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Digital Innovation in Environmental Art Design: The Combination of CAD and Multimodal Fusion Technology

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Abstract. This article aims to explore digital innovation in environmental art design (EAD), especially the combined use of computer-aided design (CAD) and multimodal fusion technology. To achieve this goal, this study designed and implemented a series of experiments using a high-performance computing environment and rich EAD data sets for model training and feature detection. The results show that the proposed method has high accuracy in environmental art feature detection, with an accuracy rate of 92.5%. Among 1000 test samples, the model correctly extracts the features of 925 samples, with an error rate of only 7.5%. The sample extraction time for feature monitoring results has been reduced by 15 seconds compared to traditional methods. This has greatly improved the efficiency of feature monitoring. In the field of experimental results, the evaluation effect of digital quantitative analysis has an average score of 9.2 in the process of analyzing experimental results, which has a certain efficiency in the multimodal fusion process of method technology. This further proves the digital multimodal technology fusion analysis method.

Keywords: Environmental Art Design; Digital Innovation; CAD ; Multi-Modal Fusion Technology; Feature Detection
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1 INTRODUCTION

Visual art is also an important source of ideas for landscape design, and environmental art designers can obtain rich and diverse design intentions and creativity in different art forms. For example, light sculpture projection art is often used as a projection art for building walls and urban landscaping [1]. Digital environmental artworks pay more attention to personal experience perception, which coincides with the interactive experience perception required by modern landscape design. The emerging information technology has also provided various design techniques for urban park landscape design [2]. Digital media art, on the other hand, can generate artistic expressions that are completely different from traditional media art [3]. Digital technology can be used for building media curtain wall construction art and urban media sculpture, while sensor technology can be used for urban landscape fun lighting, etc. It can be seen that digital media art has played an important

technological driving role in the design of environmental art. With the development of time, the aesthetic level of the audience is gradually improving, and they are no longer satisfied with simple form, function, and aesthetic design [4]. In the development of the digital age, the existing concepts of urban environmental art design have become relatively backward, and traditional urban landscapes mostly emphasize the design of form and function. And they are increasingly yearning for the diverse functions of urban landscapes and artistic expressions that can evoke more emotions. To enhance the diversity of artistic expression techniques in urban landscape design, in order to adapt to the diverse aesthetic characteristics of modern humans. The application of digital media as a new means of urban landscape design, through the use of multi-dimensional sensory experiences forms such as colour, language, and sound, makes landscape expression more artistic and moves the artistic expression of the urban landscape from traditional visual expression to a deep and multi-sensory spiritual level [5].

In the past two years, there has also been relevant literature on the application of digital media art in urban environmental art environments, such as research on urban installation art, digital architecture, environmental space, and other aspects under the influence of digital media. The environment has naturally become an ideal space for people's survival and dwelling and is undergoing unprecedented innovation and changes with the joint influence of digital modern information technology, network communication information technology, electronic transmission technology, etc. The continuous updates of digital media technology will lead to significant changes in people's lifestyles, gradually shifting from experiential to technological, cognitive, and informational approaches. Through the study of existing relevant literature, the current research on urban environmental art design mainly focuses on the aspects of artistry, ecology, and regional culture. There have been many designers and researchers abroad discussing the development trends of digital media environment design in various aspects [6]. In China, which is still in the development stage of digital media, only by combining digital technology with artistic design thinking can high-quality and new technology urban environmental art design be innovated. The theoretical system of relevant literature is not systematic, and there is no systematic description of the superiority, relevance, and necessity of applying digital media art to urban environmental art design from the perspectives of technological innovation, design innovation, service innovation, and functional innovation. This requires full consideration of the requirements of the intelligent era in the innovation process. Continuously enhancing interaction and experience, integrating it into the intelligent systems of future cities. On the premise of enjoying the visual beauty brought by the urban environment, the audience constantly puts forward new requirements for the intelligence, experience, and interaction of the urban environment. It provides a detailed introduction to the application of immersive scene design using Web3D technology in environmental art design [7]. Computer technology not only enhances the user experience of digital media art but also reveals new directions for environmental art design. To verify the effectiveness of these methods, they conducted control experiments using real datasets and specifically focused on improving user experience in digital media applications. The research background focuses on condensing multidimensional digital models for green city design and gradually constructing their digital methodology system [8]. Nonlinear technology, with its ability to break free from traditional linear thinking constraints, has injected unprecedented vitality into the field of environmental art and design. It allows designers to explore more complex, diverse, and expressive spatial forms in the process of conception and implementation, thereby creating design works that comply with natural laws while maintaining artistic beauty. In the design of landscape architecture spatial form, data visualization has become an important bridge connecting abstract concepts and concrete expressions. By transforming massive environmental and user behaviour data into intuitive and understandable visual images, designers can more accurately grasp design requirements and optimize design solutions. At the same time, this visualization method also promotes communication and collaboration among design teams, accelerating the iteration and improvement of design creativity. This design process not only embodies the cutting-edge concepts of environmental art design but also fully utilizes the advantages of digital technology, bringing new perspectives and tools for green city design. By adopting the method of colour partitioning, it has carefully designed practical scenes of garden landscapes with

nonlinear parameterization features. This achievement not only verifies the practical value of nonlinear technology in environmental art design but also provides strong support for the digital method system of green city design [9]. Through further research and practice, it is expected that this technology will be more widely applied to the design and optimization of urban green spaces, promoting continuous innovation and development in the field of environmental art design.

Some scholars have explored the framework of climate-smart landscapes, in which land use management strategies are carefully planned to seamlessly integrate sustainable production practices, enhance adaptability to climate change, and effectively promote mitigation measures. It is particularly noteworthy that in heterogeneous landscapes where land use intensity is maintained at a moderate level, the complementary characteristics of vast grassland areas and space play a crucial role. They not only provide rich habitats for biodiversity but also promote the collaborative output of various ecosystem services - from carbon sequestration to water conservation. The core objective of the research is to deeply analyze how landscape fragmentation subtly affects multifunctional performance. And further, explore how this impact intertwines and interacts with the response mechanisms under different land use intensities [10]. This multifunctional spatial dimension still needs to be formalized to improve the effectiveness of nature-based solutions. It generates a virtual landscape to simulate the interaction between six ecosystem services with different spatial sensitivities. Virtual simulation enables us to systematically understand how the interaction between land use intensity and fragmentation regulates multifunctionality. The five types of ES regulation work synergistically and are balanced with entertainment performance. Although interactions are most sensitive to strength as they have a dominant effect on individual ES, fragments mediate the strength of interactions. This is an important step in designing climate-intelligent landscape templates based on regional geography, land use allocation, and ecosystem priorities [11]. Hence, investigating the amalgamation of CAD and multi-modal fusion technology in EAD holds both theoretical significance and practical value.

On the premise of enjoying the visual beauty brought by urban landscapes, the audience constantly puts forward new requirements for the intelligence, experience, and interaction of urban landscapes. In the past two years, there has also been relevant literature on the application of digital media art to urban landscapes. Through the study of existing relevant literature, the current research on urban park landscape design mainly focuses on artistic, ecological, and regional cultural aspects. However, the theoretical system of relevant literature is not systematic, and there is no systematic description of the superiority, relevance, and necessity of applying digital media art to urban park landscape design from the perspectives of technological innovation, design innovation, service innovation, and functional innovation [12]. In China, which is still in the development stage of digital media, only by combining digital technology with artistic design thinking can high-quality and new technology urban park landscape design be innovated. For example, research on urban installation art, digital architecture, landscape space, and other aspects under the influence of digital media. This requires full consideration of the requirements of the intelligent era in the innovation of urban park landscape design, continuously enhancing the interaction and experience of urban park landscape design, and integrating it into the intelligent system of future cities. Explore the application of digital environment design methods and technological means in the outdoor environment design process. Case verification combines outdoor site types, design specifications and standards for different environmental types, and user needs. This study is a preliminary and exploratory achievement of digital environment design theory and methods based on smart landscape thinking. Establish parameterized analysis models separately to guide the design content of road organization, plant planting, environmental visibility creation, intelligent water feature pipeline layout, etc., and then combine the designer's aesthetics and experience to form a complete scheme design. Due to the limitations of current data acquisition and analysis methods and technological means, there are still areas for improvement in the exploration and application of digital technology, and further exploration and research are needed.

2 LITERATURE REVIEW

The field of landscape design is undergoing a profound transformation driven by changes in public aesthetics. This indicates that the rural landscape design industry is about to usher in a storm of innovation, and its development prospects are remarkable. This title not only highlights its important position in the global economic landscape but also profoundly reveals its extensive radiation and profound impact on various fields of social economy. At the same time, the modern rural landscape design paradigm relying on virtual environment modelling and virtual reality technology has injected unprecedented innovative vitality into this field. Among them, landscape design agriculture, as an emerging and popular trend, cleverly integrates the essence of natural aesthetics and modern agriculture, demonstrating vigorous development vitality and unlimited potential. The development of the landscape design industry not only promotes the improvement and upgrading of related industrial chains but also drives the cross-integration of multiple disciplines, such as materials science, environmental science, and information technology, opening up new paths for technological progress and industrial upgrading. From an international perspective, the landscape design industry has been dubbed the "never-ending sunrise industry." The traditional form of landscape design mainly focuses on people's direct experience at specific times and places to achieve economic value. The landscape design industry has effectively activated the labour market by creating employment opportunities, promoting consumption, bringing economic benefits, and diversifying development opportunities for surrounding areas. However, this model is constrained by time and space factors, making it difficult to fully tap into the economic and cultural value of landscape design. Therefore, paying attention to the development dynamics of the landscape design industry, especially cutting-edge issues, has profound practical significance for promoting comprehensive development in social, economic, cultural and other aspects. From the perspective of environmental art design, virtual environment modelling can design specific spatial environments and finely simulate their internal elements, using texture technology to give the environment a sense of realism and realism. The organic combination of these two technologies has brought broader design space and more delicate physical and mental experiences to the rural landscape design industry. Michalek et al. [13] delved into the optimization role of virtual environments and environmental landscape modelling based on virtual reality technology in rural landscape design. This article provides a detailed analysis of specific optimization elements in these technologies and validates them using algorithms. Compared with traditional landscape design models, these methods have an optimization rate of up to 15.73% in the tourism process, fully demonstrating their broad application prospects in rural landscape design and environmental design. This research achievement not only enriches the theoretical system of environmental art design but also provides strong technical support for the innovative development of the rural landscape design industry.

The essence of art and design is deeply rooted in the profound interaction with human emotions. Under the framework of tensor operations, the matching fusion matrix plays a bridging role. Sun et al. [14] ingeniously extended bimodal matching to multimodal matching, greatly enriching the hierarchy and depth of emotional expression. This article uses multi-mode fusion features to classify emotions in detail and samples the multi-mode matching tensor through average pooling technology to extract abstract and expressed fusion features. This mode not only allows designers to explore design concepts personally but also greatly promotes emotional resonance and interaction between users and design works. It relies on the powerful power of virtual reality technology to construct a carefully optimized virtual world, laying a solid foundation for the birth of immersive art design models. On the vast stage of environmental art design, virtual interaction models have become powerful tools for controlling design vision. This data clearly indicates that in the context of art and design, the overall three-colour matching sample is more appealing and wins widespread favour. Tang et al. [15] conducted an in-depth study on students from the School of Design and Art at G University. In the cognitive experiment test, the popularity of the three colour combinations was as high as 0.307, significantly exceeding that of the two colour combinations by 0.223. This study not only provides a powerful evaluation tool for designing artistic products with emotional tension and innovative vitality but also opens up new thinking paths for the field of environmental art design. It inspires us to pay more attention to the subtle integration of emotions and the clever combination of

technology in future environmental art and design practices, to create spatial works that are both beautiful and emotionally resonant.

With the advent of the digital age, technology has integrated into every aspect of people's lives, profoundly changing the way they live, work, and interact with their surroundings, demonstrating people's love and dependence on technology. In the current stage of smart city development, the design and expression of digital landscapes in urban commercial spaces have become increasingly important. Wu and Yan [16] used interdisciplinary research methods to demonstrate the directionality and feasibility of interactive landscape design for urban commercial spaces under the digital concept. In today's society, people are not only satisfied with the material foundation but also pursue spiritual satisfaction and filling. The digital concept affects people's cognition, feelings, and value transformation towards new things and scenes in the process of urban renewal and development. The integration and complementarity of "landscape design" and "interactive design" is the perfect fusion of art and technology in commercial spaces. Combining the interactive design forms of digital landscapes in urban commercial spaces summarizes the digital concepts, characteristics, and iterative effects that digital landscapes bring to urban commercial spaces. From the perspective of urban economic and social development, analyze the impact of digital concepts on interactive design in commercial spaces, the existing problems in the interactive design of urban commercial spaces, and the relationship between urban commercial spaces and digital landscapes. Xu and Wang [17] combined case studies of interactive landscapes in commercial spaces under digital concepts at home and abroad to analyze the current status of interactive design in commercial spaces, the differences in expression between domestic and foreign interactive landscapes, and the advantages and disadvantages of expressing interactive landscapes in commercial spaces under digital concepts. Exploring the future development trend of interactive landscapes in urban commercial spaces under digital concepts from multiple aspects such as digital technology, design techniques, and cultural communication, as well as the necessity and foresight it brings to the public. This study examines the impact of digital landscapes in commercial spaces on audience psychology and behavioral hierarchy based on the research background of interaction and user experience requirements.

EAD, as an important bridge connecting natural and human factors as well as material and spiritual aspects, has attracted great attention from the academic community in both theoretical and practical fields. Deeply explore various aspects of EAD and provide designers with innovative design tools. Yu et al. [18] conducted extensive research on the application of CAD in EAD and explored its potential integration with multimodal fusion technology. These studies collectively demonstrate the widespread application and potential of CAD technology in EAD, providing important theoretical support and practical guidance for exploring the integration of CAD and multimodal fusion technology in this article. On this basis, this article aims further to investigate the combination methods of these two technologies and design a set of 3D digital modelling techniques suitable for the EAD field.

3 DESIGN AND IMPLEMENTATION OF THE MULTIMODAL FUSION ALGORITHM

In the field of digital innovation in EAD, the design and implementation of algorithms are the key to realizing the combination of CAD and multimodal fusion technology. The core algorithm of this study aims to effectively integrate multi-modal data into the CAD platform, to realize the diversification of design materials and the intelligence of design, and to improve the construction efficiency and rendering quality of 3D models while maintaining design creativity. The network structure of environmental art feature detection is shown in Figure 1.

Multimodal data include images, audio, text and other types, which need to be preprocessed after collection to extract useful feature information. For image data, edge detection and colour analysis are carried out by using an image processing algorithm. For audio data, voice recognition, emotion analysis and so on can be carried out. For text data, keyword extraction and semantic analysis can be carried out.

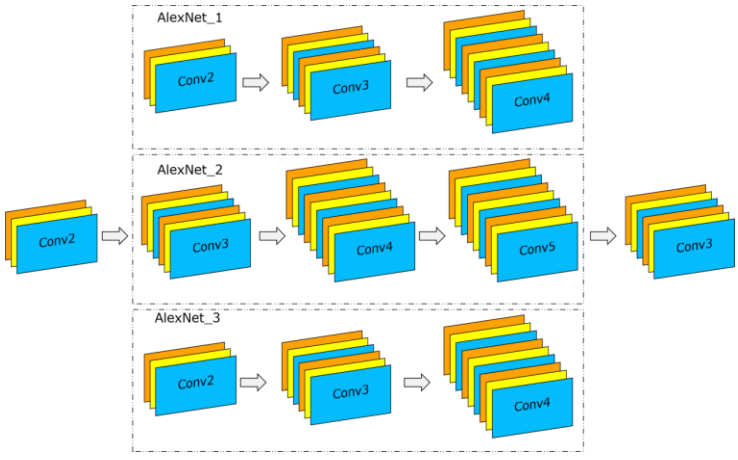

Figure 1: Feature detection network structure.

Feature detection in environmental art images is susceptible to quantum noise and stains, prompting the algorithm to incorporate noise and stain removal during contour feature detection. Specifically, the origin $O\ x_0,y_0$ and point set $P_l\ x_l,y_l$ in the acquired polar coordinates r,θ are transformed into points within the rectangular coordinate system x,y :

$$x_l = r_l^n \cdot \cos\theta_l + x_0 \tag{1}$$

$$y_l = r_l^n \cdot \sin\theta_l + y_0 \tag{2}$$

Where $\theta_l = l \cdot \Phi, r_l^n$ represents the normalized value of r_l .

In digital images, the aforementioned conditions can be met, as the linear grey scale transformation of a region impacts moment characteristics. To characterize the shape of the target, the influence of linear grey scale transformation can be mitigated by operating on the binary target area.

Given $I\ x,y\ ,x,y = 0,1,\cdots,N-1$ as a regional binary image or a suppressed background image, its $p+q$ -order statistical moment is defined as:

$$m_{pq} = \sum_{x=1}^{n}\sum_{y=1}^{n} I\ x,y\ x^p y^q \tag{3}$$

In image processing, the similarity between individuals can be assessed using various measurements, with distance measurement being the most representative approach:

$$d_{ij} = \sum_{i=1}^{K} \left| x_i^l - x_j^l \right| \tag{4}$$

Among them, the dimension vector of the object i is denoted as x_i, with each element of the vector represented by $x_i^l\ l = 1,2,\cdots,K$.

Select the unique binary code string generated by n point pairs x,y , chosen from the $S \times S$ area based on specific rules:

$$f_n\ p\ = \sum\nolimits_{1\le i\le n} 2^{i-1}\tau\ \ p; x_i, y_i \tag{5}$$

The above formula $f_n\ p$ serves as a descriptor while n is typically weighted based on different application scenarios.

Based on feature detection, it is needed to design a mechanism to associate this feature information with design elements in the CAD platform. This can be achieved by establishing a multimodal database, which stores various types of data features and their corresponding design elements. When the user needs to introduce some specific multimodal data in the design process, the system can retrieve the corresponding feature information from the database and match it with the design elements, thus realizing the integration of multimodal data.

The integration of multimodal data provides the possibility for the diversification of design materials. The traditional design materials are mainly limited to the graphic library and model library built in the CAD platform, and the introduction of multimodal data enables designers to obtain inspiration and materials from a wider range of data sources. For example, designers can design environmental artworks with specific emotional atmospheres by analyzing the emotional characteristics of audio data. Or, by analyzing the semantic content of text data, the visual elements related to the design theme can be extracted.

4 CONSTRUCTION AND RENDERING OF 3D MODEL OF ENVIRONMENTAL ART

To improve the efficiency of 3D modelling, the traditional modelling methods are analyzed and improved. In this study, a 3D modelling method based on multimodal data fusion is introduced. This method can automatically analyze and process the feature information in multi-modal data and transform it into geometric shapes and texture maps in 3D models.

In the realm of EAD, the depiction of model hues necessitates a foundation in authentic landscape imagery. However, the initial 3D landscape captures often harbour drawbacks like noise and information overload, necessitating the incorporation of image preprocessing techniques. Supposing the original 3D landscape image comprises q observed variables, many of which exhibit inter-variable correlations, we can leverage the fundamental principle of principal component analysis. This statistical method transforms q the original variables, yielding a novel variable L_w whose q components are mutually orthogonal. Within this transformed space, a variables with substantial energy are designated as principal components, eliminating redundant information and constructing a B^a --dimensional feature space.

Furthermore, to refine this feature space, we apply relevant theories to decompose the covariance matrix D_{L_w} of the dataset L_w:

$$D_{L_w} = F\left[L_w^T\right] = FEF^T \tag{6}$$

$$U = E^{-\frac{1}{2}}F^T \tag{7}$$

$$D_s = F\ \ ss^T\ \ = UF\ \ L_w L_w^T\ \ U^T = E^{-\frac{1}{2}}F^T FEF^T FE^{\frac{1}{2}} = 1 \tag{8}$$

To address the drawbacks of an overly large 3D image base, it is imperative to reduce the dimensionality of 3D image features. This is achieved by arranging the eigenvalues in descending order and selecting the top a eigenvalues with significant values to obtain the diagonal matrix $\bar{E}$ with reduced dimensions, as detailed below:

$$U = \bar{E}^{-\frac{1}{2}}D^{-T} \tag{9}$$

$$s\ t\ =\left[s_1\ t\ ,s_2\ t\ ,\ldots,s_a\ t\ \right]^T \tag{10}$$

It complies with:

$$s\ t\ =\hat{U}L_w\ t \tag{11}$$

Then the statistics $z_j\ t$ of the independent components of the 3D landscape image are:

$$z_j\ t\ =\left[\beta_{j1},\beta_{j2},\ldots,\beta_{ja}\right]\begin{bmatrix} s_1\ t \\ s_1\ t \\ \cdots \\ s_1\ t \end{bmatrix} \tag{12}$$

In the process of constructing 3D landscape images, selecting a suitable image library is crucial for optimizing performance and maintaining image quality. The independent components in these image libraries, as the basic building blocks of 3D scenes, bear the responsibility of presenting rich visual layers and details. Through careful selection, we can minimize computational resource consumption while avoiding unnecessary distortion of 3D landscape images, ensuring that the final presentation is both efficient and realistic.

During the modelling process, parametric modelling technology is employed, enabling swift adjustments and modifications to the model by defining a parameter set that controls its shape and size. The global illumination algorithm is utilized to simulate real-world lighting effects, calculating light propagation and rebound within the scene to produce more realistic lighting and shadow effects. Additionally, high-resolution texture and material mapping technologies are used to enhance the model's detail and realism. Figure 2 displays some effects of 3D environmental art reconstruction.

Figure 2: 3D reconstruction effect of environmental art.

In the process of 3D model construction and rendering, we always pay attention to maintaining and enhancing the creativity and uniqueness of the design. In order to achieve this goal, the creative protection mechanism is introduced in the process of modelling and rendering. This mechanism can not only ensure the modelling efficiency and rendering quality but also protect the designer's original design and prevent the loss of design creativity caused by excessive smoothness or distortion during modelling and rendering.

5 EXPERIMENTAL RESULTS AND ANALYSIS

To validate the feasibility and effectiveness of the proposed method in the digital innovation of EAD, this study designed and conducted a series of experiments.

5.1 Experimental Environment and Data Preparation

The experimental environment includes a server equipped with a high-performance GPU to ensure the computational efficiency of model training and feature detection. The experimental data comes from the public EAD data set and some actual EAD project data collected by ourselves. These data cover ten different design styles, 500 design elements, and 20 scenarios, with a total of 10,000 samples to ensure the comprehensiveness and generalization of the experiment.

5.2 Model Training and Loss Function Analysis

During the model training stage, the loss function value index throughout the training process is recorded, as depicted in Figure 3. The loss function serves as a crucial metric for assessing the discrepancy between the model's predicted outcomes and the actual results. Observing the loss function's changes provides insights into the model's training progress and performance.

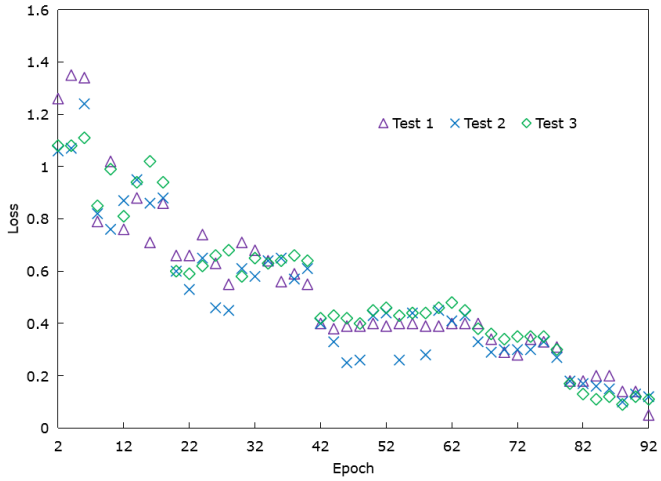

Figure 3: Loss function.

Subsequently, over the next 80 iterations, the loss function value slowly decreases to 0.2, suggesting gradual refinement of the model's fitting process. Upon reaching 200 iterations, the loss function value stabilizes and ultimately converges to approximately 0.1, demonstrating effective model training.

5.3 Environmental Art Feature Detection and Accuracy Analysis

After the model training is completed, the features of new environmental art data are extracted by using the trained model. The accuracy of environmental art feature detection of the model. Figure 4 shows the accuracy of environmental art feature detection.

Digital media technology is a multidimensional organ that allows for richer experiences, and the inherent life experiences of humans are also changing accordingly. People constantly apply new technologies to enrich content and forms of expression. More Than This. The designers also adopted a series of dynamic and participatory expressions to enhance the interactivity of the design. The designer has broken through traditional design concepts and adopted a dynamic approach rather than a static one, mobilizing more senses to participate in the joint perception of design changes.

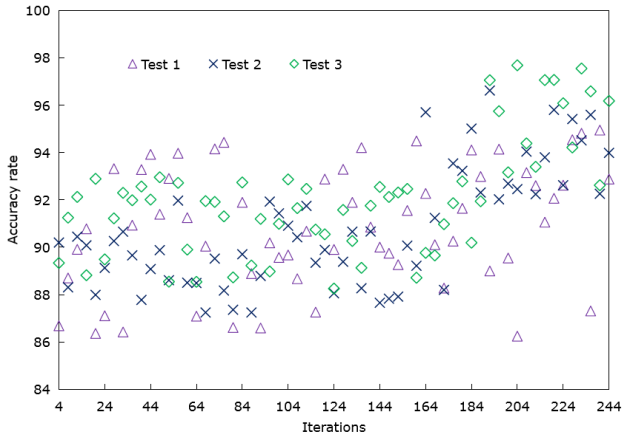

Figure 4: Accuracy of environmental art feature detection.

Dynamic landscape design has been influenced by digital media, resulting in a high degree of visual impact. Therefore, in the information age, the characteristics of visual art are visual impact, interactivity, and emotionality, and the characteristics of landscape design have gradually shifted towards expressing technical beauty. The scene environment under the participation of digital media art, from media to materials, and then to the use of materials, is constantly changing, bringing users exaggerated and stimulating psychological experiences. Landscape design has also been influenced by digital media art, characterized by a stronger visual impact. It uses unexpected scenes and bright colours that can be seen everywhere, allowing people to clearly feel the content of environmental design, understand the meaning that environmental design aims to express and be deeply attracted.

5.4 Efficiency Analysis of Feature Detection

The performance of feature detection models in reality and the feasibility of key indicators in practical applications require further verification and analysis of their accuracy.

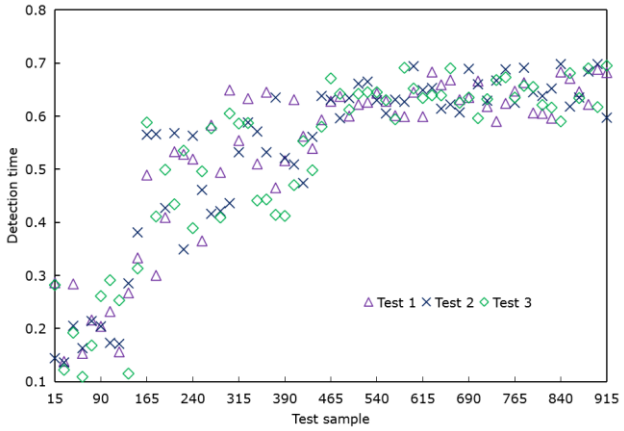

Figure 5: Feature detection efficiency.

Figure 5 shows the efficiency results of feature detection. The algorithm has achieved high accuracy in optimizing computational complexity under the same hardware conditions. Environmental art

landscape design in digital media not only has economic value but also has high dissemination value, becoming a source of information dissemination. To understand today's landscape design based on the basic concepts of communication history, the focus of research is actually on the audience and the interior of urban landscape spaces. The performance optimization feature monitoring of 1000 samples proposed by the research institute achieved a level of 75% in the frequency of model usage. So only when both aspects are mutually recognized and accepted can dissemination occur, and only in this way can dissemination truly have practical significance. Traditional landscape design is centered around landscape designers, expressing their design ideas and emphasizing their design thinking, with creativity being an irreversible process. In this process of activity, landscape design focuses more on humanistic design, that is, designing under the concept of people-oriented, and gaining a deeper understanding to make more profound design practices.

5.5 Digital EAD Effect Display and Expert Assessment

Landscape design serves as a carrier of information and a medium of communication. It conveys the way of life, the characteristics of life, and some specific information about the external world. The information conveyed by landscape is also constantly evolving and expanding with the changes in society. In this process, nature plays the role of both a medium and an information carrier. The result of these modes of existence is a closer correlation and communication between people. Because its natural landscape not only directly affects people, but also provides new information and promotes interaction between people. As a media, it meets people's viewing needs and affirms a certain way of life and attitude.

Figure 6: Display of design works.

Figure 6 displays the design work. To gather professional opinions and suggestions, experts in environmental design were invited to assess the effectiveness of digital EAD independently. The assessment content includes aspects such as realism, expressiveness, creative uniqueness, and consistency with the original design drawings of the work.

Figure 7 shows the expert evaluation results. When examining expert feedback on digital landscape design techniques in outdoor landscape design projects, its significant advantages are evident in the field of landscape architecture. At the beginning of the project, designers carefully select landscape targets as the core content of analysis based on the unique characteristics of the site. Subsequently, with the help of advanced digital tools, abstract design concepts are concretized into fine parameter models.

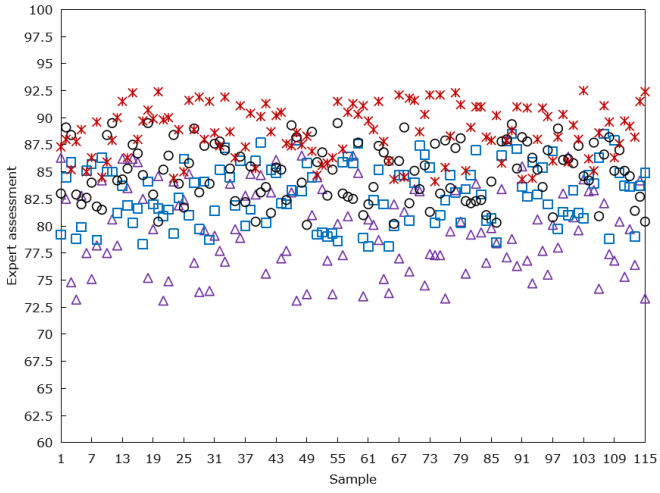

Figure 7: Expert assessment results.

This data-driven design methodology not only significantly enhances the scientific and logical nature of landscape design, but also lays a solid theoretical foundation for subsequent construction, ensuring the perfect implementation and presentation of design concepts. This method cleverly weaves an accurate network of relationships using data, refining the originally complex spatial information into intuitive and understandable parameterized models, greatly promoting the depth and breadth of design understanding. This process not only achieves a leapfrog transformation from 2D blueprints to 3D three-dimensional space but also empowers design decisions with solid scientific basis through precise data analysis.

6 CONCLUSIONS

The current development of digital media is becoming increasingly prosperous. This article analyzes the digital innovation application of a digital multimodal fusion technology in EAD. In traditional urban landscape design, the interactivity of landscape design only exists between designers and viewers. However, the media is just a bridge in the middle and has not played a significant role. Nowadays, the booming development of digital information technology, such as the Internet of Things, provides possibilities for interaction between digital media, viewers, and landscape design. The audience's acceptance of landscape design is also passive, lacking interactive communication with landscape design. It has further developed into various forms of interaction between the audience and the people and objects in the landscape infrastructure, or between the landscape infrastructure and other infrastructure. Immersive spatial design techniques have been used in environmental art landscape design, creating multimedia and digital space design environments that break through traditional cultural landscape design concepts for public construction. These diverse interactions have disrupted the relationship between designers and audiences in traditional media time, further flourishing into diverse interactions between designers, art, and audiences.

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