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Computer-Aided Design AND APPLICATIONS

Design of Virtual Tourism Interactive Products Based on Deep Features

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Abstract. The growth of tourism has correspondingly promoted the economic growth of China and promoted the growth of a series of industries related to tourism. The effective management of tourism resource information is an urgent problem to be solved at present. Traditional tourism information management adopts two-dimensional spatial data, which can no longer meet the needs of tourism development and tourists. Therefore, it is of great significance to establish 3D visual tourism scenes. As an information-intensive industry, virtual tourism based on virtual reality (VR) can not only improve the information level of the whole industry, but also promote the protection of natural and human tourism resources. This article takes experience as the path to study the emotional transformation mechanism of tourism interactive products, explores the deep features of product images with deep learning (DL) algorithm, and introduces interactive experience thinking into the research of tourism interactive product design, aiming at improving the interactive experience of tourism interactive products and expanding the research scope of computer-aided design (CAD). This method can give designers great help to specific problems, but only one method is adopted, which can only support a certain type of innovation. With the deepening of the research on innovation, the innovation problems are classified and classified, and appropriate strategies are adopted respectively.

Keywords: Deep Characteristics; Virtual Reality; Tourism Interactive Products; Computer Aided Design
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1 INTRODUCTION

Tourism has become a mass consumer product, but with the increase of demand, the richness of travel routes and the diversification of tourists' needs, tourists' satisfaction with tourism services is gradually declining. Based on the rapid growth of social economy and the sharp improvement of

people's living standards, consumers' demand for products has also changed from functional demand to emotional demand; Therefore, tourism product design no longer only pursues functional realization and product practicality, but also needs consumers to realize spiritual satisfaction and emotional care in the stage of product experience. Virtual reality technology has been widely applied in many fields in recent years, including tourism. This technology can provide an immersive virtual travel experience, allowing people to explore scenic spots around the world without having to go there in person. However, virtual reality technology also brings a complex problem: it limits human interaction in tourism. How does this restriction affect the tourism experience and human interaction? This is the issue that we need to explore. ATSIZ [1] reviewed the application of virtual reality technology in the tourism field and its impact on human interaction. Virtual reality technology provides new ways to experience tourism, but it also limits the physical distance between people. We explored the impact of this restriction on tourism experience and human interaction, and proposed future research directions. It was found that although virtual reality technology provides an immersive travel experience, it also limits human interaction. This restriction may have a negative impact on the tourism experience as it deprives people of genuine interaction with local culture, people, and geographical environment. However, we also need to recognize that virtual reality technology itself is not good or bad, it is just a tool. How to reasonably utilize this technology to balance the needs of virtual tourism experience and human interaction is a question worth exploring. The revolution of VR has caused a double change in human life style and way of thinking. A virtual world, which is different from human reality but closely related to it, is gradually entering human life, becoming a brand-new antenna for rapidly exploring the world today. Baik [2] conducted a virtual 3D model analysis of architectural heritage information model. It constructs an augmented reality architecture cloud data restoration system in a 3D environment. Interactive virtual BIM allows tourists to interact with the virtual environment, such as exploring, clicking, and dragging in the virtual environment. This interactivity and sense of participation can enhance the experience of tourists, making them feel more authentic and immersive. Interactive virtual BIM can provide personalized travel experiences based on the interests and needs of tourists. For example, tourists can choose the attractions they are interested in, or visit according to their preferences and schedule. Interactive virtual BIM can be used to promote and protect heritage sites in Jeddah. By creating a realistic virtual environment, more people can learn about and pay attention to Jeddah's heritage sites, thereby promoting their protection and development. The use of interactive virtual BIM can increase the competitiveness of Jeddah's tourism industry and attract more tourists to visit. At the same time, this technology can also help Jeddah's tourism industry achieve differentiated competition and provide a different experience from other tourism destinations. At the beginning of product design, designers fully consider all aspects of consumer experience, especially interactive experience, and at the same time think deeply about all aspects of detail design that affect product experience. According to the characteristics of tourism, how to make full use of CAD technology to develop virtual tourism interactive products, so as to meet the needs of tourists and promote the sustainable growth of China tourism industry is an important issue facing the current tourism development in China. Beck et al. [3] conducted an emerging technology system reality construction for virtual reality. By analyzing the tourism backgrounds of different virtual reality environments, a head-worn display system for tourism marketing was constructed. The headworn virtual display system can provide interactive tour guide services, allowing tourists to navigate and explore through head-worn devices. This service can provide more personalized and customized tour guide services, while also enhancing tourists' sense of participation and interactivity. The head-worn virtual display system can provide virtual exhibition hall services in the exhibition hall, allowing tourists to visit the exhibition hall through head-worn devices. This service can save space and time in the exhibition hall, while also providing a more personalized and diverse exhibition hall experience.

The online experience of Aibiying may be welcomed and loved by many travelers. Cenni and Vásquez [4] use virtual reality technology to allow users to truly experience the environment, culture, and customs of tourist destinations, and gain an early understanding of the appearance,

facilities, and surrounding environment of the house, making it easier and more enjoyable to book and travel. However, there are also some travelers who may not be accustomed to or enjoy the online experience of Aibiying. They may prefer traditional travel methods, by personally experiencing and experiencing the destination. In addition, due to the high technical requirements of virtual tourism products, some users may encounter technical issues or be dissatisfied with the fidelity of virtual reality, resulting in negative reactions to the product. In short, the response of adopters to virtual tourism products varies from person to person. Although the online experience of Aibiying may be welcomed and loved by many travelers, there may also be some travelers who are not accustomed to or dislike this new type of travel method. The system includes innovative methods, innovative tools, knowledge acquisition and unstructured design environment, etc. The system is used to guide scientific and technical personnel to carry out innovative design in the stage of product design. The rapid growth of cutting-edge sci & tech has also accelerated the application of artificial tourism interactive products in families, accelerated the change of people's lifestyles, and created new demands. Moreover, users' acceptance and trust in tourism interactive products are getting higher and higher. This also indirectly gives designers and manufacturers confidence, thus accelerating the design and research and growth of tourism interactive products. Every integration and application of new information technology, especially internet technology and tourism industry, has obviously improved the informatization level of tourism industry, and the service level and quality of tourism industry have achieved qualitative improvement. This article takes experience as the path to study the emotional transformation mechanism of tourism interactive products, and introduces interactive experience thinking into the research of tourism interactive product design, expanding the scope of tourism interactive product design, aiming at improving the interactive experience of tourism interactive products, expanding the research scope of CAD and providing new ideas for designers and researchers.

The transformation of reference frames under interaction analysis refers to the analysis of interactions and influences during the process of transformation between different reference frames. In the virtual travel experience, students can learn about the culture, history, and customs of tourism destinations through the virtual environment, and deepen their understanding and understanding of local culture by interacting with characters, objects, and scenes in the virtual environment. Durko and Martens [5] conducted an interactive analysis of the transformation of reference frames under interaction. It constructs a knowledge framework for cultural impact exchange under the virtual travel experience. The framework of cultural influence exchange knowledge refers to the integration of cultural influence and exchange knowledge, constructing a systematic framework to better understand and analyze the process and impact of cultural exchange. In the virtual travel experience, students can experience the local cultural atmosphere firsthand through the virtual environment, and gain a deeper understanding of the local culture, history, and customs through interaction with characters, objects, and scenes in the virtual environment. Therefore, the transformation of the reference frame under interaction and the construction of a knowledge framework for cultural impact communication are of great significance for cultural learning and communication in virtual travel experiences. Through the construction of these analyses and frameworks, it is possible to better understand and analyze the process and impact of cultural exchange, thereby enabling better cultural learning and communication in virtual travel experiences. Tourism interactive products will be more specialized, and the fuzzy and uncertain parts of human operation will be replaced by intelligent computing, which will reduce people's anxiety. Moreover, under the background of the Internet of Everything, the fields and scope of tourism interactive products will also be greatly expanded, linking more products and services for people. VR is a CAD technology that combines CAD technology and electronic information technology. Due to the growth of information technology, this technology has become a brand-new computer technology, which has been applied to agriculture, education and training, medicine, industrial manufacturing and other fields, and has promoted the information and intelligent growth of computers and related industries. The design of virtual tourism products is based on the real tourism landscape, and a virtual tourism environment is constructed by simulating the real landscape or surreal landscape by computer, so that tourists can get the

immersive tourism experience. This article will study the application of VR and CAD technology in tourism interactive product design, and make the following innovations:

⊖ By analyzing the present situation and existing problems of CAD in tourism interactive product development, this article introduces the working mode of VR in tourism interactive product development CAD and expounds the role of VR in tourism product development CAD.

② In the study, a model of tourism product appearance image recognition based on improved convolutional neural network (CNN) is proposed. Starting from the convenient generation, rapid variation and effective interaction of tourism product modeling, the information of tourism interactive product image primitives is extracted by DL method, and the virtual tourism interactive product CAD is realized.

Firstly, this article introduces the design requirements of virtual tourism interactive products, and puts forward the computer-aided design method of virtual tourism interactive products based on deep features. Then the effectiveness of this method is verified by experiments. Finally, the research results and limitations are summarized, and the next research ideas are put forward.

2 RELATED WORK

Fang and Kao [6] conducted the construction of a 3D computer independently designed CAD model in free mathematical mode. It analyzes the 3D digital distorted flow experience under visual shape control. Traditional parametric Computer-aided design can generate a large number of models in a relatively short time by using parametric design, which improves the design efficiency. Traditional parametric Computer-aided design modeling can accurately control the size and shape of the model, thus ensuring the accuracy of the model. Traditional parametric Computer-aided design modeling can record the construction process and parameters of the model, which is convenient for designers to modify and adjust. Virtual reality free form modeling can be used for real-time interaction through virtual reality technology, allowing designers to more intuitively adjust and modify models. Virtual reality free form modeling can quickly modify and adjust the model, making it convenient for designers to experiment and try. Virtual reality free form modeling can more intuitively display the appearance and form of the model, making it convenient for designers to design and evaluate. Frutiger et al. [7] conducted computer-aided analysis and design quantitative indicator process analysis under regression models. By analyzing the application of working fluids to enhance the robustness of the search space. Determine the range of process parameters and randomly generate a large number of parameter combinations within this range. For each parameter combination, we can use Computer-aided design software to simulate the product performance and record the results. By repeating this process, we can obtain a series of performance data and use statistical methods to analyze the optimal combination of process parameters. The advantage of Monte Carlo optimization is that it can be optimized under property uncertainty, as it does not require precise modeling of product performance. However, its disadvantage is that it may require a large amount of computing resources and time, especially when the range of process parameters is large. Therefore, we need to make reasonable sampling and optimization strategy adjustments during the optimization process to improve efficiency and quality. Gao et al. [8] conducted research on the finite element tourism experience of virtual reality, which aims to analyze the data framework of Thematic analysis algorithm through Postmodernism virtual reality. Postmodernism believes that culture is a construction, not an objective fact. In virtual reality tourism, the cultural construction of realism is reflected in the production, presentation, and interpretation of virtual environments. Different cultural backgrounds and values can affect tourists' cognition and understanding of realism. Postmodernism emphasizes pluralism and diversity, and believes that the sense of reality is a multi-experience rather than a single experience. In virtual reality tourism, tourists can experience a sense of reality through various experiences in the virtual environment, but this sense of reality is only a diverse experience that differs from reality to some extent. In a word, through the Postmodernism method to interpret the sense of reality in virtual reality tourism, we can realize

that the sense of reality in virtual reality tourism is just a subjective experience, cultural construction, multiple experiences and technical means, which is different from reality. At the same time, it can also be recognized that the realism in virtual reality tourism is a constantly changing and developing process that needs to be constantly updated and improved. The products and experiences of Metaverse can help expand the scope of tourism resources and support Sustainable tourism by providing alternative and profitable resources.

The Metaverse can provide real world tourism experience through virtual reality technology, so that people can explore the scenery, culture and historical sites around the world in the Metaverse, thus expanding the scope of tourism resources. At the same time, Go and Kang [9] analyzed and supported Sustainable tourism by providing alternative and profitable resources. For example, some tourism destinations may face environmental, social or economic challenges. The Metaverse can provide alternative tourism methods to reduce the impact on the environment, while providing new employment opportunities and income sources for local residents to support the development of Sustainable tourism. In short, the products and experiences of Metaverse can help expand the scope of tourism resources, support Sustainable tourism by providing alternative and profitable resources, and bring new opportunities and development to the future tourism industry. Liu [10] conducted parameterized interface software design for 3D visualization of product design. Through the customization and configuration of products in the large-scale production mode of enterprises, it has carried out data system management and editing in a three-dimensional environment. At the same time, a three-dimensional system parametric design and development system for heterogeneous systems was constructed. Use a 3D CAD system to model product models. In this process, designers can use techniques such as parametric design and variable design to quickly generate product models. Designers can utilize the analysis function of 3D CAD systems to optimize product models to improve product performance and quality. During this process, designers can utilize the rendering function of the 3D CAD system to render the product model, in order to improve the visual effect and attractiveness of the product. The rapid industrial product design method based on 3D CAD system is an important Computer-aided design technology, which can help designers to achieve rapid product design, improve product performance and quality, and improve the competitiveness and market share of enterprises. Using virtual reality as a tool to develop a perspective on tourist behavior at tourist destinations can help tourists better understand and experience the local culture, history, and environment, thereby promoting sustainable tourism development. Oncioiu and Priescu [11] can provide visitors with a deep understanding of local culture, history, and traditions through virtual environments, enhancing their cultural awareness and confidence. Virtual reality tourism can improve the security of tourism, because tourists can experience and interact in a virtual environment, avoiding some security risks and dangerous behaviors. At the same time, virtual reality tourism can promote local economic development, as tourists can engage in virtual tourism locally, increasing local income and employment opportunities. Tourists can experience and interact through the virtual environment to better understand and experience the local culture and environment and improve the quality and fun of tourism. In short, using virtual reality as a tool to develop a perspective on tourist behavior at tourist destinations can promote sustainable tourism development and reduce damage to the natural environment. Promote the protection and inheritance of culture, improve the safety of tourism, promote local economic development, and improve tourist satisfaction. Osman et al. [12] analyzed that 360-degree video can provide a real campus environment, making tourists feel as if they are on the scene. Interactive experience can also provide more realism, enabling tourists to have a deeper understanding of the campus. Interactive virtual campus tours can provide higher interactivity, allowing tourists to freely explore the campus, choose their own attractions and routes to visit, and have a freer understanding of the campus. Its interactive virtual campus tour using 360-degree video does not require tourists to go to the campus in person, which saves time and energy, and can also provide more information, so that tourists can better understand the campus. The virtual campus tour can be reused, and tourists can engage in virtual tourism at any time and place, improving the convenience and repeatability of tourism. This system prevents tourists from getting lost or lost in real campuses, while also avoiding safety

threats to tourists. To sum up, an interactive virtual campus tour using 360-degree video is a virtual tour that can provide a sense of reality and interactivity, and can provide tourists with a more convenient, repeatable and safe travel experience. Poux et al. [13] conducted high-precision virtual immersive experience analysis. By planning and optimizing the advanced view of user world scene promotion, an immersive experience of virtual content has been constructed. Design a real virtual environment based on user needs and analysis, including the scene, architecture, culture, history, etc. of the heritage site, so that users can feel the authenticity and liveliness of the heritage site. It has designed an interactive experience, including virtual tour guides, virtual explanations, virtual games, virtual interactions, etc., so that users can have a deeper understanding of the heritage site and interact and communicate with other users. Applying this system to digital tourism provides tourists with a more convenient, repeatable, and secure travel experience, while also improving the revenue and visibility of the tourism industry. Evaluate and improve the system to improve its performance and user experience, while also meeting the constantly changing needs and preferences of users. Suprayogi and Eko [14] explored and analyzed the object analysis of virtual English courses and virtual teaching strategies. By constructing dense 3D model data scenarios, the teaching objectives of virtual English courses can be better achieved, and students' learning effectiveness and participation can be improved. At the same time, teachers can also use virtual environments to better teach and guide students' learning, improve teaching effectiveness and student engagement. Enterprises can also better train employees and improve their work and communication abilities through virtual English courses. Freelancer can also improve their language ability and communication ability through virtual English courses, so as to work better. The goal of virtual English courses is for students, who can learn English through a virtual environment and improve their language and communication skills. Teachers of virtual English courses can use virtual environments to teach and guide students' learning, improving teaching effectiveness and student engagement.

There are many factors that affect the overall image of virtual tourism, among which the moderating effect of presence is an important factor. Existence refers to the authenticity and sense of presence that people experience in the virtual world, which can affect people's evaluation and cognition of the overall image of virtual tourism. If there is a high sense of existence, that is, the realism and liveliness of the virtual world are strong, people will be more likely to immerse themselves in virtual tourism, feel the joy and value of virtual tourism, and thus have a higher evaluation of the overall image of virtual tourism. On the contrary, if the sense of existence is low, that is, the realism and liveliness of the virtual world are weak, people will feel that virtual tourism lacks realism and experience, and their evaluation of the overall image will be lower. Therefore, the regulatory effect of existence is very important for the overall image of virtual tourism. Tsai [15] has improved the realism and liveliness of the virtual world based on tourism developers and virtual reality technology, enhancing the sense of presence. In order to improve people's overall image evaluation of virtual tourism and attract more tourists to participate in virtual tourism. Verma et al. [16] Through augmented reality technology, tourist attractions can provide richer information, such as historical background, cultural background, architectural style, and so on. This can allow tourists to have a deeper understanding of the scenic spots and improve the travel experience. By using virtual and augmented reality technologies, tourist attractions can provide a more interactive experience. Virtual and augmented reality technologies can be used for art exhibitions, such as displaying virtual replicas of art works, or displaying real replicas of art works through augmented reality technology. By using virtual and augmented reality technologies, tourist attractions can provide a richer educational experience, such as displaying virtual scenes of historical events, introducing virtual forests of animals and plants, etc. This can allow children and educators to have a deeper understanding of knowledge points. In short, virtual and augmented reality technologies can provide richer, interactive, and educational experiences for tourism experiences, thereby attracting more tourists to scenic spots and improving the attractiveness and competitiveness of the tourism industry. Yuan and Niu [17] updated the cabin technology shape module design for sensitivity parameters of tourist aircraft. In the past, passenger cabins were unable to provide a good visual environment during travel flight routes, which reduced the

experience of travel products. The computer-aided design software is used to optimize the design of the passenger cabin, including seat layout, luggage rack design, ventilation system, etc., to improve the comfort and experience of passengers. Choose environmentally friendly, lightweight, and high-performance materials to reduce the weight and carbon emissions of the passenger cabin, and improve the fuel efficiency of the aircraft. Computer-aided manufacturing software is used to optimize the manufacturing process of the passenger cabin, reduce waste and energy consumption in production, and improve production efficiency. The use of virtual reality technology for the design and evaluation of aircraft cabins can reduce the production and testing of physical prototypes, reduce costs and time. Finally, a data management system for aircraft cabin design is established to effectively manage and analyze the data during the design process, improving design quality and efficiency. Cooperation is a common mode in Computer-aided design system, which can help designers better cooperate, exchange design ideas and schemes, and improve design efficiency and quality. In traditional Computer-aided design, designers can cooperate to complete a design task, share knowledge and experience, and better achieve design goals. Zhou et al. [18] developed an emotional testing software task for CAD products. Through the analysis of participants' platform time trend Logistic regression navigation model, the function menu of CAD environment is constructed. During the collaboration process, the emotions of designers can be analyzed and optimized accordingly. For example, when designers have different opinions and ideas on the design scheme, they can work together to solve the problem and find the optimal solution. In this process, designers can respect, listen, understand, and support each other, avoid negative emotions, and maintain a good work atmosphere and cooperative relationship.

3 FEATURE RECOGNITION AND CAD MODELING OF VIRTUAL TOURISM INTERACTIVE PRODUCTS

3.1 Design Requirements of Virtual Tourism Interactive Products

(1) Tourism product design innovation

With the development and prosperity of the current tourism industry, the design of tourism products also shows more market demand. In the current tourism product market, tourism products with appreciation and readability occupy a dominant position, and the theme expression in product design depends on some visual presentation forms that the public likes. The specialization and integration of tourism interactive products make tourism interactive products expand more use scenarios in vertical and horizontal development, create and lead people to discover potential needs and more meaningful lifestyles. Due to the rapid growth of sci & tech, the traditional product design concepts and methods are constantly adjusted and changed under the impact of computers. As an important part of virtual product development, CAD is entering the stage of new product development and design with this trend.

(2) Application of VR

The design stage of a new product is a process in which design groups in different disciplines cooperate with each other and make decisions through complex reasoning. Conceptual design of products, in particular, is a stage of divergent thinking and innovative design, a stage of solving various possible schemes that can realize functions and meet various technical and economic indicators, and finally determining the comprehensive optimal scheme, which is the most important link in product innovative design. VR has the characteristics of perception, interaction, real-time and immersion, and its development and application in the field of product design greatly improves the efficiency and quality of tourism product design and manufacturing. The thinking stage of design exists through the objective form, and material, as the carrier of this objective form, has a certain reaction to the thinking stage of design. As the trace of thinking process on the material carrier, technology also has a great influence on the design form because of its different processes. VR can create and experience a virtual world. Through this technology and with the

help of sensor helmets and other equipment, users can enter a 3D dynamic virtual space composed of multiple information fusion and interaction.

(3) Application of CAD

As an important part of virtual product development, CAD consists of computer-aided two-dimensional design and computer-aided 3D design. It focuses on the construction of form, the generation and algorithm of form, and mainly tends to simulate the design elements such as product form structure, material, color and assembly, and analyzes, designs and perfects the simulation scheme. The application of computer in product design and manufacturing is an organic system, including design, performance, analysis, manufacturing and information preservation, namely CAD and computer-aided manufacturing. The stage of tourism interactive product design generally includes concept presentation, sketch drawing, detailed design and other processes. In the design process, the shape of tourism products is usually revised repeatedly. CAD is to analyze and improve the simulation scheme, and use the powerful performance ability of computer to carry out diversified design display; Computer-aided manufacturing is to analyze and improve the simulation scheme again by digital means, and finally achieve engineering.

3.2 Deep Feature Extraction and Recognition of Tourism Interactive Product Images

Image processing technology is a process from one image information to another different image information, and the essence is the recombination of computer data coding. On the other hand, in image recognition, different data are extracted according to automatically selected image information features and compared with other image data, so as to achieve the purpose of classification and detection. Moreover, it is necessary to describe the nature of the image and the relationship between modeling elements and colors more deeply, find out the meaning and recognition focus of the image, so as to guide and plan the next specific action of image recognition. Then simulated the hierarchical perception system of human brain DL on the basis of obtaining attention regions, and mined the essential features of suspicious defect regions layer by layer through convolutional networks. The CNN structure is shown in Figure 1.

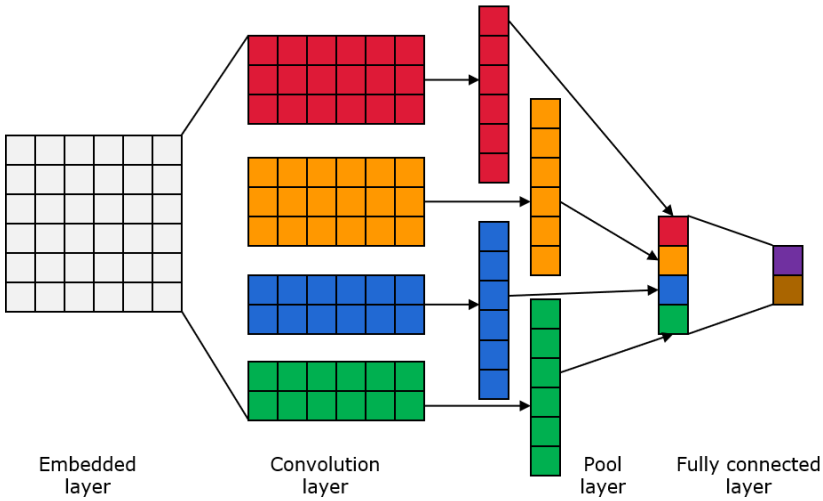

Figure 1: CNN structure.

In the manufacturing stage of tourism products, the staff can also use this technology to assess the products ergonomically. Traditional ergonomic assessment of tourism products needs to be completed after the product samples are produced. If problems are found in the product samples, it will bring great losses. Using VR, ergonomic assessment can be completed in the design stage of

tourism products. In the VR environment, staff can directly design virtual users to use virtual tourism products, and through the interaction of computers, researchers can directly obtain various data such as performance parameters of tourism products, which provides a basis for subsequent product optimization.

Image recognition is mainly in the stage of image preprocessing, the image is enhanced, restored and compressed first, and then the image data is divided into modules to find out the characteristics of image information, which is different from other image information, so as to complete the classification and recognition of images. For a ceramic product image, $p(i)$ is the histogram probability of the image, i is the gray value of the image, $0 \le i \le L$. The histogram potential function is expressed as follows:

$$P_H(k) = \frac{1}{P_{\max}} \sum_{i=0}^{L} \frac{P(i)}{1+\alpha(i-k)^2} \tag{1}$$

$$P_{\max} = \max\left\{ \sum_{i=0}^{L} \frac{P(i)}{1+\alpha(i-k)^2} \right\} \tag{2}$$

Among them, α is a parameter. Let $I = [f(x,y)]_{m\times n}$ be an array of ceramic product images, where:

$$x \in \{0,1,2,3,\ldots,m-1\} \qquad y \in \{0,1,2,3,\ldots,n-1\} \tag{3}$$

$f(x,y) \in \{0,1,2,3,\ldots,G-1\}$ is the gray value of the pixel at the position (x,y) of the image array.

3.3 VR 3D Modeling of Tourism Interactive Products

Experience is the psychological feeling caused by people receiving sensory and emotional stimuli through participation in interaction. Experience can be divided into two aspects: sensory experience and interactive experience, and sensory experience is a behavioral process in which users perform specific operations according to their cognition of products and produce interactions. After the reverse object is selected, the characteristics and technical requirements of the reverse object are analyzed, and the appropriate surveying and mapping software is selected to survey the prototype model in an accurate proportion, which provides basic model data parameter support for subsequent analysis, modification and innovative research and development, and makes it a direct source of product engineering drawings. Only by grasping the future design trend and direction of product innovation can designers really create products close to users' emotional needs. For designers, innovative product design based on interactive experience is bound to face more new challenges, and it also puts forward newer requirements. Tourism interactive products have their own characteristics, and whether the characteristics of tourism products can be expressed is the key to the success of a VR 3D model. Therefore, this article adopts the method of comprehensive modeling and pays attention to details. In the stage of shape reconstruction, for each collected image, the outline of tourism interactive products is segmented according to the brightness difference and tone difference between foreground and background.

The converted entity is a 3D model. Although the model entities are spliced at the feature points, they still cannot be completely overlapped. It is necessary to further adjust the spliced entities and rotate the spliced parts around the spliced feature points to realize the perfect splicing of the parts. Local modeling adjustment gives full play to the advantages of parameterization, and transforms modeling requirements into parameter requirements, which is convenient for users to adjust the model quickly. Local parameter adjustment realizes modeling adjustment through parameter change. The quality of model creation depends not only on the general shape of the product, but also on its grasp of the details. While obtaining the feature map of the target to be detected, CNN avoids the complicated pre-processing of the image. It learns through training data

and avoids explicit feature extraction. The stage of feature extraction and modeling of tourism interactive products based on CNN is shown in Figure 2.

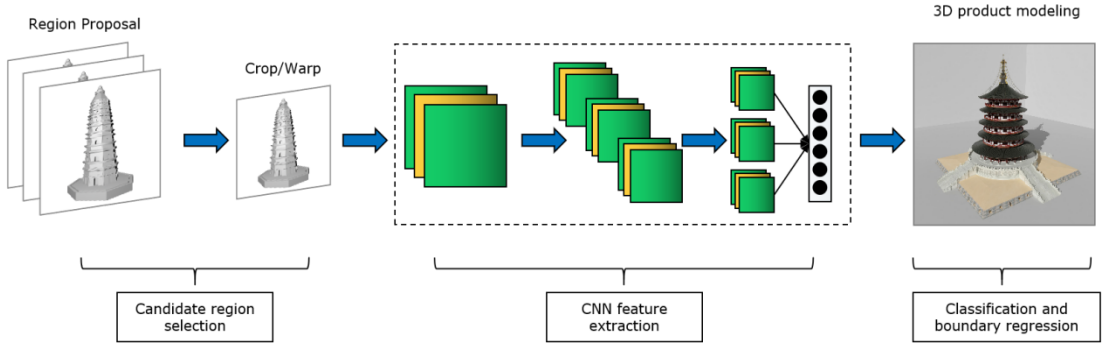

Figure 2: CNN model.

d is the projection of the object on the two-dimensional plane, which can be expressed by the quantity of pixels, D is the distance from the observation point to the front cutting surface, F is the spatial position of the model, l is its real height, and b is the inclination angle of the model caused by the change of the observation point. The size of d can be calculated as follows:

$$x = \cos b \times l / 2 \tag{4}$$

$$y = \sin b \times l / 2 \tag{5}$$

$$d = 4DFl\cos b\left(4 \times F \times 2 - l \times 2\sin 2b\right) \tag{6}$$

This can control the choice of LOD level. Corresponding to three LOD levels, three d values need to be determined: $d_1 < d_2 < d_3$.

Since the self-encoder and discriminator share all the weights except the last layer, they can be put together, and the shared network part is represented by H. Then the Encoder encoder can be expressed as:

$$\mu = f_1\left(H\left(X\right)\right) \tag{7}$$

$$\log \sigma^2 = f_2\left(H\left(X\right)\right) \tag{8}$$

The discriminator D can be expressed as:

$$D = f_3\left(H\left(X\right)\right) \tag{9}$$

Where f represents different mappings of the last layer of the network.

In order to reduce the problem of fuzzy synthesis of tourism product images, the fidelity of images is judged by inference network. Inferring that the network tries to assign a "true" label to the real training sample x and a "false" label to the generated sample x_f; The generating network attempts to generate image samples that can be inferred as "true" by the network prediction. The introspective confrontation losses of the inferred network and the generated network are respectively expressed as:

$$L_{adv}^{(G)} = L_{KL}\left(z_{a,f}\right) \tag{10}$$

Where $z_{a,f}$ represents the authenticity unit of the generated sample.

Product design is the comprehensive embodiment of technology and culture in the post-industrial era. As the premise and foundation of product design, the invention of technology directly promotes the innovation and creation of products. Because of the particularity of software, CAD is mostly used in forward design, and sometimes it can also be involved in reverse design, mainly studying the design elements such as product shape and structure, material selection and color matching. Because the software can only show the product performance from one perspective each time, the virtual product prototype with accurate proportion is usually displayed in the form of multiple views when mapping the model. In the analysis of color collocation of reverse object or newly designed product, the aesthetics of color should be closely combined with the practicality of the product to achieve a highly unified effect.

4 RESULT ANALYSIS AND DISCUSSION

Due to the rapid development and popularization of the Internet, consumers' perception and interactive experience brought by high-tech products are widely accepted and recognized, which further promotes the promotion and growth of product interactive experience design in various industries. In this article, an improved CNN-based optimization model of tourism product appearance image is proposed. Starting from the convenient generation, rapid transformation and effective interaction of tourism product modeling, the parametric method is used to extract the image primitive information of tourism interactive products, and the rapid transformation of 3D model of tourism interactive products is realized. When the image data is collected, if the brightness of the image is too high or insufficient, the gray effect and gray value of the collected image will probably only appear in a very narrow range. If linear transformation processing is used, a linear single-valued function is used to linearly expand the gray values of all pixel squares in the image, so as to effectively enhance the contrast of the image, thus changing the image quality and making the image more visually artistic. The result of the experiment is shown in Figure 3.

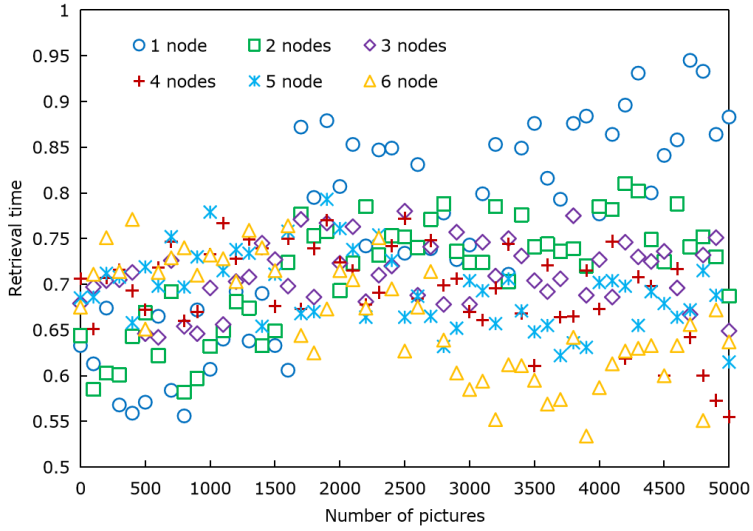

Figure 3: Image recognition consumes time.

When the quantity of image processing increases, the advantages of multi-node processing become more and more obvious. Because different images have different image features, this becomes the main basis of image extraction. To extract images successfully, it is necessary to strengthen the characteristics of image influence to improve the accuracy of interpretation.

Save the extracted useful information according to the efficient data structure defined by the system, and the saved file format is binary file. In this way, not only can the 3D scene data be optimized, but also the data can be compressed to a great extent, which reduces the amount of data that users need to download and the waiting time, and converts the 3D model files that are easy to obtain and crack into encrypted binary files. The overall data of the training model and the performance of the ceramic product image optimization model are considered comprehensively. Figure 4 shows the running time comparison results of improved CNN, traditional CNN and RNN calculation.

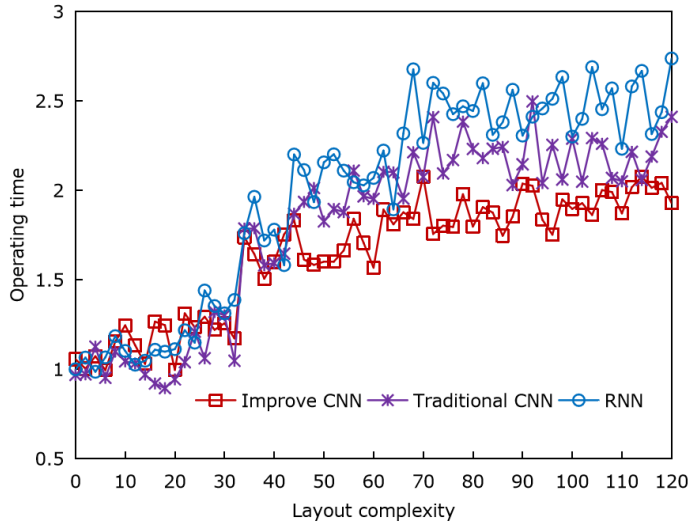

Figure 4: Calculation time comparison of the algorithm.

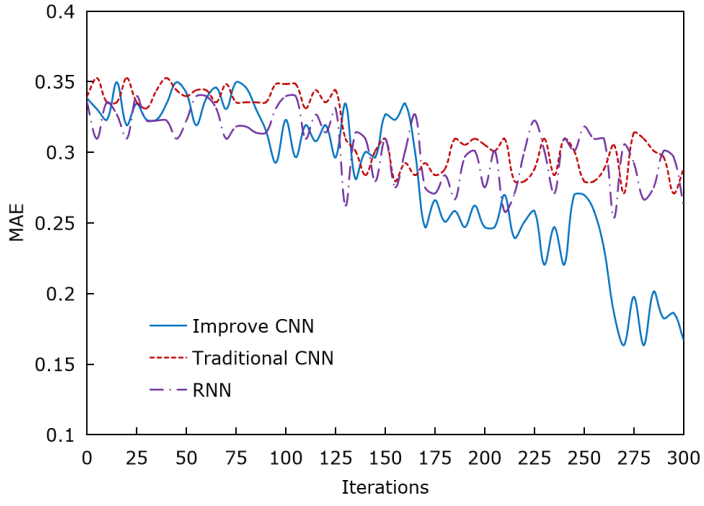

Figure 5: Error comparison results of the algorithm.

Point cloud data obtained by comprehensive utilization of outer contour limitation and feature limitation. Usually, the main stage of building a 3D model includes building a model, making texture, texture mapping, lighting production, rendering processing and model output, but the model built through this step contains a lot of useless or cost-effective information, especially for

online 3D scene systems. Therefore, it is necessary to optimize the system modeling process as much as possible. Figure 5 shows the MAE comparison results of the algorithm. Experiments show that the MAE of the improved CNN model is significantly lower than that of the traditional CNN model and RNN model.

The scene file should be parsed according to the data format of the scene file. First, read the total quantity of objects and the total quantity of faces, and save them in the corresponding variables. Then, create an object array and objects, read the data of the starting position of the object in the whole file and store it in the start attribute of the object. Compare the recall and accuracy of the feature extraction algorithm of product appearance image, as shown in Figure 6 and Figure 7.

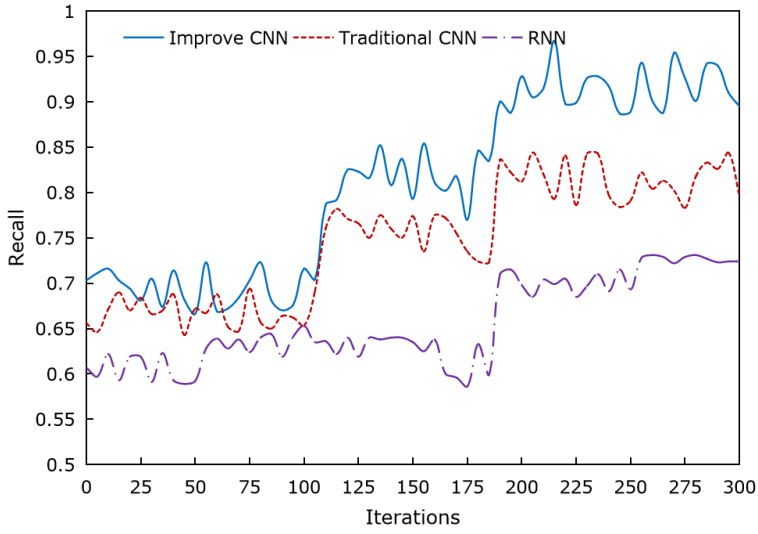

Figure 6: Comparison of recall of product appearance image feature extraction.

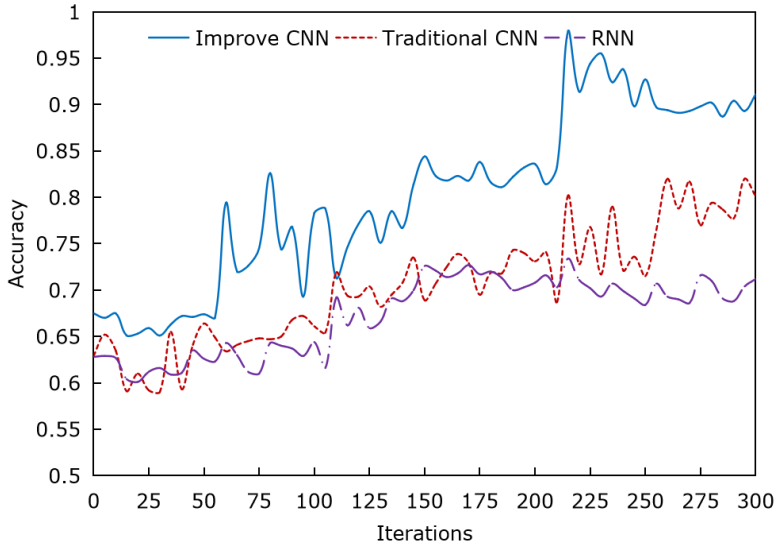

Figure 7: Comparison of feature extraction accuracy of product appearance image.

Improved CNN can identify the features of product appearance image more accurately, and can accurately locate the edge contour of tourism interactive product appearance image. After reading all the initial position information of the object, read the initial position of the material part in the whole file, and read the URL information of each material in turn, and access it in the material attribute of the object. Due to the rapid growth of social economy, product innovation design has gradually changed from material to non-material. Design is also increasingly pursuing a kind of aimless, unpredictable and inaccurate lyrical value.

5 CONCLUSIONS

It is imperative to apply VR to the design and creation of tourism interactive products and combine human-computer interaction technology with product design. In this article, an image optimization model of tourism interactive products based on improved CNN is proposed, and the artistic expression of VR in tourism interactive product design is analyzed, so as to realize the interactive design of tourism products based on VR and CAD. Although the traditional image classification and detection algorithms have achieved good recognition results on some industrial images, most of these algorithms are based on some common algorithms and pre-designed feature extractors, and the experimental results are optimized by constantly adjusting parameters, which is difficult to apply to various types of industrial products and defect types. In this article, an optimized model of tourism product appearance image based on improved CNN is proposed. Starting from the convenient generation, rapid transformation and effective interaction of tourism product modeling, the information of tourism interactive product image primitives is extracted by parameterization method, and the rapid transformation of 3D model of tourism interactive product is realized, which greatly improves the design efficiency of virtual tourism interactive product.

The work of this article mainly focuses on the algorithm design and algorithm assessment of tourism interactive products. In the further research, the visual surface characteristics of tourism interactive products can be fully combined with geometric features to carry out quantitative and targeted experiments. With the deepening of the research on innovation, the innovation problems are classified and classified, and appropriate strategies are adopted respectively.

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