emphasizes the mind, arguing that in order to learn, the physical body has to be present. Learning requires "an active body coping with things." This account shows that a body, or a self, who is able to cope voluntarily with things is required for spatial perception, which is exactly what this technology offers as an enhancement over passive modes of representation. While real-time rendering technology cannot entirely substitute for the presence of a real-life body, this mode of representation will provide a fuller, more engaged understanding of a represented space, considerably superior to any previous three-dimensional architectural representation.

CHAPTER ONE: INTRODUCTION



Chapter 1 : Introduction

Architects depend on visualization technology to allow for users or the general public to learn and appreciate their visual ideas. From hand-drawn graphics on paper, plan drawings, scale models, literature, diagrams, perspective drawings, all the way to today's state-of-the-art digital technology, the need to visualize ideas pushes the development of ever greater visualization tools. The emerging new media technology that allows for an interactive movement in virtual space, however, is an advancement that changes the direction of architectural representation.

Unlike the need for visualization with other art forms, architecture is considered unique, since architectural design utilizes a space or environment that is both artistic and inhabitable. Being inhabitable means that architectural design spatially surrounds every aspect of an individual's life functionally, emotionally, habitually, cognitively, psychologically, spiritually, and so on. The inhabitability of architectural design brings forward the significance of both private and shared existential space. The design's apparent spatial enclosure is not always the same as the individual's private existential space. Its existence is based on the fact that every human activity operates spatially[1]. According to Norberg-Schulz, private existential space is constituted during mental development through interaction between the individual and his environment. The result is an image which consists of three-dimensional relations between meaningful objects, which will not be visible without the ability to interact within the space. Norberg-Schulz continues that the basic understanding of the meaning of spatial experience is already established and acts as a context for what is actually being experienced. Similarly, according to Michael Benedikt, architecture of real qualities should be found useful and beautiful, like a tree. Architecture in reality should be understood in its own existence, and be experienced as it is. It should therefore be able to be immediately understood as it is while one experiences it, not when involuntarily given an imposed understanding by a second or third party[2]. As Ortega y Gasset, Merleau-Ponty, and the existentialists and phenomenologists of this past century have pointed out, just being alive is enough to guarantee the world's meaningfulness. When one is learning about architecture in person, one is always already embedded in the experience of it, interacting and giving feedback with his surrounding enclosure. While visualizations have focused on the visual aspects of design ideas, these humanistic aspects have not been effectively embedded in the representation.

The need to consider other means of representing architecture arises from the visual representation's failure to provide comprehensive architectural representation. To remedy this problem, architects have used alternatives such as literature to expand the passive visual-centric architectural representation.

Moving forward from manually hand-drawn images after the verge of the digital era, architects started using three-dimensional digital simulation software to represent

1 Norberg-Schulz, C. (1980). Meaning in Western Architecture. New York: Rizzoli.

2 Benedikt, M. (1987). For an Architecture of Reality. New York: Lumen Books.

their designs. Architects have used computer graphics technology with which any kind of three-dimensional object can be rendered easily without the usual perspectival chores of hand-drawn rendering, but at the same time requires large amounts of time to render the final image.

Recently, the growing popularity of three-dimensional video games has accelerated the development of its underlying technology, real-time software graphics simulation technology, or real-time rendering technology. Since its inception, real-time rendering technology has attempted to create software that is able to render simulated images instantly, or at least at a rate of two images per second, to allow for real-time interactivity with the computer user. Early attempts required a great geometrical reduction of the three-dimensional model to allow for this immediacy, hence making the simulated image look very bland and unexciting. However, advancements in computer processing capabilities have allowed the software to render more realistic simulated images in much less time and therefore to make real-time rendering with better quality increasingly possible.

Realizing the broad opportunities for experimentation in architectural representation, this study will examine this new and emerging technology. The prospects of this technology are greatly promising; despite its limitations, the technology has succeeded giving video game players a sense of "being there" in the virtual video game world. This sense of "being there" is one of the most compelling learning opportunities for architectural representation. At the present time, implementations of this technology in the field of architecture have been limited.

Figure 1.1 : Assassin's creed 2 (Venice in the 15th century)

Pertinent to real-time rendering and real-time interaction is what is considered as virtual reality. Virtual reality has been of major interest to the Information Technology (IT) world for some time, and has been considered as the future of digital representation. Architects have in turn become familiar with fly-through systems that