Retraction

Retracted: Design of Lingnan Cultural Gene Implantation Cultural and Creative Products Based on Virtual Reality Technology

Mathematical Problems in Engineering

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] J. Fang and W. Deng, "Design of Lingnan Cultural Gene Implantation Cultural and Creative Products Based on Virtual Reality Technology," *Mathematical Problems in Engineering*, vol. 2021, Article ID 5554360, 9 pages, 2021.

Research Article

Design of Lingnan Cultural Gene Implantation Cultural and Creative Products Based on Virtual Reality Technology

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With the development of virtual reality technology, people are increasingly aware that the combination of virtual reality technology and product design can enable companies to obtain stable profits and maintain long-term competitive advantages. And design evaluation plays a pivotal role in a large number of important decisions in product development. This article takes Lingnan culture and cultural products as an example, combining virtual reality technology with the design of Lingnan cultural and creative products, verifies the effectiveness and rationality of the virtual evaluation system of Lingnan cultural products through the evaluation of examples of Lingnan cultural products, and proposes amendments to the evaluation case. This paper constructs a product design evaluation system based on virtual reality technology and designs a theoretical model VR, which is the application of virtual reality technology in product design evaluation. The PDES system expounds the idea and method of constructing the system model. This paper studies the evaluation object, evaluation content, evaluation method, evaluation platform, and manifestation of evaluation results of the Lingnan cultural product virtual evaluation system and builds the framework of the Lingnan cultural product virtual evaluation system. This paper studies the product display method based on virtual reality technology and realizes the three-dimensional display of products on the Internet and the design of user interaction in virtual reality. In this paper, the two algorithms BRSK and SURF are used together, and the multiscale expression characteristics of BRISK in space and the rotation invariant characteristics of SURF are used. Experimental research shows that, compared with the pure BRISK algorithm, the rotation performance of the method in this paper can be seen through the experimental results in this paper to have better accuracy. The method in this paper ensures the accuracy and accuracy of matching as much as possible.

1. Introduction

Research on product design evaluation under virtual reality technology is based on virtual reality technology as a support to simulate the design of the product and its use environment [1], so that evaluators can interact with the product immersively in a realistic virtual environment, use the perceptual engineering theory to quantify the perceptual information of the evaluators, and evaluate the product design. Among them, virtual reality technology (VR for short) is a human-machine interface technology that realistically simulates human visual and auditory behaviors in a natural environment and is a computer system that can create and experience virtual worlds [2].

Virtual reality technology is a new development in the field of computer-aided applications. Although its research is still in its infancy, the application research results of virtual reality technology have attracted great attention at home and abroad. Many scholars have conducted research on virtual reality technology. For example, Berg LP has conducted research on product display methods based on virtual reality technology and realized the three-dimensional display of products on the Internet and the design of user interaction actions in virtual reality [3]. Mitrouchev P builds the hardware system of the panoramic roaming display platform by studying the related technologies of the panoramic roaming display platform based on panoramic camera technology [4]. The basic architecture and work flow of the

panoramic roaming display platform are summarized; its design concepts and design principles in the actual application process of product display design are analyzed, and the advantages of panoramic roaming display and the influencing factors of the display design effect are clarified, as a panoramic roaming display. The promotion and application of the platform provide reference and guidance [5]. Based on the hardware system of the panoramic roaming display platform, Adrian developed a software platform for product promotion and display design based on panoramic camera technology, as well as the design practice of the panoramic roaming display platform in the promotion and display of tea products. The existence of the problem and the direction of future research are provided in [6].

In China, many scholars are also very keen on the research of virtual reality technology [7]. For example, Zhang H took the display of light-sizing equipment as an example, showing the effect of virtual interactive display based on 3D Max and VR-Platform, so as to enable users to achieve active operation [8, 9]. Wang took the 3D animation display design of the light machine as an example and took the 3D interactive software as the platform to discuss the methods and techniques of realizing virtual roaming animation in the 3D model, focusing on the texture adjustment and environment design and camera and interaction. Interface and navigation design, scene release, and other aspects are used to illustrate how to achieve realistic product display animation technology [10]. Diao promoted virtual reality technology to the display of large-scale mechanical products, changing the dull image of the whole machine in people's minds [11]. 3D animation and multimedia technology is applied to large-scale equipment products to break the communication barriers between professionals and nonprofessionals [12].

This article uses Internet technology as a platform to design a product display and evaluation website, link the virtual reality technology introduced above and various methods of product display design to the website, and apply the entire process of the evaluation model to the establishment of complete website. This paper uses the BF Matcher feature point matching algorithm to achieve matching and uses the distance method to replace the RANSAC algorithm to further refine the point pairs after the preliminary matching and get a good matching effect.

2. Research on the Design of Cultural and Creative Products of Lingnan Cultural Gene Implantation Based on Virtual Reality Technology

2.1. Extraction of Elements from Lingnan Cultural Products. Agricultural products are like a kind of local business card of Lingnan. Through reasonable packaging design, it is expected to be built into an effective tool to promote local culture. As one of the three famous dishes of Lingnan, Mei Cai packaging design should be refined, interpreted, and reconstructed in Lingnan culture in order to complete the

branding and serialization of Mei Cai packaging design [13]. Because Lingnan culture has the advantages of innovation, compatibility, pragmatism, and openness [14], it has had a profound impact on contemporary packaging design in China.

(1) *Modeling Application.* When designing the shape of Mei Cai packaging, we should also pay attention to cultural taste and must fully reflect the local cultural characteristics of Lingnan. Affected by the historical environment and geographical location, the Lingnan region has inherited many unique styles. For example, Guangzhou Chen Clan Ancestral Hall is quite representative. Its courtyard space, modeling style, architectural layout, and other modeling elements can be fully applied to the packaging design of Mei Cai.

(2) *Color Application.* Through the inspection of Chen Clan Ancestral Hall and the Tomb of Yue King, it can be found that the colors of Lingnan are mainly red, yellow, green, white, and black. When designing the packaging of Mei Cai, you can choose colors with strong contrast.

(3) *Application of Lingnan Traditional Materials.* In contemporary life, everyone advocates a low-carbon and environmentally friendly life. Therefore, traditional materials should be used when designing Mei Cai packaging, and traditional production techniques should be used to make the materials show different texture effects, making the packaging more practical and beautiful and at the same time playing an environmentally friendly role. The Lingnan region is located in southern China, with a warm and humid climate, which provides a good growth environment for many plants [15]. Diversified plants provide many choices for Mei Cai packaging design materials.

(4) *Visual Design of Lingnan Mei Cai Packaging.* Product packaging is the industrial and technical design of the commodity carrier as a whole. An excellent and exquisite Mei Cai packaging should first design the brand name. Before consumers buy the products, they have completed a complete set of packaging design for agricultural products, and the designer's design ideas are also a complete set. When designing packaging, the first problem encountered is the determination of the size of the packaging container. When designing the size, the principle of convenience for consumers must be followed [16, 17]. In addition, the packaging design should also consider whether the selected materials are green and environmentally friendly; whether the waste after use can be recycled or easily degraded; after a special style design, whether the main display of the packaging can meet the consumer's requirements psychologically appeal; whether the design of taste and color caters to consumers' senses; whether the application of color has strong impact; and whether it can highlight the theme.

2.2. The Impact of Virtual Reality Technology on Product Design Evaluation. The ultimate goal of product design is the market. There are many unknown factors that can get the expected effect after the design is put on the market. If we can predict the degree of market response in the future and solve the problems and deficiencies in the design in time [18], then these unknown factors will inevitably be transformed, allowing designers and producers to make correct market decisions and reducing risk factors to improve the efficiency and success rate of the design [19, 20].

Virtual reality technology has brought a brand new model to design evaluation. Product design evaluation is a complex and critical task, and there is no doubt that it plays an important role in the development and design of new products. New products designed and developed can better adapt to the development needs of society and meet consumers' increasing quality needs [21, 22]. Due to the rapid development of virtual reality technology and its extensive application in design, our design evaluation methods for products have also changed, which provides us with strong technical support for more scientific and reasonable evaluation of products. Today's evaluation of design objects is very inaccurate. The reason is that the design expression is far away from the real products in future production, even for prototypes.

Virtual reality technology has opened up a new situation of information exchange between human beings and products, the environment, and changes in phenomena. It combines the most advanced modern information technology and human creativity. In its simulated virtual world, we can carry out related natural simulations and realistic experiences and achieve the realm of interaction between real experience and human natural functions. Compared with the computer system, VR technology can provide the advantages of real-time interactive operability, three-dimensional space, and multichannel man-machine interface [23, 24].

Virtual reality technology makes design evaluation truly accurate and in place. Virtual reality technology in product design has changed the way of design expression of the previous two-dimensional or three-dimensional renderings. It digitizes the three-dimensional model, provides accurate and intuitive performance, and can provide a virtual and real design object for consumers or designers to experience products, evaluate products, and validate products on the same platform [25, 26]. They can be in or in front of the evaluation object and evaluate the scale, space, structure, proportion, color, and texture of the object through simulation and use. This evaluation model should be said to be the most accurate, convenient, and specific. Not only can it truly reflect the real ideas of the designer but it can also quickly and conveniently obtain the real experience of consumers, reduce various irrational factors in product design evaluation, and obtain more accurate results.

2.3. BF Matcher Performs Feature Point Matching. Brute-force matcher, as the name suggests, is to match the feature points one by one until the best match is found. So, we often use Brute-force matcher to find the best match.

(1) *Euclidean Distance.* Formula (1) using Euclidean distance to achieve matching is as follows:

$$D_{ij} = \left(\sum_{k-1}^{n} \left| L_i(k) - L_j(k) \right|^2 \right)^{1/2}, \quad (1)$$

where $L_i(k)$ and $L_j(k)$ represent the feature descriptors of points i and j to be matched, respectively. Because it is tested by the distance method, the value of D_{ij} in the formula indicates the degree of matching between two points. The larger the D_{ij}, the lower the matching between the two points.

(2) *RANSAC Algorithm Optimizes Matching Points.* Find an optimal homography matrix H with a size of 3×3 through the RANSAC algorithm so that H can satisfy the transformation relationship between feature point pairs in the largest number, which is the coordinate transformation relationship between feature point pairs and the matrix where h_{33} is the homography matrix H, where we usually normalize the matrix with $h_{33} = 1$ and H also contains 8 other parameters that have not been obtained. It can be known from mathematical knowledge that at least 8 parameters need to be set to solve this problem:

$$S \begin{bmatrix} x\prime \\ y\prime \\ 1 \end{bmatrix} = \begin{bmatrix} h_{11} & h_{12} & h_{13} \\ h_{21} & h_{22} & h_{23} \\ h_{31} & h_{32} & h_{33} \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}. \quad (2)$$

Among them, s is only a scale parameter, $(x, y, 1)^T$ represents the position of the feature point in the first image, and $(x\prime, y\prime, 1)^T$ represents the position of the feature point in the second image. The RANSAC algorithm randomly extracts 4 pairs of noncollinear feature point pairs from the set of feature point pairs after the preliminary matching is completed. Through the transformation relationship between these 4 pairs of feature point pairs, the remaining 8 parameters mentioned above are obtained. From numerical value, you can get the homography matrix H and then use this homography matrix H to test the remaining pairs of feature points and finally find the number of feature point pairs that satisfy the homography matrix H and the cost function as shown in the following formula:

$$\sum_{i=1}^{n} \left(x_i' - \frac{h_{11}x_i + h_{12}y_i + h_{13}}{h_{31}x_i + h_{32}y_i + h_{33}} \right)^2 \\ + \left(y_i' - \frac{h_{21}x_i + h_{22}y_i + h_{23}}{h_{31}x_i + h_{32}y_i + h_{33}} \right)^2. \quad (3)$$

RANSAC algorithm steps are as follows.

(1) Randomly extract 4 pairs of noncollinear feature points from the feature point pairs and obtain the homography matrix H;

(2) Test the homography matrix H with the remaining feature point pairs, and find the number of feature point pairs and the cost function that satisfy the homography matrix H.

(3) If the final number is greater than the optimal point set, modify the value of the optimal point set and change the number of iterations k.

(4) Repeat the iteration until the number of iterations is greater than the value of k. Among them, the number of iterations can be obtained by formula (4), and the value of k is continuously updated when the maximum iteration is not exceeded.

$$k = \frac{\log(1-p)}{\log(1-w^m)}. \tag{4}$$

Among them, the value of P is usually 0.995, w is theratio of "inner points," and m is the number of selected feature point pairs.

2.4. BRISK Feature Algorithm.
Because the SIFT and SURF algorithms are relatively time-consuming in use, they cannot be used on the AR system of handheld terminals. At the same time, when extracting feature points for images that are not particularly clear, BRISK has a good effect compared with other equivalent algorithms. The BRISK natural feature detection algorithm used in this paper is an improvement of the feature point related technology of the FAST algorithm [27, 28]. To solve the scale invariance, it is necessary to add a scale pyramid of the image to the BRISK feature point algorithm and perform scale space detection and multiscale expression of the feature points.

(1) *BRISK Feature Point Detection*. First create n octave layers and inner octave layers represented by C_i and d_i, C_0 layer represents the image itself, the C_1 layer of octave is obtained by sampling the source image down by 2 times, and the C_2 layer is performed on the previous layer C_1. It is obtained by 2 times sampling. The inner octave layer is obtained by sampling the source image itself by 1.5 times, the d1 layer is obtained by sampling the inner octave layer down by 2 times, and the d2 layer is obtained by sampling the upper layer d1 by 2 times [29, 30]. When the value of n is 4, 8 sampled pictures can be obtained, and then the nonmaximum value suppression in the scale space is performed on the sampled pictures.

This paper selects the point with the highest FAST score among all the 26 points in the domain and scale space of the feature point as the feature point and discards all other points. The extremum points obtained at this time are not the most accurate, and further purification is needed. The position interpolation method is used to perform parabolic fitting on the extremum obtained in each layer and finally subpixel level accuracy is obtained in the scale space where the extreme point of is the last thing needed.

(2) *SURF Feature Algorithm*. The SURF feature algorithm is improved on the basis of the SIFT algorithm. It solves the feature detection algorithm with long running time and complex description. The SURF algorithm first uses the Hessian matrix to filter out candidate feature points and then performs nonmaximum value at the same time, and the image after integration is used for calculation, so the calculation can be fast and efficient [31, 32].

(1) *Dynamic Environment Modeling Technology* [33]. Dynamic modeling technology refers to a technology in which modelers obtain three-dimensional attribute data according to the actual environment in order to meet the needs of actual applications and establish corresponding virtual environment models. Given that the core content of VR technology is the establishment of virtual environments, dynamic modeling technology is particularly important. The acquisition of dynamic modeling data is very important. Generally, the acquisition of 3D data can be achieved through CAD technology (regular environment) and visual modeling technology. If the two are used in combination, the effect will be better, but compared with CAD technology in other words, modelers will use visual modeling technology in more cases because it is noncontact.

(2) *Real-Time Generation Technology of 3D Graphics*. With the rapid development of computers, three-dimensional graphics generation technology has also obtained a larger development space, and the level of three-dimensional graphics generation technology is relatively mature. However, how to use 3D graphics generation technology to achieve "real-time generation" is still a major problem and bottleneck in the development of virtual reality [34, 35]. In order to realize the real-time generation of 3D graphics, it is necessary to ensure that the refresh rate of the screen graphics is maintained between 15 frames/s and 30 frames/s. Therefore, a more important research content in the real-time 3D graphics generation technology can be obtained, that is, how to quickly increase the refresh frequency without reducing the performance of the graphics. Fortunately, the continuous development of computer graphics technology and simulation technology has a positive impact on promoting the realization of real-time 3D graphics generation technology [36].

2.5. Computer Virtual Display Characteristics of the Product.
The characteristics of the product display can be divided into the following three points according to the value attribute of the product.

(1) *Static Display*. Static display is the most basic form of product display. At present, the display of many products is still in the static display stage. These products are generally affiliated with relatively small commodity categories or some commodities in

relatively large commodity categories, such as kitchen utensils. Generally, it is statically displayed in the store, while high-end clothing will be displayed in the store or through the catwalk.

(2) *Dynamic Display*. Dynamic displays often appear together with static displays. Generally, manufacturers will attract customers' attention through short-term, high-cost dynamic displays to stimulate their purchase interest and then maintain customer relationships and expand new customers through long-term, low-cost static displays.

(3) *Multimedia Display*. Multimedia display is a beneficial supplement to physical display, and display investment is relatively large [37]. Advertising is currently one of the more popular forms of multimedia display. For products with greater relative value or greater potential value, after market analysis, manufacturers usually adopt advertising display methods to expand the popularity of the product. Comprehensively considering the display characteristics of the product itself and the characteristics of virtual reality technology [1], the computer virtual display characteristics of the product can be found:

(1) *Static Product Display*. The static virtual display of products is the most common form of product display because, in the real world, products are mostly displayed to users in the form of display, so in the virtual environment, considering the technical restrictions, static display has naturally become the main way of computer virtual display of products. Under normal circumstances, in this way, a product explainer will participate in the static product display. Through the explanation of the explainer, the user will be more aware of the connotation of the static picture on the computer screen. This method has low cost and is suitable for small-scale workshops or shops and the display of products that cannot participate in interaction. However, this approach often increases the information asymmetry between the product and the user because the customer's perception of the product does not reach the level of personal experience.

(2) *Product Dynamic Display*. The dynamic virtual display of a product means that the product is displayed to the user from a three-dimensional perspective, and the static display of the product beyond the two-dimensional mode allows the user to understand the function and information of the product from multiple directions and has a certain degree of interaction between the product and the user. It also reduces the information asymmetry between users and products. Customers experience the product's functions to a certain extent through vision and hearing [2], but they still have not reached the point where they can experience personally in the virtual environment. At present, on some product websites, there will be dynamic display simulations of products. Customers enter the simulation system through computer mouse operation to observe the basic functions and structure of the product. For example, there is a three-dimensional display of sports shoes on the "Nike" website. This form is currently trending in popularity and is in its infancy, but it is developing rapidly.

3. Experimental Research on Cultural and Creative Product Design of Lingnan Cultural Gene Implantation Based on Virtual Reality Technology

3.1. Development Environment Construction

JNI. Java native method interface: It is mentioned in the book Java Virtual Machine that JNI can realize the communication between codes written in Java and programs written in other languages. In this article, JNI is mainly used to enable Java code that can run on the Java Virtual Machine (JVM) on the Android system to interact with Open CV applications and libraries written in C/*C*++.

The relationship between NDK and JNI is as follows. NDK is developed on the technology of Java native method interface, and the tool library developed on the Android system is realized.

3.2. Framework and Modules.

The movement enhancement system based on natural feature points designed and implemented in this paper is mainly to store all the feature information of the target object or image to be detected in the local database, and then when the video acquisition device obtains the feature information of the video frame image in the video stream after the consistency with the information stored in the previous database reaches a certain level, we consider the matching to be successful, and then we can perform subsequent operations such as superimposition and camera pose estimation. In order to improve the real-time performance of the system, this paper adopts the L-K optical flow tracking algorithm, which avoids the acquisition of feature information for all frames in the video information, thus saving time and enhancing the response rate of the system [38].

(1) Tracking Registration Module. According to the feature point pair set, the homography matrix H can be obtained, and then the internal parameters of the camera can be obtained, and then the external parameters of the camera can be obtained from the above data, and the conversion matrix between the world coordinate system and the pixel coordinate system can be obtained. At the same time, we also use the LK optical flow algorithm to track the previous frame, determine the current position of the feature

point, and complete the parameter calculation of the camera, so as to calculate the position where the virtual object needs to be correctly fused.

(2) Virtual and Real Integration Module. The conditions for superimposing into the real world have been met, and the effect of augmented reality can be achieved. The accuracy of the rotation matrix R and the translation matrix T directly determines the accuracy of the virtual information superimposed position in the virtual and real fusion; that is, it depends on the accuracy of the pose estimation. On the handheld terminal platform, Open GL ES technology is used to superimpose the two-dimensional mapping of three-dimensional objects into the video and realize the fusion and output of virtual and real information.

3.3. System Data Processing and Collection. The design parameters of product design evaluation in virtual reality are taken as the input end of the BP network, the product design evaluation result is the output end of the network, and the middle is the hidden layer. The product evaluation data and results obtained in the virtual reality environment are used as the training samples of the BP network, and the BP model is trained. After the training, click the BP evaluation to obtain the relevant evaluation data value.

4. Based on Virtual Reality Technology, Lingnan Cultural Gene Implantation Cultural and Creative Product Design Experiment Research Analysis

4.1. Experimental Analysis of Virtual and Real Fusion Module. The video capture resolution of the Android phone used in this article is 1024×768. The SIFT, SURF, and BRISK + SURF algorithms are, respectively, implemented, and the corresponding time parameter information is obtained, and the data obtained are tabulated and analyzed. The Open CV for android is SDK 2.0, and the results are shown in Table 1.

As shown in Figure 1, the analysis can use the same mobile phone to detect the same image or object. BRISK can achieve a good registration effect when the object to be detected rotates and the light intensity changes. Compared with SIFT and SURF, the overall running time of the algorithm is much less, and compared with the pure BRISK algorithm, the rotation performance of the method in this paper can be seen through the experimental results of this paper. It has better accuracy, and it is relatively less time-consuming. Therefore, under the premise of ensuring rapidity, the method in this paper ensures the accuracy and time cost of matching as much as possible.

4.2. Functional Analysis of Website Pages. The homepage of the website should highlight themes and provide links to some frequently used functions of users. According to UPS's survey of online shopping users' behavior, most users hope to add a link to order query on the homepage of the website.

TABLE 1: Comparison of three feature point detection algorithms.

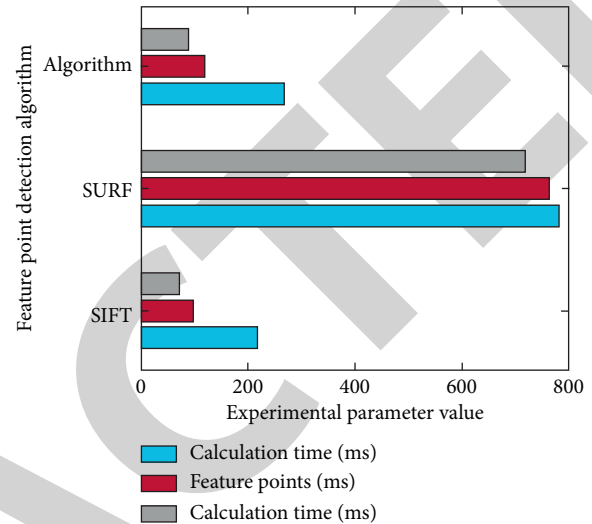| Feature point detection algorithm	SIFT	SURF	Algorithm
Calculation time (ms)	217.3	98.24	71.36
Feature points	783	763	719
Calculation time (ms)	267.3	118.3	88.3

FIGURE 1: Algorithm histogram.

They hope to understand their purchases more conveniently and quickly. When will your product be available? Another survey showed that most users browse the product website to understand the features of the product, so the content on the homepage should be the product display. However, the content of virtual display is not suitable for being placed on the homepage. The second function required is that the regular functions of the website include registration and login, product recommendation, and after-sales service. The experimental results are shown in Figure 2.

As shown in Figure 2, the function of the product aggregation page includes a product classification list and product display thumbnails, and the user's preference information is determined by collecting the user's product browsing clicks on this page. The product classification list should contain the screening function and short evaluation information of related products. Problems that may occur during user browsing and links to presales services should also be added to the page to ensure a smooth user screening process.

4.3. User Evaluation and Evaluation Analysis. Evaluators can use the Lingnan cultural product virtual evaluation platform to learn about products through environmental roaming, product display, and user display and then enter the product evaluation section. The evaluators are 15 males and 25 females. The ages of the evaluators are between 20 and 50 years old, covering various occupational fields, a total of 40 people, and the data validity rate is 100%. After the user evaluation is over, click Submit, the system will automatically record the evaluation data, and the evaluation results can be viewed
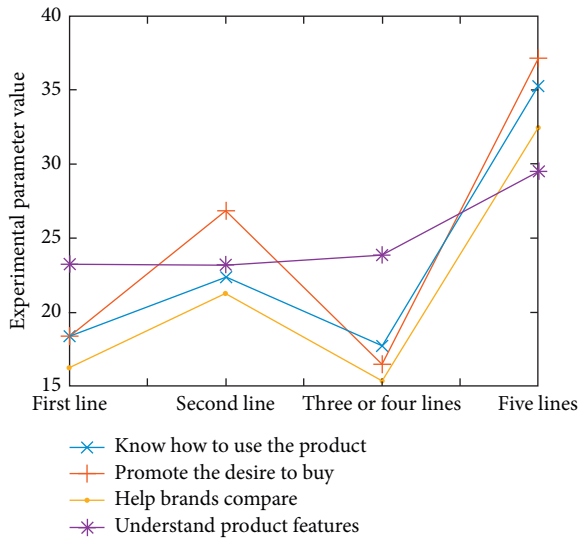
Figure 2: The purpose of browsing product websites by consumers in different cities.
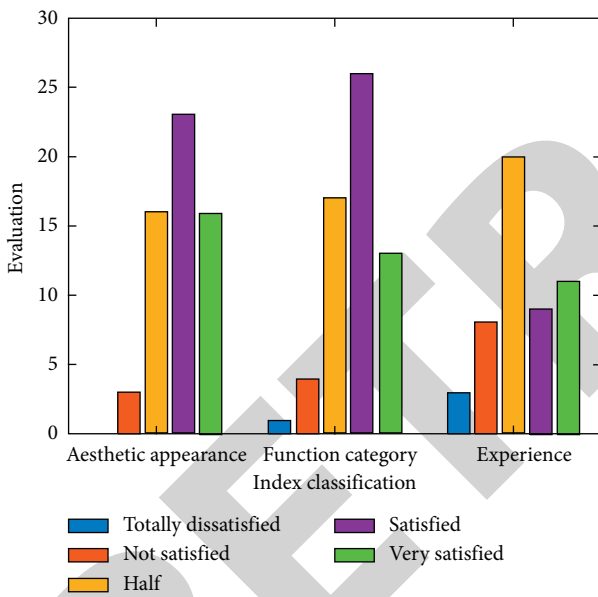

Figure 3: Evaluation data analysis of option one.

after the evaluation is over. Statistics of all evaluation data and the evaluation data are shown in Figure 3.

The overall comprehensive score is 4.27, which fails to reach the general satisfaction level of users and needs to be adjusted. According to the histogram and radar chart of each index score, it can be seen that the evaluation index score is obviously low, which shows that this design scheme has defects in these two aspects. In other aspects, the aesthetic point of appearance score is higher than 6 points, which has reached the general satisfaction level of users, and the degree of completion is good; the score of function point is 5.23 points, of which intelligence and ease of operation score are 4.19 and 6.53, respectively, which are lower than the average evaluation angle. The score, therefore, should be adjusted in these two areas.
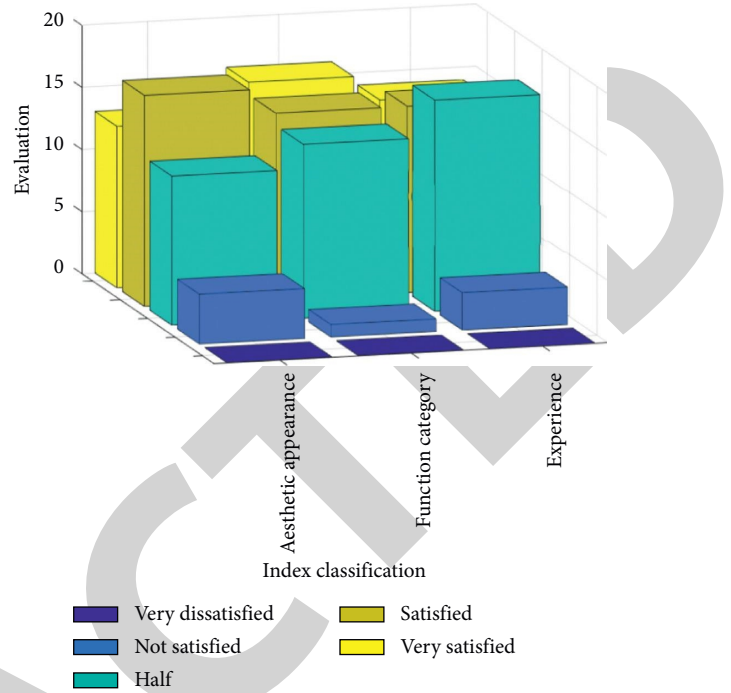

Figure 4: Scheme 2 evaluation data.

In the same way, the experimental data survey results of the second scheme are shown in Figure 4.

The experimental results are shown in Figure 4. The overall score is 25.24 points which has reached the general satisfaction level of users. The degree of completion is good in all aspects and meets the production and sales standards. According to the evaluation results, combined with market demand and consumer trends, fine-tuning the products can further ensure sales and consumer satisfaction.

5. Conclusions

With virtual reality technology as the technical support, this paper uses SolidWorks and 3dMax to realize the digital simulation of products and product use environment and uses unity3D to develop a virtual evaluation platform. Evaluators can participate in the virtual environment on the immersive virtual evaluation platform, interact with the product naturally, and get a realistic experience. The entire evaluation process is not limited by time and region and highly simulates the real use situation of the product, so as to maximize the control of the uncertain factors of consumer demand and make the results more objective and accurate. At the same time, the whole process of digitalization greatly shortens the product development cycle, realizes the interaction and flexibility of all aspects of product design, can quickly feedback the design plan, and adjust and modify when it is implemented.

Aiming at the problems of Internet-based product evaluation, this paper starts from the user's psychology and studies the factors that produce psychological changes during the interaction process of Internet evaluation. It

explains the user's attitude toward Internet-based product evaluation from the perspectives of psychological value, consumption information, and social inertia and proposes to divide users according to their psychological state and then to modify the product evaluation results. By referring to general evaluation methods, the process of Internet-based product evaluation is designed, and the user's mental state and user product evaluation are divided into two parts, and the Internet-based product evaluation model is used to correct the product evaluation based on the user's status, and the evaluation is selected. Elements designed a new interactive way to collect evaluation data.

This paper applies virtual reality technology to product design evaluation and builds a model framework of the product design evaluation system that applies virtual reality technology. By citing relevant theories and technical support for system construction, the feasibility of the design ideas, methods, and technologies of the product design evaluation system based on virtual reality technology proposed in this paper is confirmed. The idea and method of constructing and realizing better product design evaluation with expectations have certain theoretical and practical significance.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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