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Analysis of the Application of Multimedia Technology in Modern Landscape Architecture

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Abstract: When contemporary landscape designers have innovated the traditional landscape concept, multimedia technology is used as a principle tool to advance landscape architecture, which also represents one of the development trends of landscape architecture. In general, the modern landscape development, it's the precise measurement of the 3D landscape index can make up for the defects of the 2D landscape index. The main purpose of this article is to study multimedia technology as a professional research tool and aesthetics into contemporary natural landscape. Studying the relationship between the contemporary natural landscape and multimedia technology from the perspective of "multimedia teaching" brings the new changes, contents, and forms of the field. In this paper, we analyze the designs and applications of multimedia technology in landscape, which are mainly reflected as having negative effects on the application of multimedia technology, exampled by light pollution, noise pollution, "container man effect" and the infringement of privacy due to the interactive nature of multimedia. The paper presents how multimedia can be used as a media to shape a more humanized landscape space environment with the characteristics of the information age. The paper gives the corresponding solution strategy, scheme and expounds on the practical prospect of multimedia technology in the future of landscape design.

Keywords: Multimedia Technology, Multimedia Teaching Landscape, Modern Landscape, Landscape Design

1. Introduction

We are surrounded by different modes of media at any given time. The IT sector has aided the TV businesses through the development of images, audio, videos, and texts. This advancement in multimedia has changed people's views on landscape design, and the concept of aesthetics. With it, the concepts and requirements of living spaces have changed. Multimedia technology will be used more as a tool to advance landscape architecture, which also represents one of the development trends of landscape architecture. Therefore, we must focus on the main characteristics and changes of landscape design in the multimedia technology era. Computation provides powerful tools and new approaches to design thinking which directly address this necessity. While technology can never cure the ills of industrialism and should never be considered a panacea, digital projections and simulations allow expert engagement with evaluating alternatives for conformance with sustainability goals—before construction [1, 12]. Contemporary landscape designers have innovated the traditional landscape concept. In modern landscape design, they boldly use multimedia technology and its new materials such as metal, glass, plastic products, rubber, chemical fiber cloth and paint as the structural elements of modern landscape design. With multimedia technology, contemporary landscape designers also started to use new technical methods such as night scene lighting, irrigation spraying and new processing methods of building materials. It has greatly developed and enriched the creative concepts and expressions of landscape design and changed the appearance of contemporary landscape works [1]. Hence, landscape architecture is described as a field that is continuously developing with new technologies. With the background of digital media technology, modern landscape architecture design including landscape, energy construction

architecture shows an intuitive and applied visual experience in the scenic parts [2-3]. The modern architecture based on spatial pattern, habitat model, architectural form, and social relationship are valuable ecological wealth in China. It has realized the functions of landscape information query, high-dimensional measurement, terrain analysis, visibility analysis, and virtual roaming of a landscape. It has specific promotion effects on landscape spatial analysis, landscape planning, ecological protection, natural and cultural inheritance, and tourism development [4-5].

In general, the modern landscape development, it's the precise measurement of the 3D landscape index can make up for the defects of the 2D landscape index. It can highly enrich the landscape pattern information, reflecting its structural composition and spatial configuration characteristics [6].

Although landscaping is now a completely independent art and science, one has to remember that it stems from gardening, as well as architecture and several related fields, and it still has a connection with them, drawing on the theoretical and practical experiences [7]. Exploring how to make full and rational usage of language and ideology of contemporary natural landscape with the help of "multimedia" forms a landscape space with the characteristics of the new information age.

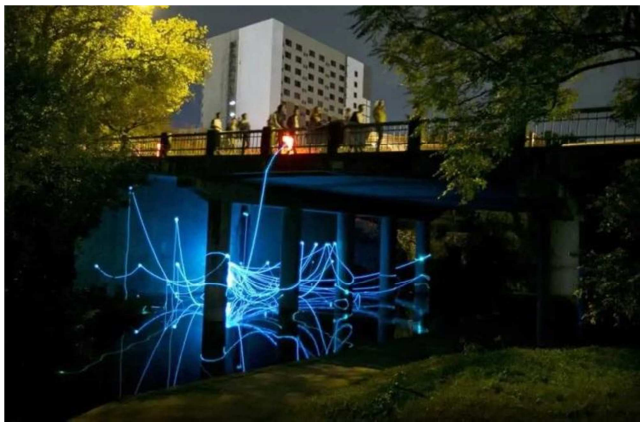

Figure 1. *Floating Light Installation in Austin Creek.*

Figure 2. *Museum of the Moon.*

In the design of modern urban landscape, the wide use of multimedia has also completely changed the previous audio-visual experiences of mankind, thus shaping a novel landscape style in modern urban landscape (Figure 1).

Multimedia information transmission is new. It is based on digital technology, information technology and propagates in a different way from traditional media. With the development of social science and technology, multimedia has attracted more and more attention from people. Compared with traditional media, multimedia is bigger, faster, and more interactive. Information technology media also stimulates and inspires landscape designers. Another inspiration for landscape designers is the relationship between people and the natural environment (Figure 2). This paper begins to discuss how to liberate the humanized communication mode formed by multimedia on the narrow computer screen, and integrate the two by introducing it into landscape design so that it can become a new design direction with humanistic characteristics and be distinctive [1, 10]. Therefore, this paper tries to explore the characteristics and evolution of landscape design in the era of multimedia technology, to explore how to create and enrich the natural landscape.

2. Methodology of Landscape Information Dissemination and Interactivity

The designers have the requisite modes of thinking in their habits, but have neither time nor inclination to learn programming skills, and hence have outgrown conventional CAD packages in their process. This cannot effectively describe structural relationships, physical behaviors, or the effects of time. It is key that design groups with technical expertise begin to set terms for collaboration which facilitate robust information sharing and workflow structuring [8].

2.1. Information Dissemination

Landscapes are unique, immovable objects to nature. Its characteristics lead people to go and appreciate the view. Landscape designers' job is to simply highlight what makes it such a beautiful sight. To analyze each land requires the senses of people to perceive information [9-10]. People use the following 5 senses to accomplish the goal aforementioned.

(1) Vision

Through vision, human beings perceive the size, brightness, color, and movement of external objects, and obtain various information of great significance (Figure 3). At least 80% of external information is obtained through vision. People also use visual senses in the dissemination of landscape information.

Therefore, in the dissemination of landscape information, vision is vital. Generally, we comment on the visual image of the landscape from two aspects: landscape constituent elements and spatial combination form.

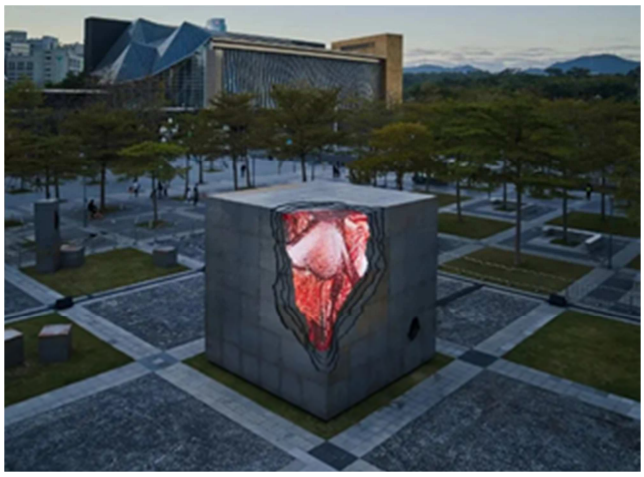

Figure 3. *Time peeling public art installation, creative team: UFO Media Lab.*

(2) Hearing

Vision is mainly to appreciate the appearance of landscape works. You can also receive the information by hearing. In this specific environment, not only the ears can feel the beauty of sound, but this sound can also effect people's inner imagination, stimulate people's emotion, and make them produce another sensory experience.

In 2008, Usman Haque designed a multimedia device in Santa Monica Beach. It transformed the Haishi building for the festival participants to interact with the virtual environment.

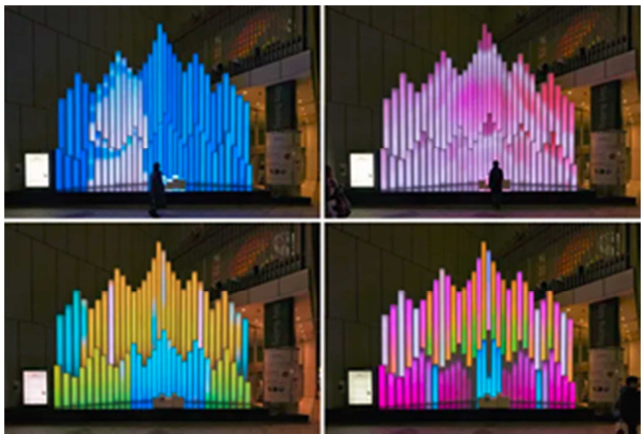

Figure 4. *"Sound Interaction" Large Square Installation.*

(3) Touch

Tactile refers to the nerve cells distributed on the whole body's skin to receive the feelings of temperature, humidity, pain, pressure, vibration, and so on from the outside world. Plants, buildings, ground, and other landscape elements can be directly touched and approached by people. Different constituent materials have different surface touches; thus, it can be inferred that we can receive information by touch. Through the contact of the audience, we can simply recognize and feel the difference. When multimedia is used in landscape, when people touch a certain interface, it will cause changes like color.

The intervention of multimedia changes the static state of touch, makes the audience interact more closely with the landscape, and enhances the diversified experience of the audience.

2.2. Landscape Interaction

Landscape is interactive. When the viewers see it, they will analyze the perceived information by the senses and accept it to their own experience and knowledge. When multimedia is involved in the landscape, this interactivity and sociality will be more prominent [10].

The interactivity of landscape includes the following four aspects in a broad sense (Figure 4):

(1) Interaction between people – This refers to the information transmission between designers and audiences. Audience appreciation in the landscape will have a positive influence on the designer.

(2) Interaction between landscapes - This refers to the coordination of landscape architecture and the sketch drawn by the designer.

(3) Interaction between people and scenes – This refers to the process of people changing the input of the scene and the landscapes ability to affect people's feelings.

(4) Interaction between time and space – This refers to landscapes having different characteristics in different times. Therefore, the change of time will lead to the change of landscape design, so as to better reflect the characteristics of the era.

From the above four aspects, the landscape must maintain mutual coordination with society, architecture, environment, and time, which is prominently reflected in the relationship between people in the landscape (Figure 4). Landscape designers express their design ideas through their work, and the audience obtains the ideas to be expressed by the designers through sensory appreciation and then feeds back their feelings to the landscape designers. In this way, a complete interaction is completed. This process will continue until the landscape and the audience reach a harmonious state.

3. Analysis of Modern Landscape Designing and Its Applications

At present, multimedia technology is mainly applied to landscape design through mostly computer based auxiliary design tools. With the in-depth application of computer technology in landscape design, the role of computers in various fields such as mapping, modeling, representation, management, information storage, and the query is becoming more and more important. Presently, modern landscape designing relies on digital design tools (and computers) and uses information communication networks to complete information exchange. The original physical exchange of drawings is gradually replaced by digital information exchange. Although the application of computer technology in China is still immature, the overall advanced design

direction will not change, and the development prospect is bright [9-12].

3.1. Computer-Aided Design

Designing with the use of CAD technology allows for the implementation of bold functional and spatial ideas. Modelling the spatial concepts of the designed facilities gives one the opportunity to present them in three-dimensional space. The application of CAD tools in landscape design mainly includes the following three aspects:

(1) Drawing and 3D view

The original computer technology used in drawing and three-dimensional view, replacing the traditional paper drawing, has the advantage of saving time and labor, but this aspect of the application of the actual design process is not very important [12-13]. It is simply a tool to show the designers idea in a realistic way. For the designer to show their idea to the clients, constructors, the labor force, and any other relevant people, a CAD model is needed. As we can see in the image below, the number of windows, amount of space for the patio and other elements are highlighted. The measurements are responsive and the entirety of the CAD model is aesthetic.

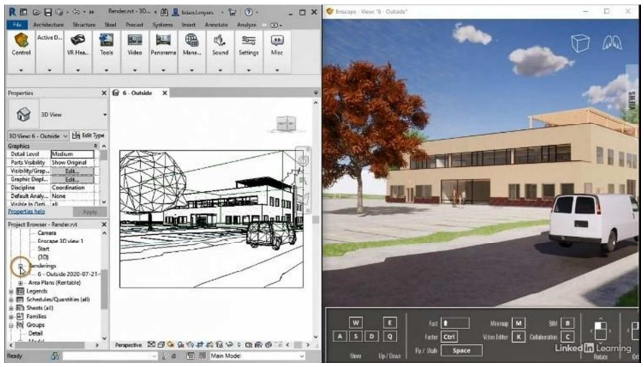

Figure 5. *Enscape software drawing.*

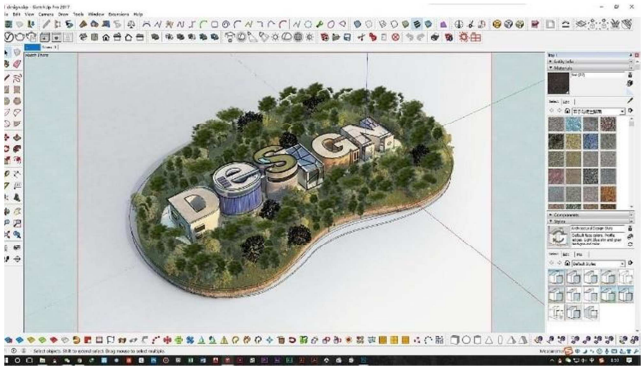

Figure 6. *Sketchup Software modeling.*

(2) Design evaluation tools

Computer technology is used to evaluate designs, both during and after a design has been made (Figure 5). It is widely used in foreign countries, especially in architectural design, such as material consumption, ventilation, and lighting. However, it is seldom used in landscape design.

(3) Computer-aided design generation

At present, it is only a research field of many designers and has not achieved ideal results in practice (Figure 6).

3.2. The Application Value of Computer Digital Technology

The rise of computer-aided design in the 1960s also brought innovation to landscape design, which is mainly reflected in two aspects: design methods and design means. In modern landscape design, traditional technology has many shortcomings, such as planning and design on a large scale. It is very difficult to use traditional technology.

If computer technology is used, the complex data of manual field surveys can be collected by technologies such as GPS, GIS, and RS. This evolution in technology greatly aids the designers by completing the busy work such as taking narrow measurements, calculating the site coordinates, etc. The designers need to understand the complex data points is reduced and this affords a great advantage.

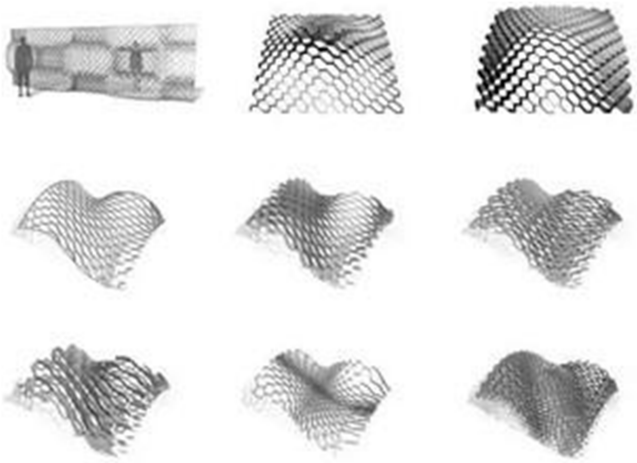

Figure 7. *Computer processing of complex forms.*

In the actual landscape design, the designer can use the fully functional auxiliary design software to get rid of the traditional manual drawings, and compared with the traditional physical model, the virtual 3D model and animation made by the 3D modeling software are more vivid and realistic (Figure 7). In addition, the designer's subjective evaluation of the landscape environment can also be replaced by the rational and objective analysis of various computer models [12-14].

The increasing development of network communication technology also makes cross-national and cross-regional remote design exchange and cooperation possible. Computer-aided design systems have the advantages of a virtual environment, three-dimensional model, and global information network, which makes the traditional design methods can be freely transferred with computer information. These have created a favorable technical foundation for designers' innovation and brought unprecedented improvements to the field.

This special multimedia form of computers has many advantages. Generally speaking, the computer provides a

more real and advanced new experience for the landscape, which is more interactive, real-time, and dynamic.

3.3. Applicational Characteristics of Virtual Digital Technology

The application of virtual digital technology in modern landscape design has the following four characteristics:

(1) Panoramic display,

Generally speaking, the traditional landscape expression can only transmit part of the landscape information. However, through the use of virtual digital technology, the designer can accurately express their thoughts and ideas. The audience can roam freely in the landscape, immerse themselves, and have an intimate experience [14].

(2) Provide convenience for aided design

In the process of design, landscape designers can experience and observe their designed works through the virtual landscape environment, and investigate the elements such as material, color, light, and shadow (Figure 8).

Through this way, they can timely find the problems existing in the design and modify the design works in real-time, which can better help landscape designers' creative inspiration and design innovation. It can also better grasp the design process and ensure the smooth completion of the design works.

Figure 8. *Using computer technology to display the virtual city landscape.*

(3) Remote browsing and communication

In the process of landscape design, landscape designers usually need to maintain continuous communication with the construction party and put forward ideas and suggestions on landscape design work. The designer's virtual works can be published to the Internet through VRML, and the construction party can browse remotely through the network and communicate remotely through virtual means [15].

(4) Achieve public participation

In the process of landscape design and construction, designers, construction workers, decision-makers, and ordinary people play different roles. In order to ensure the timely and effective completion of a landscape design, we must reach an agreement and cooperate effectively as soon as possible. Virtual digital technology allows for efficient communications between the aforementioned parties about design, measurement, construction inquiries.

4. Analysis of Liberating Landscape Design of Multimedia Technology

Liberating architecture through modularity starts with a holistic integration of the processes, products and people in the design, construction of systems, spaces and places [15-18].

4.1. Analysis of the Constituent Elements of Modern Landscape Based on Multimedia Technology

Landscape designers plan and combine various constituent elements according to different design needs and actual sites [10]. The application of multimedia technology can enrich the morphological characteristics and colors of different elements. Therefore, whether from the functional needs or artistic value needs, multimedia technology does build a broad platform for modern landscape design (Figure 9).

Figure 9. *Architectural art installation "Mirror Forest" by Wonderlabs.*

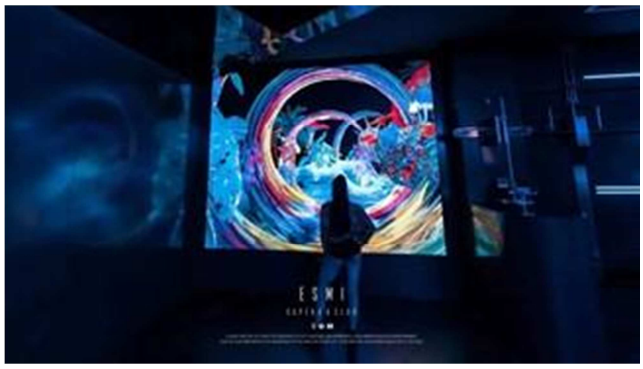

Figure 10. *Naked-eye 3D interactive digital installation architectural space, creative team: Singularity Art Technology.*

(1) Combination with architecture

With the help of modern information technology, various types of platform applications and more colorful ideas have emerged in architectural design. The continuous introduction of large-scale software systems to control accurate images further promotes architectural innovation. At the 2010 Shanghai World Expo, in the Spanish Pavilion, there was a long projection tunnel with galloping horses and long twists and turns. The combination of realistic dance and

architectural projection greatly satisfied the space of people's artistic imagination (Figure 10). Multimedia technology has brought a new visual experience to architecture [16].

(2) Combination with waterscape

At present, the concept of waterscape design in the world has tended to join multimedia technology, such as water walls, falling pools, fountains, water gushing, and other forms. This realizes the combination of water, sound, light, shadow with elements such lights, fireworks, lasers, music, and animations. These designs are exquisite and delicate, which not only improves the beauty of the landscape but also promotes the circulation of water. More importantly, it can also increase hydrophilicity.

Abroad, Bahrain Island floating high spray, Jakarta projection fountain water show, Russia's St. Petersburg floating music fountain, etc. are all examples of a dynamic waterscape. China's Olympic Forest Park multimedia music fountain, Xidan culture square, Shanghai Raffles square, Dongguan new municipal square, Nanjing Water Tour City, and Wuxi Ancient Canal Park are also the embodiment of these ideas [17].

(3) Combination with pavement

In modern landscape design, the application of multimedia technology to pavement can enrich the modeling characteristics and colors of landscape elements. For example, adding influence projection to pavement can increase the interest of pavement and convey information more vividly. LED energy-saving lamps can also be paved on the ground to make the ground shine at night, transforming the whole landscape to be more active and vivid. The famous Dublin Grand Canal Square creates a gorgeous visual effect and highlights the design theme through the combination of LED lights and pavement.

(4) Combination with plants

If we add multimedia technology to the plant landscape design and use five-color LED lights and different sound soundtracks, we can create a unique plant community, increase the visual and auditory expressiveness of the landscape and create a unique audio-visual effect.

(5) Independent multimedia artworks

In many museums, art galleries, or international art festivals, more and more multimedia artworks are displayed. They rely on advanced scientific and technological means to involve the audience, and make people feel the real artistic charm. For example, there is a screen in Times Square, the title is "enjoy your 15 seconds fame", several screens are spliced from top to bottom, and then pedestrians can pass their photos up, and then the photos fall one by one from the top screen, and then fall to the largest screen below, a total of coincident seconds. This design is simple, but allows the peoples interaction with the environment as well as the city.

4.2. Analysis of Materials of Multimedia Technology in Modern Landscape

The application of multimedia is inseparable from various conventional design materials, which can enhance the use effect of multimedia technology. Because landscape design is displayed, materials are by images, characters, and other effects.

(1) Lighting and display based on LED technology

At the current technical level, the color transition of 256 gray level images has been very soft, and the image restoration effect is satisfactory [18]. Long service life: the LED light source has no filament and low working voltage. The service life can reach 50000 to 100000 hours, that is, 5 to 10 years. Data shows that an LED light source saves 87% more electricity than an incandescent lamp and 50% more electricity than a fluorescent lamp, while its service life is 2030 times longer than an incandescent lamp and 10 times longer than a fluorescent lamp. High Tech Tip: compared with a traditional light source, LED light source integrates high and new technologies such as computers, networks. It also has the capability to be programmed, updated and is generally very flexible.

With the emergence of LED, lighting design theory is also developing. The first theory is situational lighting which is to design lamps according to the needs of the environment. The second theory is emotional lighting, which is to design lamps according to people's emotional needs. Emotional lighting is different from situational lighting. Emotional lighting is dynamic and can meet people's spiritual needs; the scene lighting is static. It can only emphasize the need for scene lighting, but cannot express people's emotions. Emotional lighting includes four aspects: first, environmental protection and energy-saving, second, health, third, intelligence, and fourth, humanization [19].

(2) Interactive multimedia technology based on sensors

The combination of LED lights and sensors would require the ground to be consisted with a see-through material and sensors depending on the need. When people step on the ground, the pressure is transmitted to the sensor. With the change of pressure, the LED illumination will show the change of color or light, to create a gorgeous landscape effect.

In some paving, its paving material is the most critical media device. It is an inductive digital paving material, that is, the so-called contact photosensitive ground technology. Every time people step on it, the stressed material will glow, after a series of steps, a luminous footprint will naturally form, and the reaction of a person will be recorded.

(3) Projection multimedia technology

At present, among various multimedia means, the projection should be common and simple. It uses the building wall as the background curtain, and then fills the projection on the wall. The atmosphere of the whole space will change with the change of projection content.

In recent years, we have seen the rapid development of projection design from quantity to quality. Through fine design, software control, graphic synthesis, and meditation, the image combination has increasingly become an important way of landscape information expression. Now, 3D projection technology has gone out of the laboratory. With the maturity of technology and the decline of price, it will bring more shocking holographic image feeling and experience. At the 2008 Beijing Olympic Games, landscape

designers used the interactive projection method to continuously transform the image graphics of various Olympic elements on the walls and ground of the venue.

4.3. Analysis of the Usage of Multimedia Technology in Landscape

Multimedia technology plays an important role in the landscape, which mainly has the following five functions:

4.3.1. Publicity or Release of Public Information

Multimedia devices (such as LED display screens) can be used as an important tool to convey social, political, economic and cultural information in the landscape of public places. The public can learn more public information and news through this medium. This way of information dissemination has unique advantages. For example, the LED display screen is placed in somewhere concentrated. The system can release news, information, policies, and regulations, weather forecast, convenience notice, public welfare information, emergency notice, etc. by using video, pictures, text, and other means. The above contents can be broadcast in groups, grades, and parts according to needs. It has the advantages of real-time communication and direct reproduction, which cannot be compared with other media technologies at the same time.

4.3.2. Commercial Publicity

The use of multimedia devices in urban public landscape space can also play the role of commercial publicity and bring economic benefits that cannot be ignored. For example, an LED large screen display system can release commercial advertisements or real-time information, which can be transmitted to the public for the first time with a striking display effect. This provides a unique advertising effect for businesses. At the same time, the LED display can give full play to its superior video function and color performance. It can beautify the environment and improve environmental facilities, a win-win situation has been achieved [20]. It will offer rich information whether the space is public or private.

4.3.3. Unique Sensory Experience

Multimedia technology not only has strong practicability but also allows us to experience a new artistic charm. For example, the combination of LED lighting and ground sensors can present different light and shadow effects through the audience's own participation, which makes the audience feel the beauty of art. The "enjoy your 15 seconds frame" giant screen in Times Square brings not only sensory experience but also a psychological shock.

4.3.4. Assist in Daily Life

In fact, multimedia technology devices can be applied to all aspects of life in the landscape. In terms of assisting daily life, multimedia technology devices have great potential. First, various daily information released by LED display screens, such as weather conditions, stock market dynamics, and agricultural product prices, help guide daily life; Second, some multimedia interactive devices can provide more convenient and comprehensive functions. For example, in Florence's "future bus stop eyes OP PP" (illustration) covering touch-sensitive e-ink technology and screen, equipped with the most advanced remote sensing technology and various interactive services. They can also publish advertisements on electronic bulletin boards in bus stops, and improve the function of Eyestop as a social gathering space in the future [21]. Passengers can plan bus trips through interactive maps, surf the Internet, monitor real-time exposure to pollutants, and use their mobile devices as the interface to contact the bus shelter.

5. Conclusion

Shaping a new landscape space through multimedia technology is a new direction. The integration and construction of multimedia technology and landscape is actually exploring a more positive way to respond to the needs of human nature. The contemporary and future landscape does not necessarily develop in the direction of multimedia technology, but the contemporary and future landscape will use multimedia more and more because it responds to the reasonable and fundamental internal needs of society and the public. This also represents one of the development directions of the landscape. The paper discusses how multimedia can be used as a new means and new media to shape a more humanized landscape space environment with the characteristics of the information age. On the other hand, it analyzes how multimedia technology intervenes and becomes a means of landscape design.

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