




Garden Space Planning and Design Method Assisted by CAD Virtual Reality Technology

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Abstract. With the acceleration of the current urbanization construction process, gradually improve the overall environment in the city, to create a green development atmosphere, has become the main goal of the current urban construction. Landscape planning and design work in China has been developing for a long time, and in China's urban development has played a role that can not be ignored. Using a variety of plants to carry out garden planning, can not only protect the ecological environment, in line with the current concept of green development, but also to ensure the beauty of the city, to meet the current residents of the living environment requirements. It embodies its power in many aspects. For example, in the early data analysis stage, computer aided technology represented by geographic information system can accomplish land use and positioning tasks more conveniently and efficiently. The in-depth application of computer aided landscape planning and design can better open the ideas of landscape designers, especially the development of modeling rendering technology and virtual reality platform.

Keywords: urbanization construction; landscape planning; computer aided design; virtual platform;

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1 INTRODUCTION

The concept of the landscape is more long, existed before the computer does not appear, such as the court of the western landscape, Chinese classical gardens, but previous landscape designers work can only rely on pen and paper to complete, work efficiency is very low, and more time could only express some limited thought, also can't transfer and express to others. With the progress and development of science and technology, the landscape designers gradually from the original and the low efficiency of tool and work, especially the rapid development of computer technology, the performance of hardware and software of the quick update iteration, landscape engineering design also gradually got rid of the bondage of pen and paper, especially the emergence of

drawing software technology, The working methods and efficiency of designers have a fundamental breakthrough from the onerous drawing task out [1].

From the point of view of technology development and evolution, and computer aided technology in landscape design, has experienced from simple to help with the creation of a complex process, the emergence of the computer drawing software such as CAD, the designer from the simple low-end Labour liberation, make them have more time and energy to create, to think, to complete. Computer technology such as virtual reality turns static into dynamic, extending simple visual sensations to other senses through some sensing devices. Now, geographic information system, in landscape design, makes the landscape design not only is a kind of art and aesthetics, but also combine science, especially the digital analysis of the landscape of the geographical environment, scene deduction and simulation of the future building, makes the designers work more efficient, feasibility is higher, the works of design more scientific basis. At present, Li et al. [2] introduced computer virtual technology into the teaching of landscape design, greatly improving the efficiency of landscape design. At the same time, the emergence of computer technology will bring some new challenges. Da et al. [3] argue that most computer designs show promising results, but they are low in maturity and require further development.

Textile art design refers to a kind of artistic design that expresses and completes the beauty of textile with certain creation way and expression means. It requires both unique artistic effect and practical application function. Therefore, the designer should not only consider the perfection of the composition, but also consider the completion of the craft. To master the application of new computer software and understand the textile design process of digital technology has become a necessary knowledge and skills for designers. At the same time, the changes brought by the application of computer technology are not limited to the simple design links, but also the production, sales, use of textiles and other aspects brought innovation. In today's textile market, due to the development of science and technology and the explosion of information, textile design is no longer confined to the design of a single product, but for the cost, market, use environment, aesthetic value, production technology and many other aspects of the overall consideration. The realization of CAD technology provides designers with great creative space for textile pattern design, and truly realized the unlimited ideal of color simply adopt the traditional way for textile design, obviously cannot adapt to the current development trend [4]. How to make good use of computer technology to design has become a problem that designers generally consider.

Although there are a lot of people in the traditional garden design, but the lack of physical perspective in the design, some garden landscape will be due to the uneven distribution of stress resulting in low stability of the situation, under the impact of some external forces such as natural disaster or construction, Will do harm to it, plus the local government is too lazy to repair and cause some problems. However, the computer aided system will check the design scheme, and put forward suggestions from the perspective of mechanical properties to improve the durability of the garden. And the use of Auto-CAD plane planning, more conducive to the designer into the park planning, before the investment and construction can have a rough solution to the effect of the whole body, in the process of construction problems, but also to find a solution in time. Therefore, it is of great significance to use computer aided technology for garden space planning and design [5].

2 COMPUTER AIDED AND VIRTUAL REALITY TECHNOLOGY

Computer-aided technology for landscape planning and design, has epoch-making significance, he completely made designers from the heavy, monotonous hand-drawn design and expression of the liberation. Computer-aided technologies, such as 2d accurate drawing, 3D modeling, virtual reality experience represented by CAD, and support of GEOGRAPHIC information system, have greatly improved the efficiency of landscape design, improved the quality of works and extended the ideas of designers. Huang et al. [6] proposed a conceptual framework to develop product design quality from the aspects of product design requirements, design product concept, product detailed design,

and product design evaluation. It can be used in garden design. Liu et al. [7] studied the nonlinear design of landscape based on computer aided parametric model. Raaphorst et al. [8] used CAD software to construct 3d landscape modeling. A large number of studies show that it is reasonable to apply cad in landscape spatial planning.

With the development of technology and the concept of landscape design, the extension and coverage of landscape design is also expanding. In terms of disciplines, landscape science, design, plant landscaping, land use, art aesthetics, history and humanities are all involved and cross-applied. From the perspective of application practice, landscape planning and design are required for urban overall planning, land utilization and development, overall scenic area transformation, green corridor and greenway construction, and comprehensive regulation of river waters.

In order to support the development of landscape planning and design, computer aided technology is also rapidly updated and iterated, CAD graphic design software, 3DMAX rendering modeling, VR virtual reality technology, GIS geographic information system, PHOTOSHOP post production software. These early and mature technologies and platforms cover most of the computer-aided technologies used in landscape design. It is applied in the field of landscape design to solve practical operation problems and affect designers' ideas and concept progress [9].

(1) Three-dimensional modeling technology: Starting from three-dimensional virtual model construction, the three-dimensional imaging technology and rendering technology of model construction are combined to obtain a three-dimensional landscape closer to the real entity, and the information morphological changes and storage capacity of model construction are expanded. This is the key link in the development of landscape design from flat to three-dimensional, especially important for landscape design, because boring TWO-DIMENSIONAL CAD drawings do not have aesthetic expression, it is difficult for landscape designers to see whether their ideas and structures are fully reflected, and there is no way to start later modification. The participation of the audience and owners is also very limited, because they are not professionals after all, but they are the end users, the audience. Based on two-dimensional drawing structure of 3 d modeling technology just solve this difficult problem, and has set up a communication bridge for the stylist and owner, don't need too many professional knowledge, only need sensory aesthetic can participate in the landscape planning and design, also is helpful for designers to understand and to listen to different opinions, change their work, make it more perfect. The three-dimensional virtual modeling technology in what is now the main application aspects such as construction, industrial, landscape design is not their own professional virtual design platform, to a certain extent also restrict the application of computer aided technology in landscape design and development, the designers still eager to have their own proprietary technologies and platforms.

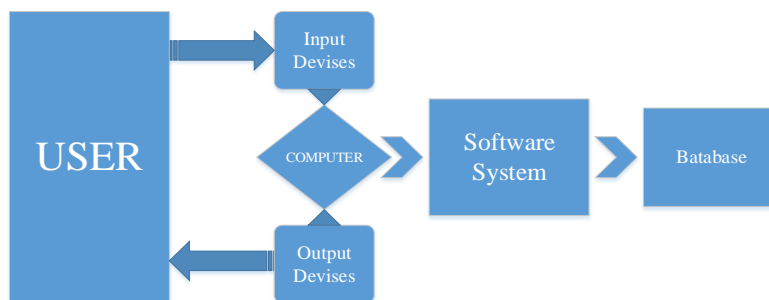


Figure 1: The composition of virtual reality system.

(2) Virtual reality technology: it simulates and simulates the environment through computer technology, and uses a variety of special equipment to realize the interaction between users and the simulated environment. A computer system that simulates a world that can be created and

experienced; Virtual reality technology is a combination of image technology, sensor technology, computer technology, network technology and human-machine dialogue technology. It is based on the computer to create a three-dimensional visual, auditory and tactile environment, which has been widely used in many fields. The composition of a virtual reality system is shown in Figure 1.

Virtual reality technology is of great significance to landscape planning and design, its significance is mainly determined by the characteristics of virtual reality technology. The interactivity, immersion, imagination and multi-perception of virtual reality technology are mainly reflected in assisting landscape architecture scheme design and enhancing scheme performance. The application of virtual reality technology in the stage of landscape architecture scheme design makes the designer's space experience more interactive and intuitive, which provides a new way for the designer to create the scheme and makes the scheme design more reasonable and perfect. In terms of the performance of the program, the audience can understand and feel the design intention of the designer from multiple angles and real-time interaction, so as to achieve an immersive feeling. In addition, the use of virtual reality technology simulation garden construction site, is conducive to global control of the construction site, reasonable arrangement of the construction schedule, scientific guidance of the whole process of construction, ensure. The project is carried out safely, and waste is avoided to the greatest extent. Virtual reality technology assisted landscape planning and design has a great development prospect. At present, there are many researches on virtual reality assisted urban planning and architectural design in China, but there are not many or not enough in-depth researches on assisted garden planning and design. This paper mainly studies the rapid and efficient application method of this technology assisted landscape planning and design [10]. The framework of virtual reality technology is shown in Figure 2

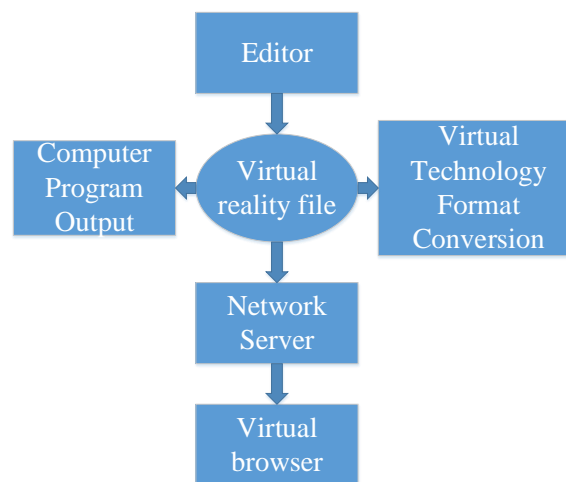


Figure 2: Virtual reality technology framework.

3 VIRTUAL REALITY TECHNOLOGY ASSISTS LANDSCAPE PLANNING AND DESIGN

3.1 Application of Virtual Reality Technology in Various Stages of Landscape Design

(1) Research prior to project planning

Virtual reality technology in the investigation and analysis of landscape planning project prophase work plays an important role, in general, in order to make better construction project, to make the global accurate feasible design scheme, and reduce the major decision-making mistakes, realization of landscape planning and design in front of the project is accurate, clear. Virtual changes can be made to each construction stage of the project. To the project in the front of the

investigation and analysis is the first step on the landscape design, some of the natural conditions and historical context, the comprehensive analysis of the folk customs and the other objects such as geographical location and surrounding buildings and traffic conditions are investigating and analyzing the content, to provide help for the implementation of the landscape design, because the area have a comprehensive and in-depth understanding, favorable for construction management. Carry out feasibility analysis on all aspects of the project before planning it. Accurate positioning of the project and smooth development of the project. Avoiding major decision mistakes plays a key role. Virtual reality technology is used to analyze the project feasibility analysis, comprehensive analysis can base within the terrain, roads, trees, rivers, buildings such as present situation as well as to the wind and the sun Natural conditions, to provide policy makers and designers in the early period of the scientific and effective judgment, assistant decision-making, and can simulate the project each phase of the process in advance, is conducive to overall arrangement. The node hierarchy diagram in virtual reality technology is shown in Figure 3

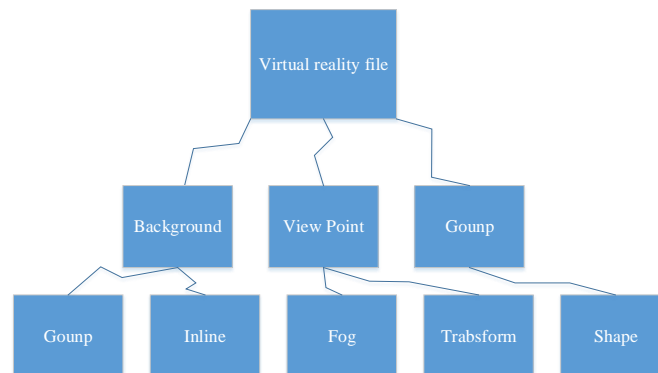


Figure 3: Node Hierarchy Diagram in Virtual Reality Technology.

(2) Conceptual design of auxiliary scheme

After helping to complete the preliminary research of the project, virtual reality technology can also assist in the conceptual design of the project. Virtual reality assisted concept design is similar to the designer's hand-drawn thinking. Designers can quickly analyze sites by creating large volume models. Such conceptual design is helpful for designers to grasp the overall and local relations and large spatial relations, grasp the volume of the structure. Virtual reality technology in the completion of project research and prediction, the use of computer aided technology in the completion of the overall planning and landscape design, need to use some models to help planners make a rapid analysis of the base situation, in order to better grasp the whole project accurately, but also to grasp the construction of local and overall layout. Compared with scheme design and landscape planning design drawing, the concept of landscape planning design is the first step. The designers used immersive virtual reality technology to create concept drawings for landscape planning and design. Through computer aided technology, designers strive to better create, develop and express virtual landscapes. In the past, due to methodological lag, there was no way to test these abstract ideas. In this process, the presentation of things is always a certain distance from their own imagination. In the backward traditional methods, when analyzing how various landscape elements organically match together, they often rely on the improvement of painting skills to achieve this goal, to explore and express the spatial composition of the landscape. The design of virtual reality system is essentially to replace the expression of painting with the expression of machine. From plane to three-dimensional, from static to dynamic, the expression ability has made great progress.

(3) Detailed design of auxiliary schemes

Virtual reality technology can assist designers in scheme design through human-computer interaction. The designer puts the viewpoint into a simulated real space environment, which makes the garden planning and design break through the two-dimensional thinking mode of "flat, vertical and profile" and helps the designer to design intuitively. In this way, we can grasp the space, scientifically compare the scheme and weigh the advantages and disadvantages, and make the scheme design more reasonable and perfect.

(4) Performance of auxiliary schemes

Virtual reality presents design effects in a new, panoramic way. Decision makers and the public can go deep into the scene from the perspective of human eyes, understand and feel the design intention of the designer from multiple angles, real-time interaction and unconstrained, and achieve an immersive feeling in terms of vision, hearing and even touch, which can completely simulate the effect after the completion of the scene. This is not possible with traditional renderings, sand table models or even animations. This way of expression plays a key supporting role for decision makers and the public to accurately evaluate project design and put forward opinions and suggestions.

3.2 The Key Technology of Landscape Planning and Design Assisted by Virtual Reality

The prerequisite of virtual reality technology is to have a three-dimensional model. The construction of virtual space and landscape is based on a large number of three-dimensional models. Therefore, it is required that the model should be diversified in type, realistic in effect and easy to operate. In this way, you can build rich and smooth virtual scenes. The reason why virtual tour has high requirements is that the audience can choose any Angle of view to watch by themselves, which requires the quality of the virtual rendered model to be very high, and every small side must be properly handled without defects. The comparison between rendering intensity and rendering unit model in CAD computer-aided garden design is shown in Figure 4. In order to achieve the virtual effect of the real level, special attention should be paid to the processing of the light and dark effect during modeling, so as to enhance the three-dimensional sense of the THREE-DIMENSIONAL model and highlight the environmental content of the landscape modeling.

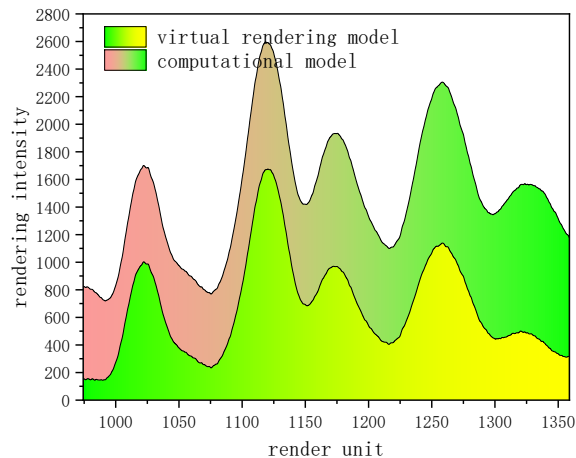


Figure 4: Rendering Intensity Comparison Chart.

Immersion, that is, the sense of experience, is the advantage of virtual reality technology compared with traditional graphics and image creation. In order to enable users to get a good immersive experience, it is necessary to connect people's vision, hearing and touch to virtual

reality. Starting from the most-simple display screen, headphones, a preliminary solution to the problem of visual and auditory, special helmet, then VR strengthened both feeling experience, recent European using finger nerve, bring some tactile sense into the virtual world of equipment, with the change of technology, landscape virtual model will bring users and true experience.

4 APPLICATION OF CAD TECHNOLOGY IN GARDEN PLANNING AND DESIGN

Now in the design industry, CAD technology has become an indispensable tool for designers, not only because of the convenience of CAD technology, and CAD technology can also design drawings, graphics drawing and engineering budget into a interrelated whole. Designers with the help of computer CAD strength, not only can reduce the designers of labor intensity, drawing loss, can better proofread drawings of the scheme, and convenient modification. Designers in the completion of a project, which can be useful to their own design in the form of blocks into the gallery, when they need, they can be directly used from the gallery, accelerate the efficiency of the designers. Designers can communicate with architects and corresponding structural engineers at any time when they are drawing with the assistance of computers, cooperate with each other and coordinate constantly.

Design personnel in the use of CAD design, can be simulated to generate the model of the ground and building framework, and then in the three-dimensional animation software for qualitative, the supply of light source, finally through the camera to the normal view of people was simulated, the formation of a series of trajectory, achieve the result of a comprehensive observation, make the person such as immersive. When designing, designers can find their mistakes and correct them in time, improve their design effect and make their design more perfect. There are other products of information technology in garden planning and design, such as Photoshop, CAD and 3DSMAX. In traditional garden design, manual drawing not only wastes a lot of time for designers, but also causes unpredictable disasters such as wrinkles and mildew over a long time. But computer design will not appear the above situation, it can be very scientific to save the design drawings, not only convenient to watch, but also can be backed up for many times, high security. The comparison of artificial and computer design efficiency is shown in Figure 5.

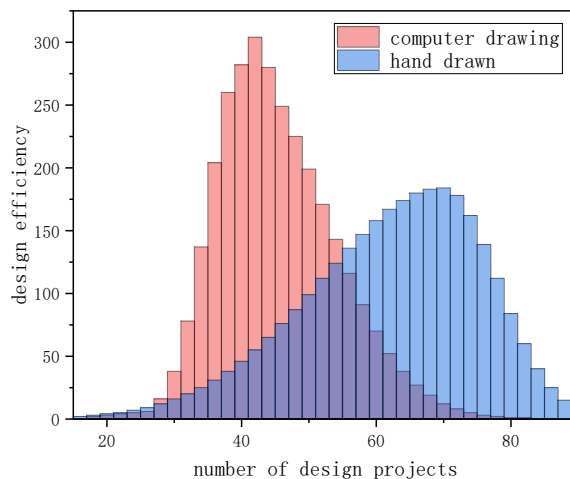


Figure 5: Comparison of Human and Computer Design Efficiency.

The resources about landscape design on the network are very rich, and its content is very extensive, including urban greening, landscape greening and the dynamics of these designs in the

market. Therefore, designers can make full use of this point, according to the online function of CAD to get a large number of rich resources, and the best point is, designers can also be sorted out their own or collected to share on the network. It can be seen that CAD online function plays a great role in promoting landscape design. It has become possible to receive information about landscape design in the first place.

The specific role of garden planning and design through CAD software is as follows.

(1) Improve work efficiency: CAD software is a new horticultural planning technology, after the actual inspection, the data input software, CAD software can be integrated into the specific scheme design, graphics and the overall budget situation. With the help of network technology and related software, planners can not only reduce work errors and improve actual efficiency, but also help relevant employees deal with work loopholes and proofread drawings and planning in the first time. After completing a task, planners can store satisfactory graphics or styles in the early planning into the software gallery. If they want to add such graphics or styles in the later stage, they can directly find the original drawings from the software, which greatly improves the actual efficiency. The inspiration of planners often comes from the moment, seize the inspiration, as soon as possible to carry out the drawing, can really plan drawings with soul. Wasting time looking for the original will not only prolong the planning cycle, but also hinder the actual work of employees. Therefore, we can improve the utilization efficiency through various methods. The software utilization efficiency improvement method is shown in Figure 6.

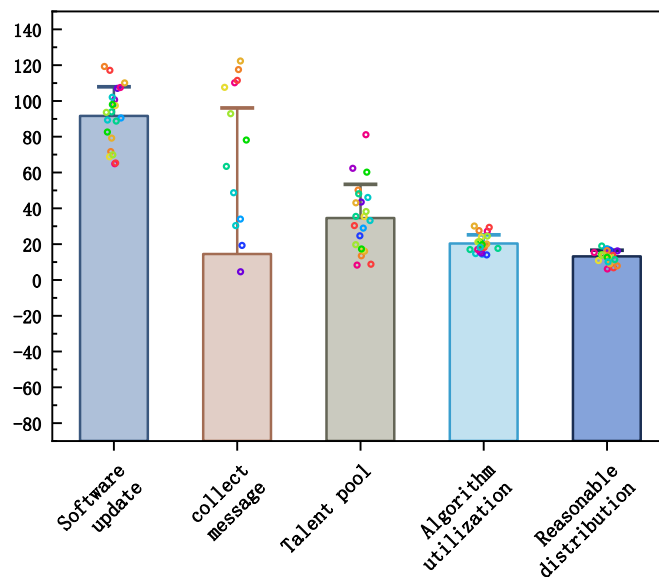


Figure 6: Efficiency improvement chart of various methods.

(2) Normative operation link: Different from manual operation, CAD technology is through the construction of the corresponding simulation model to show the three-dimensional effect of the drawings, real show the problems existing in the drawings, strict specification of the operation link. Horticultural planning is mainly divided into two parts: field investigation and drawing. Practical investigation is the basis of drawing, while drawing is the key of horticultural planning, both of which cannot be ignored. On the one hand, using relevant software to carry out field investigations can carry out more scientific investigation work through standardized technology. CAD technology

includes the standards and corresponding requirements for field investigation work, which can not only help employees to carry out more in line with the standard requirements of work, but also through a series of technical means to enable employees to obtain more accurate soil conditions, vegetation conditions, and so on, to design a more practical scheme. On the other hand, CAD software can be used to simulate the generation of three-dimensional models, and feel the effect of drawings. The use of relevant technology in the three-dimensional software to provide images and light supply, and the use of the camera to simulate the normal observation point of the human body, can form a series of tracks, to help everyone can observe at different levels. Once found in the drawings reflected in the model of the error, can be timely corrected, constantly improve the effect of the drawings, help planners to develop more beautiful, more in line with the actual requirements of the drawings and plans. The influencing factors of modeling failure and their degree of influence are shown in Figure 7.

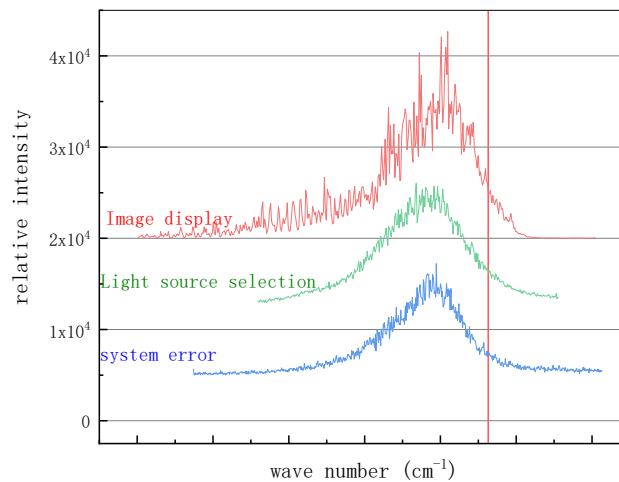


Figure 7: Model Error Probability Plot.

(3) Provide substantial resources: The actual situation in different cities is different, and there are many differences in the garden planning and design scheme, but it is because of these differences that it can provide a variety of ideas for practical work, so that the garden planning is no longer conformist. Combined with CAD software and network technology, it has the function of real-time Internet access, which can collect different resources in the network in the first time, and provide model reference for innovative development of horticultural planning in practice. Planners can also integrate and publish their own drawing results and collected plans, so as to display their own work results and help other planners to carry out their work. The diversity of network resources enables employees in different areas to communicate with each other, which really promotes the innovative development of horticultural planning industry.

5 CONCLUSION

On the one hand, the development of computer-aided technology and platforms enables landscape architects to obtain virtual scenes which were originally only imagined and inspire designers. In virtual reality scenarios, landscape designers can combine various landscape elements to create more different styles of landscape design. Computer aided technology, on the other hand, is a

product of today's information age, network platform, computer aided technology and platform as the main approach of the contemporary landscape design, had the characteristics of opening and sharing, through the network platform, can draw lessons from all kinds of creative thinking, work type, easy to produce new landscape thoughts and intentions. Designers can do whatever they want in the data analysis and landscape positioning at the early stage of design. They can analyze different projects efficiently and accurately, making landscape design a perfect combination of rigorous science and aesthetic art. So that landscape designers can get rid of the past massive data collection and analysis work, can better create. Computer aided technology, especially the virtual reality platform, can provide users with the grandeur of the virtual landscape and immersive experience feeling, in the process of interaction with virtual scene, the drawbacks of landscape designer can find their own work or do not agree with their own design intent, change and improve in time. Computer aided plane software, can accurately obtain the landscape construction drawing, in the actual engineering construction, can be done according to the drawing, according to the standard landscape, so as to ensure that the actual results and design effect is consistent, improve the quality of landscape.

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