PUNE RESEARCH DISCOVERY ISSN 2455-9202
AN INTERNATIONAL JOURNAL OF ADVANCED STUDIES VOL 5, ISSUE 3

COMMERCIAL BUILDINGS, ARCHITECTURAL AND INTERIOR DESIGN BASED ON VIRTUAL REALITY TECHNOLOGY: A REVIEW

Ar. GURUPRASAD J. YERNALKAR
Assistant Professor
Department of Interior Design
College of Non-conventional Vocational Courses for Women,
Kolhapur **[MS] INDIA**

ABSTRACT

The value of architectural design in modern day commercial buildings and the nature of the collaborative business become important demands of consumer behavior. The benefit of experience economy, sensory experience and to be gain by the mind are becoming obvious. Analysis of the underlying causes and then to scheme evaluation and design optimization, in order to improve the effectiveness and prospect of interior design of commercial buildings, make it be a building with a sense of happiness. This paper uses technical of virtual reality to simulation the three and four-dimensional dynamic scenes and entity behavior for commercial complex design. This paper attempts to collect and analyze the data by spatial selection, action path and sensory feedback to summarize the main factors of user's behavior in commercial space.

Keywords: *Architecture Design; interior design; commercial buildings; virtual reality; interactive*

1 Introduction

In today time commercial buildings are becoming developed integrately, the commercial interior space is particularly important as well. cost of construction for Commercial buildings projects generally a lot, and the construction period is too much longer, there is a lot of public participation. So the requirements of design with comfort, economy and functional are much more than other building design requirements. From the user's view thinking about commercial building interior design is becoming an important direction.

The innovation of interactive interior design and architectural design in the world is mainly focused on the performance of multimedia digital technology. self-adaptation on the basis of

the intelligent dynamics, depends on the environment which can reconfigure itself and respond, adapt to the physical changes automatically. At the same time virtual reality is just emerging as a technology in the era of artificial intelligence, this technology has been widely used in many fields, the application of virtual reality in architecture design is also gradually discovered .

Environmental behavior study is the relationship between human behavior and the surrounding environment. The common research methods of environmental behavior study include questionnaire, field observation, covert measurement, semantic analysis and cognitive map and so on. In this study, we use virtual reality technology to create virtual scenes, locate and observe the users, and collect the users' behavior data and analyze them.

2. Virtual Reality Uses in Architecture and Design.

The emergence of virtual reality applications for architecture has been one of the big stories of the past few years in the future, we've been told, and VR will become an integral part not just of presenting a project, but of the design process as well.

For many design-led industries, the biggest challenge is often convincing the client that the finished article will look just like or better than the 2D or 3D representation.

No matter how talented the designer, it can take a leap of faith and a vivid imagination from the client to get them on board with, and excited by, a design idea.

Architecture is no different and that's why virtual reality for architecture and design could help transform this industry.

In this paper, we will look at the possibilities attached to this most exciting of new technologies, the benefits to designing in a virtual world (for both the designer and the client), and how we expect the industry to grow and evolve as virtual reality (VR) is accepted and implemented.

Fig -1 Virtual Reality Uses in Architecture and Design.

2.1. Virtual Reality for Architects.

VR technology has so much potential for architects and designers. From initial design mock-ups, to project collaboration, through to the finishing touches that make a building design go from good to great, virtual reality possesses the capability to really sell an idea better than any other medium.

As mentioned at the beginning of this article, one of the greatest challenges faced by architects is working with a client to convince them that a design works, before receiving valuable — and workable — feedback that can be integrated into a finished design.

And the bigger the project, the more stakeholders it will inevitably involve. It's unlikely that there will be one single decision maker; rather, multiple people will be asked for their input on various aspects of a building's design. Getting all these people into a single room to discuss these design decisions can be incredibly difficult, not to mention time consuming and inefficient.

Floor plans, 3D renderings, and models are often used to convey an idea for a particular space within a design, but even these approaches — a staple of architectural design — can fail to effectively communicate ideas with clients.

At present, the performance of virtual reality technology in China is mainly in the simulation space of building interior space, and then the users could have real sense of space layout and details of building facilities in the virtual space, such as the dimension, fenestration, daylight environments of doors and windows, and the colors, patterns of architectural decoration. Such as the format like the virtual space make the users to be more interested and involved, and better than the performance of plane drawing in intuitive and attractive. Virtual reality means to use of a series of computer-based platform for external devices, such as projector, VR glasses helmets, audio, data gloves and sports capture to achieve the comprehensive perception from the simulation with the virtual environment and interactive technology platform. Fig.2

Fig.2 Virtual Reality for Architects

3. Commercial Architecture and Interactive Interior Design Based on Virtual Reality Technology

Application of virtual reality technology in interior design, there will be interactive between the beginning of design plans and the users. It makes the designer as the initiative part, because they could be personally on the scene. To the design plans traditional performance as CAD, the designers are the passive part which is accepted observation. So the technology of virtual reality makes architecture more people-oriented. In the traditional design method, the interaction between human, architecture and environment is an abstract display by two-dimensional images and language description, it cannot be perceived with human activities and psychological emotions intuitively and truly.

The digital media form based on computer and network technology, it transforms the design plan with model into a virtual reality scene that one would have an immersed sense to response the behavior with the subconscious mind. Virtual reality technology provides more possibilities for interior design of commercial buildings. The core of interactive design is no longer a one-way thought expression of the architects, but a two-way of synthesis with experience and meaning between various relational variables. In this paper, people interact with space based on the virtual reality, and then the behavior changes in a virtual space, after that the changes will be reflected in the real space. And the effective analysis of this behavior makes it possible to design Interactive Strategies for commercial buildings based on virtual reality technology. Interactive interior design in two aspects, on the one hand it refers to the public participation in the design, on the other hand it is building a dynamic system between of users and building space based on the medium of information technology, it makes the interaction greatly enhanced. Fig.3

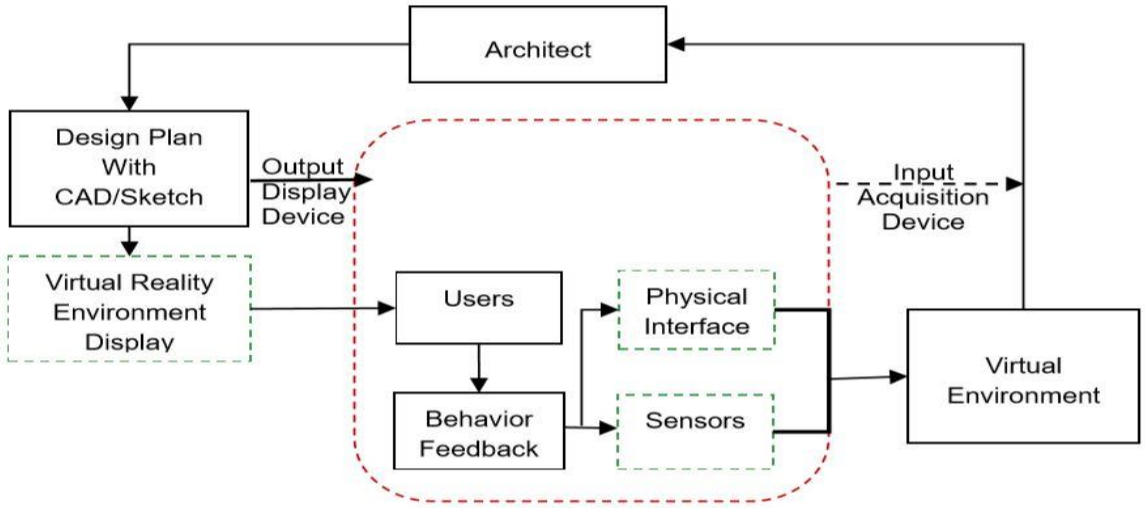

Fig.3 The Process of Interactive Architecture Design Based on Virtual Reality Technology.

4. The Application of Virtual Reality Technology Commercial Building Interior Interactive Design Strategy

The digital media form based on computer and network technology, it transforms the design plan with model into a virtual reality scene that one would have an immersed sense to response the behavior with the subconscious mind. And the effective analysis of this behavior makes it possible to design Interactive Strategies for commercial buildings based on virtual reality technology.

Virtual reality technology provides more possibilities for interior design of commercial buildings.

Fig.4 3d dynamics

4.1. 3D Reconstruction in Dynamic View of Real Size

Our system is designed around a simple and flat point-based representation, which directly works with the input acquired from range/depth sensors, without the overhead of converting between representations. The use of points enables speed and memory efficiency, directly leveraging the standard graphics pipeline for all central operations; i.e., camera pose estimation, data association, outlier removal, fusion of depth maps into a single model, and detection and update of dynamic objects. We conclude with qualitative and quantitative results that highlight robust tracking and high quality reconstructions of a diverse set of scenes at varying scales. Real-time or online 3D reconstruction has wide applicability and receives further interest due to availability of consumer depth cameras. Typical approaches use a moving sensor to accumulate depth measurements into a single model which is continuously refined. Designing such systems is an intricate balance between reconstruction

quality, speed, spatial scale, and scene assumptions. Additionally, many systems assume a static scene, and cannot robustly handle scene motion or reconstructions that evolve to reflect scene changes. We address these limitations with a new system for real-time dense reconstruction with equivalent quality to existing online methods, but with support for additional spatial scale and robustness in dynamic scenes.

Existing online methods either trade scale to achieve higher quality reconstructions of small objects/scenes. Or handle larger scenes by trading real-time performance and/or quality, or by limiting the bounds of the active reconstruction.
https://www.researchgate.net/profile/Damien_Lefloch)

4.2. Combination of Dynamic and Static Substantive Behavior Simulation

Entity behavior simulation that based on virtual reality technology is the combination of certain behavior of users' behavior in a simulated dynamic and static state, and eventually come to the form of digital image and to be assisted in the design process. Although due to individual differences and the environment variable factors can affect the effective organization of behavior, but through the study with self organization behavior of general biological characteristics and group wisdom, can find the laws of universality and organization which included by the human public behavior.

5. The Method with Application of Virtual Reality Technology in Commercial Building Interior Design Interaction

The technology provides a number of advantages that are improving the way designers and architects interact with their concepts and customers. There are a number of benefits to virtual reality for interior design including: being able to design in the space where work will be completed for accuracy, and a designer making the most of their skills and imagination. In addition to virtual reality, providing a visual tool helps to convey ideas and concepts globally without language barriers, and the ability to make adjustments and tweaks along the way. When most think of virtual reality they think of video games, leisure and entertainment. However, this technology is now being put to use in the design and architectural industry. Virtual reality for interior design is a new and upcoming tool that is rapidly developing and we hope it will become common place for our commercial office design Toronto firm.

Fig.5 The Method with Application of Virtual Reality Technology in Commercial Building Interior Design Interaction

5.1. Experimental Virtual Simulation of Design Content

To optimize the operation experience and improve the system running fluency, the experiment only meticulous modeled the necessary traffic spaces and style and color of the decoration, moreover, the construction details and accessory equipment are simplified and neglected to minimize the number of rendering planes and reduce system operation. The scene model to be virtual constructed with 3DSmax, sketch up, Revit and other three-dimensional modeling software. To build the commercial building design scenarios for three-dimensional simulation modeling, in the process of modeling, the size of the internal space should be built in strict accordance with the actual size, proportion and structure, so as to restore the actual shape and proportion of the building space with the greatest extent. At the same time the realistic display and fluency operation of hardware equipment are both important, in order to meet the audience correct cognition, we take the methods of simplified modeling, improve the complicated details, use real photo mapping instead of meticulous models, after all it could be ensured the smooth interaction experience by the optimize displayed commercial buildings. In the virtual modeling practice of design with commercial buildings (Fig.6), The SMART+ virtual reality three dimensional modeling software to simulate and model a commercial building.

Fig.6. Virtual Reality Scenes built by Software Rendering.

5.2. Special Interaction Design Method

The simulation technique can record the time spent in the experiment and the data of the plane route map. Through the analysis of the data of the plane route map, we can get the route choice of the users in the space, so as to carry out the special organization and format distribution more effectively. The method of commercial building interactive design based on the virtual reality technology mainly rely on some 3D simulation software such as 3DVEGA PRIME and MASSMOTION etc., build the design plan into the virtual experiment scene, roaming mode according to the actual flow of people walking imitation, the sites will set the corresponding space flow routes automatically generated. The commercial building model that has been built to transform into 3D model of virtual reality. For example, using SMART+ software, Sketch Up model can be imported directly to get virtual reality model. The experimenters can select the route in the virtual scene by wearing the 3D helmet to obtain the true proportion, size, and visual field (Fig.7).Design of Internal Flow of Shopping Organization Based On the Data Feedback of Simulation. The design of internal circulation of commercial building mainly depending on the design factors like accessibility, visibility, a sense of direction, to avoid the end of moving lines. Moreover, except the field investigation and questionnaire survey, the experiments were carried out with the application of virtual reality technology, and the experimenters will be measured inside the virtual experiment environment to obtain the feedback results which close to the real sense. Therefore, use the appropriate software to simulate the users' special choice in commercial buildings to provide an important reference for the design and planning of space organizations.

The Internal Special Organization Based On Crowd Simulation. The basic layout mode of traditional commercial building is to use the pedestrian roads to connect a number of main stores, besides that arrange franchised shops and restaurants on both sides of the walkway to form a continuous and smooth shopping space. The shops is not only major income with the commercial rental, but also to be a space which the purchase behavior takes place. In order to maximize its business value, the layout and space division of shop unit space should follow the principle of optimization and equality of excellence.

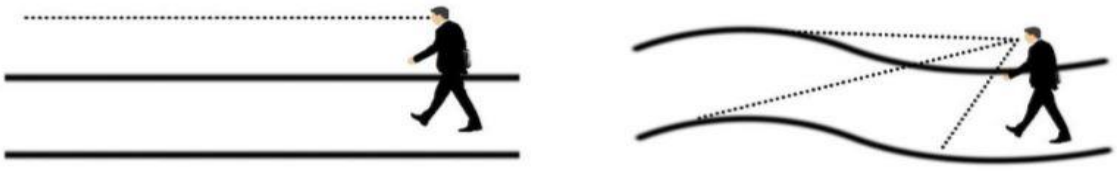

Fig.7. Sight Range of Commercial Channel with Straight Line and Arc Line

The real-time rendering is that when the view of the user changes, the scene he sees needs to be updated in a timely manner to ensure that the speed of graphic display updates must keep

up with the speed of view change. Through the real-time tracking information to feedback, we can record the experience's route and combine the visual focus of the experience in the 3D virtual scene to analyze the rationality of the design plan.

6. Conclusion:

This paper analyzes the strategy and method of commercial buildings interior design based on virtual reality technology, and shows the potential of virtual reality technology. We believe that there are still a lot of valuable applications in virtual reality technology to be tapped, and we will also use a variety of methods to explore further.

Compared with the traditional method of interior design of commercial buildings, experiential virtual space makes the design method of commercial buildings break through the traditional and conventional, and resonance through public participation must be one of the effective ways of design. For the interior design of commercial buildings, the method based on virtual reality through the processing of target tracking, to get the feedback of users' behavior and virtual simulation the flow for the design method of commercial building. It solves a series of problems, as that in the preconstruction of large commercial buildings that cannot be intuitive felt, caused that the effect of corresponding drawbacks could not be optimized and improved in time. On the other hand, this paper is mainly introduce the theoretical basis, and if it can be combined with specific cases for practical operation, it will put the theory and method more concrete to a new height.

Virtual reality technology can simulate the interior space of commercial buildings and obtain intuitive users' feedback. It opens a new way of virtual reality in interior design. With the display features of combination of virtuosity and reality, interactive participation in real-time, multi sensory perception experience, the users can be closest to the design scheme with real experience to obtain the most effective behavior feedback and related analysis.

Finally, the research of interior interactive design method of commercial buildings based on virtual reality is not only a new way of academic research, in practice, will also bring important influence on enhancing the level of interior design, optimizing the operations of commercial space, improving the interior comfort. We believe that in future, the technology in practice will iteration and development, and will give full play to the power of virtual reality technology.

Acknowledgements

The authors are appreciative of the valuable comments from editors and anonymous reviewers. Their detailed comments helped to improve the clarity and focus of this paper.

REFERENCES

1) TMD STUDIO LTD Gary Lucchesi.
2) Online Interior Design Service: Havenly.
3) UIA 2017 Seoul World Architects Congress.(Author: Guangtian Zou, Professor, Harbin)
4) Google
5) https:// www.researchgate.net/profile/Damien_Lefloch
6) Acadia Quarterly 18:4 1999 Virtual Reality In Architectural Education: Defining Possibilities Rodrigo Garcia Alvarado And Tom Maver.
7) Merging Three Spaces: Exploring User Interface Framework For Spatial Design In Virtual Reality By Joshua Choi Submitted To The Department Of Architecture On May 18, 2016 In Partial Fulfillment Of The Requirements For The Degree Of Master Of Science In Architecture Studies
8) CHIU-SHUI CHAN Department Of Architecture, Iowa State University 482 College Of Design, Ames, Iowa 50011-3093, USA
9) Chapman Taylor LLP is a Limited Liability Partnership registered in England, number OC302467. Registered office 10 Eastbourne Terrace, London, W2 6LG.