Chapter 100
Using Advanced Approaches in Urban Design Researches: A Mutation from 3D Digital Models to Virtual Reality

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ABSTRACT

A lot of scientific studies have investigated virtual reality, the technological phenomenon of the modern world. However, there is no comprehensive study about the practical use of this technology in the urban design field. The aim of this chapter is to investigate this subject. The first step is to outline the 3D digital models discussed as a context for the formation of virtual reality. Then summarizing experts view in the field of virtual reality technology; the study presents components, conditions and requirements necessary to create a virtual environment in its real scientific sense. Since the chapter aims at utilizing virtual reality in the context of urban design studies, it focuses on virtual reality applications in urban design projects, and advantages and limitations of this technique in this area. Finally, at the end of this chapter most common devices needed for equipping a VR Lab and experiencing the sense of presence in virtual environment have been studied in three main categories including non-immersive, immersive, and full-immersive.

INTRODUCTION

In the past few years, researchers in planning have taken full advantage of advances in three-dimensional (3D) graphics, computer simulations, digital video, interactive maps, virtual reality, and the Web, at least at the stage of prototypes, if not in actual planning practice. Some have argued that the possibility of modeling the built environment and being able to interact within it represents a paradigm shift in the urban design process that may fundamentally change the way in which designers

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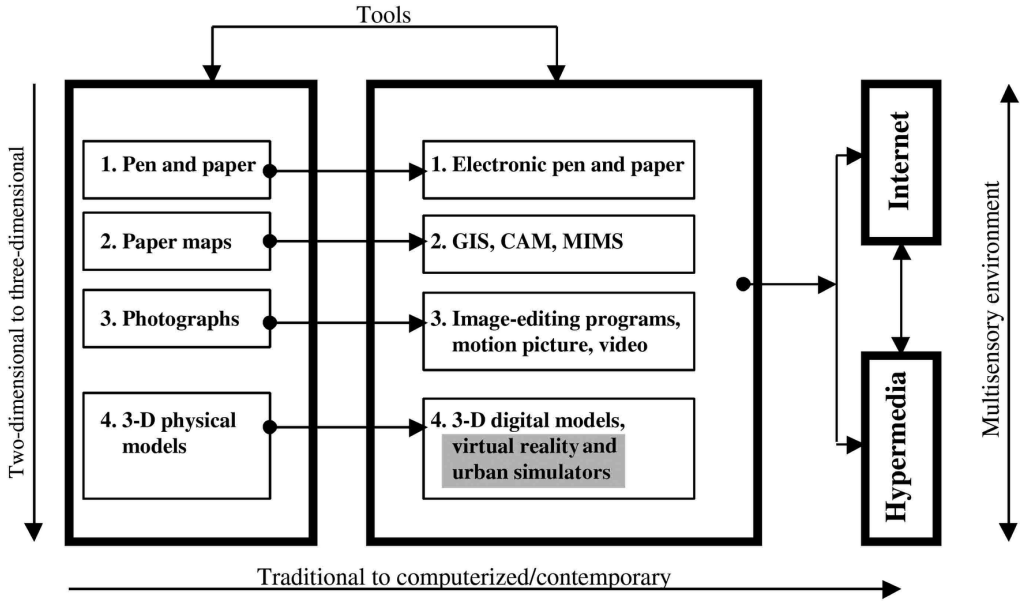
communicate ideas and developments to the public (Al-Kodmany, 2002, p.190). However, facilitating public participation by computer modeling is just one of the major benefits of digital modeling in urban design. Since the goal of the chapter is to engage in the effects of virtual reality technique, as an advanced level of computer 3D digital modeling, in urban design, we need to investigate the evolution of 3D modeling from the beginning up to now and then discuss about the virtual reality and its uses in urban design in detail.

FROM 3D PHYSICAL MODELS TO COMPUTER 3D DIGITAL MODELS

The four traditional visualization tools that are used most often in public participation planning are from the simplest to the most complex: pen-and-paper sketching, paper maps, photographs, and physical models. Each of these traditional tools can be extended with a more sophisticated computerized counterpart. For example, electronic sketch boards have enhanced the capabilities of pen and paper; Geographic Information Systems (GIS) have revolutionized the use of paper maps; computer imaging technology multiplies the usefulness of photographs; and 3D modeling, urban simulation, and virtual reality transform the use of simple physical models. Two types of communication media, hypermedia and the Internet, are placed perpendicular to all the other tools in the diagram, as they may encompass a variety of individual tools. Different tools such as GIS, drawings, photographs, and virtual reality may all be used with the Internet (Figure 1) (Al-Kodmany, 2002, p. 190)

Three different tools, or types of software, are now available for creating 3D representations of real or planned designs: 3D digital modeling, virtual reality and urban simulation (Al-Kodmany, 2002, p. 196). Although 3D digital modeling, virtual reality, and urban simulation are related, they have some differences. 3D digital modeling, which allows users to view (but not to interact with) 3D models on-screen, is the simplest of

Figure 1. Progression of Visualization Tools from Traditional to Computerized/ Contemporary .(© 2014 "Kheir Al-Kodmany. Used with permission.).
(Note: CAM= computer-aided mapping; MIMS = Mapping Information Management Systems)



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