

Application of Computer Modeling and Rendering Technology in Aging Environment Design -- Taking Bedroom as An Example

Wenming Liu^{1a*}, Yingying Wang^{1b}

^{a*}liuwenming@sjzu.edu.cn

^b544220302@qq.com

¹Department of Design and Art, Shenyang Jianzhu University, Shenyang110168, China

Abstract—Starting from the current situation of population aging in China, through the analysis of the current domestic research on the design of suitable environment for the elderly, it is found that the current design of suitable environment for the elderly in China can not meet the living needs of the contemporary elderly, and the growing elderly groups have higher and higher requirements for living space. According to the living status of the elderly in China, the future development trend of aging environment design, and the design method of aging environment design, and combined with the living habits, psychological needs and barrier free design of the elderly, the barrier free aging design of the bedroom space of the elderly is carried out. In the design process, computer modeling and rendering technology play a good role in helping the design process and further improve the quality of the design. Computer software 3DMAX and V-Ray renderer can play a high value in environmental design.

Keywords—computer modeling; suitable for old age; interior design

1 Introduction

With the increase of age, the physical quality of the elderly continues to decline, resulting in the previous living space environment, which can not meet the demands of the elderly for indoor life. Therefore, it is necessary to design barrier free indoor living space suitable for the elderly, solve the indoor living problems of the elderly, effectively improve the living standard and quality of the elderly in China, and make the social pension in China develop sustainably and stably. Facing the grim fact that China has entered an aging society, the Chinese government has issued a series of policies and systems according to the comprehensive factors such as the level of social and economic development, the characteristics of aging and the wishes of the elderly. At the same time, most rural residents begin to choose to buy houses in cities, and the urbanization transfer is very obvious, which also makes the middle-aged and elderly population of urban residents gradually increase, resulting in the increasing demand for

aging living environment. The design of aging suitable living space is still in its infancy in China. At present, there is no more mature design method and design process. Ordinary design is difficult to adapt to the living habits of the elderly and can not fully meet the daily needs of the elderly. Therefore, it is necessary to conduct in-depth research on space planning, aging design of furniture and facilities, and color matching to ensure that the design results can not only meet the daily needs of the elderly, but also better meet the psychological needs of the elderly at the psychological level. China is the most populous country in the world. The number and proportion of the elderly in the total population are also increasing with the rapid development of social, economic, cultural and scientific undertakings, the promotion of family planning, and the continuous decline of population birth rate and mortality. The rapid growth of population has brought many social problems to mankind. In terms of the demand for natural resources, the supply of food, water and land will bring greater pressure. In human society, education, employment, medical treatment and pension are also under great pressure shown in Fig.1.

China has officially entered the aging society in 2003. The office of the National Working Committee on aging published the statistical bulletin on the development of China's aging cause in 2009 in June 2010. The bulletin first published the basic information of China's elderly in 2009. The population aged 60 and over reached 167.14 million, accounting for 12.5% of the total population Compared with the previous year, the elderly population increased by 7.25 million, an increase of 0.5 percentage points. The elderly population over 80 years old reached 18.99 million.

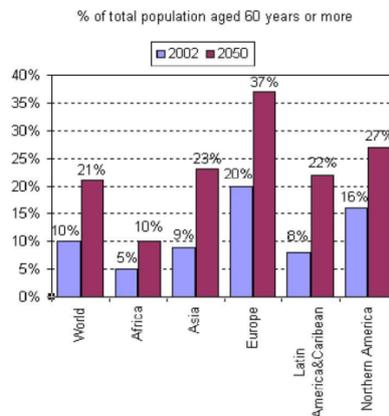


Fig.1 % of total population aged 60years or more

1.1 Purpose and significance of design

China has entered an aging society ahead of time, and the social problems it brings will become more and more serious. Today, with the growth of life expectancy in China, we have not done a good job in relative pension measures. Now, while people pursue life growth, a series of related problems bring us into a dilemma. The living environment for the elderly is

the most basic one among the many needs of the elderly. In the process of solving the problem of the elderly, we should put it in the first place, study the living environment of the elderly, fully understand the needs of the elderly for their living space environment, and create a more comfortable, healthier and more suitable living space for the elderly. It can provide a good living environment for the elderly.

2 Current Situation of Aging Environment Design

2.1 Relevant theories and research abroad

France first entered the aging society in 1872, followed by the United States, Switzerland, Germany, Belgium and other countries. During this period, preliminary results were also obtained in gerontology research. The lifestyle and living environment of the elderly are studied, but most of the focus is on the design of indoor public activity space in residential buildings.

Britain is the first country in the west to advocate welfare policy. With a high degree of aging, it is the first country in the world to study the planning and design of residential environment. It formulated the "housing and urban planning law" in 1909. France is the first country in the world to enter the elderly society. With the rapid development of population aging, the Singapore government has gradually realized the importance of housing development policy to social spiritual civilization and family structure.

2.2 Domestic related theories and research

"Study on the evaluation of daily life function and its influencing factors of the elderly in Xicheng District, Beijing" comprehensively analyzes and evaluates the daily life function of the elderly in urban areas by means of daily life function index and multiple regression analysis. The results show that the loss rate of life activities increases with the increase of complexity and difficulty of activities. Lin Wenhao and Lu Wei summarized the ideal living mode of the elderly through a questionnaire survey in the study on the living intention of the urban elderly, and put forward the "assumption of the spatial structure mode of the new residential area". By discussing the method of combining theoretical research and design practice, they summarized the concept of "taking human design as the main body and human needs as the basis of design".

3 Introduction to The Basic Theory of Computer Modeling and Rendering Technology

3.1 Introduction to 3D Max

3DMAX is a 3D animation software of Autodesk company. It is an animation production and rendering software based on personal computer. It has been developed for more than ten years. It is a very successful product series in the field of 3D animation production^[1]. Its first application is animation production in PC games, with further development, they began to participate in the special effects production of film and television films. At present, it is widely

used in advertising production, game development, animation design, architectural design, film and television editing and other fields. It is a three-dimensional animation software integrating animation, rendering and professional modeling. 3DMAX 2012 is used in this production shown in Fig.2.



Fig.2 3dmax working interface

3.2 Introduction to V-Ray renderer

The V-Ray renderer is a professional 3D rendering engine that produces incredibly high-quality realistic images. It has been widely used and recognized in the processing of 3D models and post materials in the field of virtual reality. It is considered to be one of the most advanced 3D rendering solutions in the market^[2]. Using this renderer in the scene can obtain more accurate light energy distribution, faster rendering speed, and more realistic reflection and refraction of simulated light.

3.3 Advantages of computer modeling and rendering technology in environmental design

Computer modeling and rendering technology is the product of the combination of art and technology^[3]. It is virtual and super real, but the final reality should be based on this super real. Computer modeling and rendering technology can make customers intuitively close to the scheme, understand and accept the scheme introduction of the designer in a form loved by customers, which is the prerequisite for the design work to achieve the best effect.

With the emergence of computer modeling and rendering technology, we are no longer limited to imagining the overall picture of the whole indoor space from the plane and elevation, nor satisfied with the excessive romanticization of watercolor and the excessive conceptualization of charcoal, but can provide indoor renderings that can realize the design idea according to the real proportion, real modeling and real color^[4]. In the process of making computer renderings, we can accurately analyze and simulate any indoor elements such as materials, texture, lighting, furniture, etc. all kinds of libraries, material libraries, furniture libraries, ornaments libraries, etc. can be handy.

4 Design Process

4.1 Necessity of development and design

In daily life, the elderly and their families often feel inconvenient and unsafe^[5]. Find out all kinds of problem points, carry out appropriate aging housing transformation, and properly add reasonable aging appliances. The convenience and safety of life will be significantly improved^[6]. The state guides and supports the development of livable houses for the elderly, promotes and supports the barrier free transformation of families of the elderly, and creates a barrier free living environment for the elderly.

4.2 Design Requirement

Bedroom is the most important habitat for people, and it is also a place for people to freely control and enjoy their leisure time. For the elderly, the bedroom environment is particularly important, because the main activity place of the elderly every day is in their bedroom. The bedroom is well arranged, which can make the old man spend time comfortably and happily^[7]. The living environment of the elderly should emphasize practicality, convenience, safety, simplicity and softness. At the same time, we should transform our bedroom according to local conditions to make it more conducive to the health of the elderly.

4.3 Bedroom space design

In the process of bedroom space design, the use of computer modeling and rendering technology can easily modify and adjust in the process of problems or customers' need for adjustment. Such a simple operation form makes it possible to improve the efficiency of interior design. Whether in the process of design or modification, it plays a high value^[8]. The space of barrier free living environment design for the elderly needs to be adjusted to local conditions according to the physiological characteristics of the elderly. In order to enable the elderly to move freely, the bedroom design must meet some natural scale requirements of their activities and feel the comfort of the space, but it should not be too large. Too much space will make the elderly feel lack of warmth, lose the unique life atmosphere at home, and sometimes make the elderly feel cold, lonely and small shown in Fig.3.

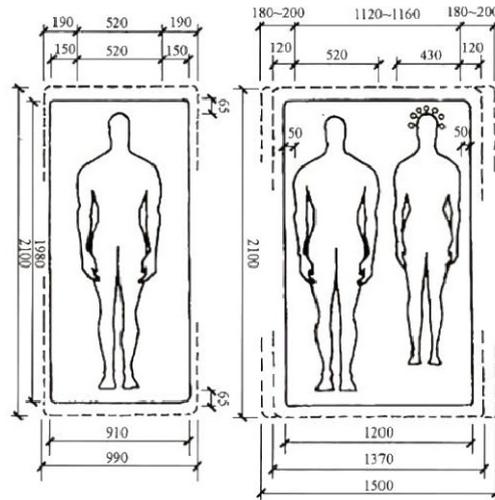


Fig.3 Ergonomic dimension

4.4 Bedroom lighting design

The bedrooms of the elderly should ensure sufficient sunshine, smooth ventilation, soft daylighting and not too strong. Because the immunity of the elderly is reduced, the living room of the elderly should pay more attention to heat preservation, moisture-proof and heat insulation. The external environment of the building should also have a wide field of vision, so that the elderly can overlook the future, maintain a comfortable mood and get close to nature^[9]. During the design of this part, through the efficient use of 3D Max software, it can have strong simulation in the design process, simulate all kinds of light in reality, intuitively present the real light in front, and realize the effect close to the reality through the operation of multiple software.

4.5 Bedroom furniture design and display

Computer modeling can be expressed through three-dimensional drawing, which can directly understand the design of different positions, make the size more accurate, reduce the error to a large extent, and there is little difference between the designed model and the real object shown in Fig.4. Furniture is very important in the bedroom design of the elderly. First of all, it should have pleasant effects, and its form beauty and color stimulation should conform to the aesthetic experience and personality differences of the elderly^[10]. In this way, the elderly can have visual and tactile pleasure and beauty, and meet their psychological needs. The size of the furniture, especially the height of the bed and sofa, should be moderate to facilitate the elderly to get up and sit freely. The furniture shall be placed in an appropriate position and shall not hinder the traffic. It shall be placed along the wall in a balanced and symmetrical way, and shall not be placed in the middle of the room as far as possible, which also gives the elderly a stable and stable feeling psychologically, and prevents the elderly from being bumped.



Fig.4 Design the interface in 3dmax

4.6 Bedroom color design

In addition to the feeling of cold and warm, distance, weight and size, color can also produce psychological effects such as excitement, depression, tension, relaxation, irritability and stability. Therefore, the bedroom color (mainly refers to the wall color) should first consider using the color that complements or contrasts with the main color of the living and working environment. According to the psychological state of the elderly, choose the corresponding colors: those who are depressed, depressed and sad can be matched with warm colors, such as red, yellow and orange; Those who are emotionally unstable, irritable and excited are matched with cold colors, such as blue, green and cyan. You can also adjust the color of the bedroom with color lights. When using computer modeling, it is particularly beneficial to change the color. It can more intuitively control the correlation between the color and the overall environment, make the perfect combination of the two, and reflect the real color. Through the simulation of the object under light, the information of the illuminated object is transmitted, and then the object scene is displayed after the implementation scheme, which is compared with plate drawing, this method is more vivid shown in Fig.5.



Fig.5 Design rendering

4.7 Bedroom green plant beautification

The bedroom should also pay attention to greening and beautification. Several pots of flowers, bonsai and green grass can be placed on the balcony or indoors, which not only adds beauty, but also purifies the air, reduces pollution, improves the microclimate of the bedroom, and makes the indoor air fresh and fragrant, which is conducive to health.

5 Conclusion

At present, the construction of pension model needs to reasonably design the bedroom space to make it conform to the living and activity characteristics of the elderly. At the same time, in the process of bedroom design, we should pay attention to the actual needs of the elderly. In the relevant design process, we should complete the relevant planning and design according to the specific needs of the elderly to meet the actual use needs of the elderly. On the basis of following the principle of aging design, provide a safe, comfortable and convenient living space for the elderly, improve the quality of life of the elderly in their later years and maintain their physical and mental health. In the process of design work, 3dmax is a common software. 3D model is established by 3DMAX software. Finally, V-Ray software is used for post rendering and processing to obtain the best display effect. Interior design needs the cooperation of a variety of software, and the application of 3DMAX is the top priority of interior design. The application of 3DMAX in interior design can not only expand the designer's thinking, improve design efficiency and save design cost, but also improve the accuracy, culture and artistry of interior design.

References

- [1] You Zu Hui on the role of computer software 3DMAX in interior design [J] China high tech Zone, 2017 (4): 133
- [2] Hu MENGZHENG, song Jinyu, Shu Ting Research and implementation of virtual reality modeling technology based on 3DS MAX [J] Industrial control computer, 2015 (9)
- [3] Cui Ying On the role of computer software CAD-3D in interior design [J] Electronic production, 2014,13 (19): 60-60
- [4] Tao Rui Feng, Yang He Research on the design of barrier free and suitable living space for the elderly [J] Western leather, 2020, 42 (13): 30-31
- [5] Zhang jijuan, Yang shuran, Zhao Yun Research Progress on aging design of elderly care living space and supporting facilities at home and abroad [J] Hunan packaging, 2019 (1): 16-19
- [6] Kong Lin Aging design [D] Central Academy of fine arts, 2014
- [7] Wang Wei, ZHANG Shuhong. Research on ingenious Collocation method of color in interior Environment Design [J]. Furniture and Interior Decoration,2013, 4th issue
- [8] Li Yin, LI Jing. Basic principles of interior design. Beijing: China Water and Power Press,2012
- [9] Xu Jun, XU Yongcheng. Brief Analysis on the Concept of green design in interior Design [J]. Science and Education Literature, 2008 (32).
- [10] Xu Guanglei, Zhang Pengxiang, Xie Yan. On barrier-free Design of toilet in old people & apos; s Residence [J]. Theoretical Research of Urban Construction (electronic version), 2011 (14).