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Retraction

Retracted: Application of VR Technology in Jewelry Display

Mathematical Problems in Engineering

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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.

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] C. Jin and J. Li, "Application of VR Technology in Jewelry Display," *Mathematical Problems in Engineering*, vol. 2021, Article ID 5516156, 9 pages, 2021.

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Research Article

Application of VR Technology in Jewelry Display

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As a special symbolic cultural carrier that reflects people's material life and spiritual state, jewelry plays an increasingly important role in life. How can we accelerate brand promotion, promote jewelry product sales, and establish a rapid market response mechanism? High efficiency, high quality, and low cost to meet consumers' increasingly personalized and diversified needs are the problems we currently need to solve. The purpose of this article is to explore the application of VR technology in jewelry displays and provide a brand new idea for jewelry display. In order to realize the virtualization of the jewelry design process, this article uses the Cult 3D VR platform to complete the design and realization of the interactive function of the jewelry virtual model, uses the Photoshop software to design the jewelry virtual display system interface, and finally completes the jewelry virtual display system in the Dreamweaver software integration and release. Through detailed example application, the feasibility of the viewpoint of this subject was effectively verified. In this paper, the two algorithms BRSK and SURF are used in conjunction, and the multiscale expression characteristics of BRISK in space and the rotation-invariant characteristics of SURF are used. Studies have shown that the experimental results of the rotation performance of the method in this paper show that the accuracy is improved by 60%, and the time-consuming is relatively less. Therefore, under the premise of ensuring the rapidity, the method in this paper can guarantee the accuracy and time cost of control matching.

1. Introduction

Modern physical show has radically changed the way of traditional acting, transformed into new design ideas, new communication methods, and interactive ideas. In other words, physical rendering is moving towards humanitarian design interactions, data networks, forms, and virtual reality (VR), creating people-centered, interactive-centered technical support. Virtual display is the evolving trend of modern displays and is also a strong expression of the spirit and technology of that era. The virtual display uses computers to simulate physical scenes, allowing visitors to receive stimulation on the visual-based sensory system through natural human-computer interaction methods that conform to their own cognitive and behavioral habits, produce a fun interactive experience, and accept display information conveyed by display design. The biggest advantage of virtual display is its interactive display method and convenient mobile Internet communication method.

In recent years, from an international perspective, VR technology has also begun to be gradually used in the jewelry industry, and many scholars have conducted research on it. For example, Ko SH elaborated on the way to realize the key technology of the digital Earth system and proposed an X3D-based the architecture of the digital Earth system. The system adopts client server structure, uses view related detail model and multilayer overlapping scene model to form scheduling data, and uses compressed binary code to compress data to meet the requirements of network transmission and add a functional model in order to improve the input of users [1]. A geospatial database online visualization environment developed by Peukert C using Java3D is a web-based geographic information system, which demonstrates how to reduce bandwidth based on

Java3D and allow direct connection to systems that have spatial databases enabled [2]. Farah applies panoramic roaming technology to the field of tourism information services, which involves hotel reservations, sightseeing and shopping, dining and entertainment, and traffic guidance [3].

In our country, Kun-yang has launched a panoramic roaming service based on panoramic images to help users accurately locate the map address and watch the satellite bird's-eye view of the searched address to achieve the user's purpose of roaming around the world on the Internet [4]. Wu et al. proposed the use of Java3D for the description of virtual three-dimensional models, through the remote client to read the three-dimensional graphics data uploaded by the server client, to achieve a virtual three-dimensional interactive modeling program that interacts with the user [5]. On the basis of analyzing its own networked customization design characteristics, Wang et al. proposed a new product networked assembly customization and display technology. The realization path and process of this technology are discussed, and the key technology of part-level assembly customization based on form is studied in detail [6].

This paper proposes a way to combine BRISK feature point detection algorithm with SURF feature point description. This article constructs a product display model based on VR technology. First of all, the concept, characteristics, and core technology of VR technology are described. Combined with the demand analysis of the subject research, the computer virtual display function of the product is summarized; secondly, in view of the above content, it describes the process of building a product display model based on VR technology; finally, the simulation process of product display model based on VR technology is explained. This part realizes the systematic analysis of the subject. This paper first explains the advantages of VR technology and its development background, significance, and so on, then explains the role of VR in jewelry display, and demonstrates the role of VR technology through simulation experiments.

2. Application Research of VR Technology in Jewelry Display

2.1. Application Relationship of Panoramic Roaming Technology in Panoramic Roaming Display Design. Roaming screens based on panoramic camera technology are mainly offered as virtual screens but are actually based on physical screens. However, various exhibitions at home and abroad have not given up the design form of physical display. Many companies are still on the basis of these two forms of display; the virtual display video content is uploaded to the Internet at the same time. With the help of the form of network display, the entire product display method is enriched, the range of participants in the exhibition is expanded, and the participation of enterprises is better realized [7, 8]. The development trend of modern exhibition economy is the physical space and VR technology, the traditional display and modern display forms, the complementary advantages of reality and network communication methods, and the integration of functions. That is, physical display is the leading factor, and virtual display and network display are combined. The product display design pattern is shown in Figure 1.

2.2. Application Research of Virtual Reality Technology in Jewelry Design and Display. With the development of e-commerce and the maturity of online consumption, people's demand for dynamic, interactive, three-dimensional visualization and self-browsing display forms is increasingly urgent. If VR technology is used for the display of jewelry products, it can not only display the appearance and performance of the product in real time but also provide rapid information feedback with the help of platforms such as the Internet [9, 10].

The application of virtual reality technology in jewelry display will create a new way of jewelry display [11]. Specifically, it uses technology to generate virtual models of real scenes, jewelry, and other specific objects and integrates new multimedia elements such as images, sounds, animations, and videos to create an interactive, immersive, and conceptual virtual display environment. In this environment, people can perform detailed observations on virtual jewelry products in all directions, such as rotating, zooming in, and zooming out, even complete a series of design actions such as changing colors, materials, shapes, and matching combinations, and combine the necessary equipment to achieve jewelry try-on [12, 13].

2.2.1. Humanized and Free Interactive Experience. The form of virtual jewelry display focuses more on customer experience and focuses more on enhancing customer self-awareness. The virtual display of jewelry provides customers with a humanized interaction method through VR technology. Customers can choose their own way to browse, visit, or purchase activities. Because the display effect of jewelry products designed by technology is realistic, customers can compare styles and check details in a more relaxed and free manner in a virtual environment. Not only that, the powerful real-time rendering function interactive browsing mode allows customers to follow their own need to change perspectives, zoom in on details, modify shapes, colors, and materials in real time, choose suitable styles for try-on, and exchange experiences with other online customers through the Internet, so as to generate purchase desire and strengthen purchase confidence in a relaxed and pleasant experience. In addition, the humanized, novel, and interactive experience brought by this virtual display also helps to discover potential customers.

2.2.2. Intuitive, Continuous, and Interactive Visual Effects. Using virtual reality technology in jewelry display, using virtual three-dimensional models as jewelry representations, not only can display jewelry products 360° in all directions but also can zoom in, zoom out, and rotate arbitrarily to obtain multidirectional, multiangle, and continuous observation. And because VR technology supports real-time

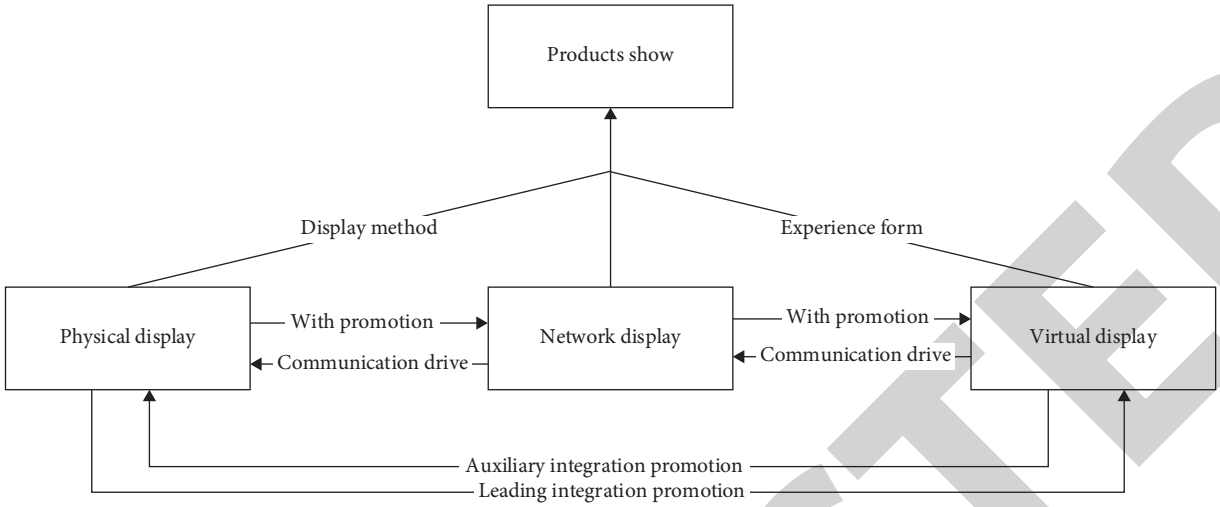

Figure 1: Product display design pattern.

rendering, it has the incomparable advantages of two-dimensional and three-dimensional single-frame images, and the interactive browsing mode makes it more advanced than multimedia display [14, 15].

2.2.3. Breaking the Limitations of Conventional Physical Conditions Such as Time and Space. Conventional physical display forms are mostly restricted by space and time. For example, it is difficult for Chinese customers to easily buy TIFFANY new jewelry that is only sold in the US market; customers can only buy the jewelry products they need during the business hours of the mall; the types of jewelry styles displayed are limited, and due to different dealers and distribution locations, even jewelry products of the same brand will have a difference in time to market; if you want to compare jewelry products of different brands, you need to go back and forth between multiple shopping malls [16, 17]. The virtual display of jewelry combined with the network platform can connect merchants and consumers and make jewelry display and transaction process break through the traditional time, space, and other physical constraints. When a company has established a complete online virtual product library, customers only need to log in to the online virtual display system of the jewelry brand they are interested in, and they can browse virtual jewelry products and obtain corresponding information anytime and anywhere.

2.2.4. Advanced Display Ability. In the virtual jewelry display based on VR technology, designers use VR and other technologies to realistically display the design plan in the form of virtual jewelry models in front of customers. Customers only need to use a browser with VR function to display the design in the world. Any place can fully understand the details of the jewelry virtual model and put forward their own opinions and opinions to the designer through the network platform, and through the form of virtual display, the jewelry designer can not only modify the design plan according to the situation but also foresee market feedback in advance and optimize its design, thereby increasing the success rate of jewelry design, so the risk after the product is put on the market can be reduced to a minimum [18, 19].

2.3. Related Technology Hybrid Feature Detection Method and Registration in the VR System. For the problems encountered in the real time and accuracy of image feature extraction and matching, this paper innovatively uses the scale-invariant BRISK algorithm and the rotation-invariant SURF algorithm together and optimizes the point at this stage; it also used the distance algorithm to optimize the point pair in a unique way.

Since BRISK generates multiscale features and uses SURF to describe the feature points obtained by the BRISK algorithm for rotation invariance, the BFMatcher algorithm is used to ensure the best feature matching, and then the traditional distance algorithm is used to rewrite the obtained feature points. Screening ensures the rapid detection of feature points by the system and the accuracy of the final registration result. Under the premise of realizing correct matching, the method in this paper can achieve good results in both processing speed and matching accuracy.

2.3.1. SIFT Algorithm. The SIFT algorithm has good robustness in detecting object movement, angle change, light intensity change, occlusion, and scale change. It can get rich and high-quality feature point information. It has good scalability and can be used in conjunction with other feature point extraction algorithms, and the extraction speed is relatively fast [20, 21].

At the same time, the feature point descriptor generation in the SIFT algorithm is to extract the descriptors containing the feature point scale, rotation, scaling, brightness, and other pieces of information from the image. The usual steps are as follows:

(1) For scale invariance, first establish scale space and complete the judgment of extreme points.

(2) Determine the specific location after filtering the obtained feature points.

(3) Assign a direction value to each feature point.

(4) Generate feature descriptors. In the range where the feature point is the midpoint, draw a 16×16 unit size area as the sampling area to get 8 gradient directions obtained from the relative direction between the direction of the sampling point and the direction of the feature point after the Gaussian weighting operation.

2.3.2. FAST Algorithm. FAST algorithm is a fast detection algorithm that detects corner information distributed in the neighborhood of the point to be detected by segment detection.

In the calculation process of the algorithm, these 16 pixels are classified according to

$$S_m \longrightarrow i = \begin{cases} \mathrm{d}I_m \longrightarrow i \le I_m \longrightarrow n, \\ I_m - n < I_m \longrightarrow i \le I_m + n, \\ I_m + n \le I_m \longrightarrow i. \end{cases} \tag{1}$$

Among them, n is a numerical value, I_m represents the pixel value of the m point at the center of the circle, and $I_m \longrightarrow i$ represents the pixel value of the i point when m tends to the i-th pixel on the circle.

2.3.3. BRISK Feature Point Detection. First create n octave layers and inner octave layers, which are represented by c_i and d_i, respectively. The C0 layer represents the image itself. The c_i 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 C1. It is obtained by 2 times sampling. The inner octave layer is obtained by sampling the source image itself by 1.5 times, the d_1 layer is obtained by sampling the inner octave layer down by 2 times, and the d_2 layer is obtained by sampling the upper layer d_1 by 2 times.

2.3.4. Transformation of Several Coordinate Systems

(1) Conversion of Pixel Plane Coordinate System and Image Plane Coordinate System. The pixel coordinate system used on mobile phones is based on the first pixel in the upper left corner of the screen as the origin, the x-axis points to the right of the screen, and the y-axis points to the bottom of the plane [22, 23]. Assuming that P is the pixel in the x-th row and y-th column of the image coordinate system, the center point coordinates of the image are (U0, V0), and the corresponding physical dimensions are d_x and d_y. Then point P is converted to the pixel coordinate system, and relationship (2) can be obtained:

$$u = \frac{x}{d_x} + u_0, \tag{2}$$

$$v = \frac{x}{d_y} + x_0. \tag{3}$$

After transforming into matrix form, we get

$$\begin{bmatrix} u \\ v \\ 1 \end{bmatrix} = \begin{bmatrix} \frac{1}{d_x} & 0 & 0 & u0 \\ 0 & \frac{1}{d_y} & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}. \tag{4}$$

(2) Conversion of Image Plane Coordinate System and Camera Coordinate System. $O1$ is in the image plane coordinate system, the camera coordinate system is $O_c(X_c, Y_c, Z_c)$, the optical axis Z_c is the main axis, and the direction of Z_c is the positive direction of the camera. Point $P(x_0, y_0)$ is the point where the point $X(x_c, y_c, z_c)$ in the camera coordinate system and the origin line intersect on the image plane. According to the perspective projection formula, the change relationship can be obtained as follows:

$$\begin{cases} x0 = f\dfrac{x_c}{z_c}, \\ y0 = f\dfrac{y_c}{z_c}, \end{cases} \tag{5}$$

where f is the focal length of the camera itself. Thus, the relationship between points in formula (5) can be converted into this form of the matrix expressed in

$$z_c \begin{bmatrix} x0 \\ y0 \\ 1 \end{bmatrix} = \begin{bmatrix} f & 0 & 0 & 0 \\ 0 & f & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_c \\ y_c \\ z_c \\ 1 \end{bmatrix}, \tag{6}$$

(3) Conversion between World Coordinate System and Camera Coordinate System. Because the rotation matrix R is orthogonal and because we know that $R = [r1, r2, r3]$, a column vector is eliminated through $r3 = r1 \times r2$, so that $Z_w = 0$ in the world coordinate system, combined with formulas (4)–(2). The matrix transformation relationship between the world coordinate system and the pixel coordinate system can be obtained as

$$\begin{bmatrix} u \\ v \\ 1 \end{bmatrix} = s \begin{bmatrix} a_x & 0 & 0 \\ 0 & a_y & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} r1 & r2 & r3 & t \end{bmatrix} \begin{bmatrix} x_w \\ y_w \\ 0 \\ 1 \end{bmatrix} = sH \begin{bmatrix} x_w \\ y_w \\ 1 \end{bmatrix}. \tag{7}$$

Among them, S is a constant, the components of R on the x-axis and y-axis are $r1$ and $r2$ in turn, and H is a matrix with a size of 3×3, and M_{int} is the camera's internal parameters, so formula (7) can be obtained from formula (8):

$$H = \begin{bmatrix} h_1 & h_2 & h_3 \end{bmatrix} = sM_{\text{int}} \begin{bmatrix} r1 & r2 & t \end{bmatrix}. \tag{9}$$

Through formula (9), we can get

$$h_1 = sM_{\text{int}}r1, \tag{10}$$

$$\begin{aligned} h_2 &= sM_{\text{int}}r2, \\ h_3 &= sM_{\text{int}}r3. \end{aligned} \tag{11}$$

Then through the property that R is an orthogonal matrix, we can know that $r1$ and $r\,2$ are also orthogonal, so that two implicit formulas can be derived:

$$r1^T r2 = 0, \tag{12}$$

$$||r1|| = ||r2|| = 1. \tag{13}$$

Through the knowledge of linear algebra, the two vectors of m and n have the property of $(mn)^T = n^T m^T$, so we can replace $r1$ and $r2$ in formula (13) to obtain the following two formulas:

$$h_1^T M_{\text{int}}^{-T} M_{\text{int}}^{-1} h2 = 0. \tag{14}$$

2.4. Design and Realization of Interactive Function of the Jewelry Virtual Model. It is very simple to set up interactive actions in Cult3D, which is very similar to the behavior settings in web design; that is, connect the action to the event and then connect to the target object. There are three main types of objects set in Cult3D: scene, action, and event. The scene includes each element in the file and other elements, such as materials, textures, and sounds added later; actions mainly include object movement such as rotation, translation, zooming, selecting camera or perspective switching, coloring materials, and displaying or hiding objects; events are divided into mouse events and keyboard events, scene start events, timers, and custom events for event excitation or browser external events excitation [24]. The interactive design of the Cult3D object is to establish the relationship between events, actions, and scenes in the event map window, so that when the viewer triggers an event or an event occurs automatically, the browser program can control the scene corresponding to the event to make a response. The visual process and results are fed back to the viewer in real time to achieve the purpose of interaction.

2.4.1. Import the Jewelry Model. Start the Cult3D Designer program, click the "Add C3D file" command in the file menu in the Cult3D Designer program window, select the C3D file just exported in the pop-up dialog box, and click "Open" button to complete the import.

2.4.2. Realize the Spatial Viewpoint Change of the Virtual Scene. However, in order to facilitate the user to view the model, you can use the left mouse button to create several viewpoints, such as front, back, left, and right, so that you can directly call the predetermined angle for viewing.

2.4.3. Set Up Interactive Actions for the Overall Rotation, Enlargement, Reduction, and Translation of the Jewelry Model. First, make the mouse control the rotation, zoom, and pan of the virtual jewelry model. Select the "click with the left mouse button" icon in the event map window and drag it to the blank space on the right side of the event map window. In the interaction/interaction of the action window, use the mouse to drag the "mouse-Arcball" icon to the event map window. Click on the icon with the left mouse button, then select the jewelry "hanging ring" in the scene graph window, drag it to the "mouse-Arcball" icon in the event map window, then set the mouse-Arcball parameters, and finally click the "Preview Run/Stop" button in the presentation window to immediately set the preview.

3. Application of VR Technology in Jewelry Display

3.1. Development Environment Construction. (1) NDK: local development kit; NDK enables developers to use programs written in C/C++ language. It includes the following parts:

(1) It contains all the tools needed to run C/C++ code and creates compiled files for it

(2) Some other language programming programs can be put into the application file package under the Android system

(3) It has good compatibility with all programs on the Android system

(2) Advantages

(1) The code developed using Java on the Android system is easy to be decompiled, but this is rarely the case with the C/C++ library, and the code can be protected.

(2) Programs written in C/C++ language are highly efficient. Using the third-party C/C++ library of NDK allows efficient code to be used on platforms such as Android, which improves the overall operating speed of the system. JNI: Java Native Method Interface. It is mentioned in the book Java Virtual Machine that JNI can realize communication between codes written in Java and programs written in other languages. In this paper, 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++.

3.2. System Framework and Modules. We put the execution of the more complex registration algorithm (image processing algorithm) module in the native layer using the C/C++ language, which can reduce time-consuming and improve operating efficiency. The model rendering module can only parse files in obj format, and loading the model is implemented in the Java layer under the Android system.

In this paper, the designed and implemented system for improving the behavior of natural feature points is mainly

for storing all feature information of the target object of the facility or the detected image. When displaying local data, the video recorder will automatically obtain the video image and feature information of the video. Once the consistency with the information stored in the previous database reaches a certain level, the match is considered successful and other actions can be taken. In this paper, such as nested position and camera pose estimation, in order to improve the real-time performance of the system, we apply the LK optical flow tracking algorithm so that we cannot get the attribute information of all frames of the video information to improved system response time and speed.

3.3. Establishment of an Internet-Based Product Evaluation Model. The process of the Internet-based product evaluation model is based on the user's order of browsing web pages. Different information is collected through the logical relationship between web pages. When a user browses a website, the first information collected should be the user's psychological state. Register and sign up to understand the objective status of the user, and then understand the user's preference information through the choices made by the user during web browsing. When users determine certain products, they begin to understand the feedback that users receive after the promotion. For users who consulted before sales, understand the reasons why users choose products, what they have doubts about products, and what other information is conveyed in the process of display deviation or whether the user is interfered by other information, and for after-sales service users, it is necessary to know exactly which factor caused the user's dissatisfaction. By referring to the divided user groups and the psychological state of the user interaction, the users select and answer questions to obtain specific evaluation information.

4. Application of VR Technology in Jewelry Display

4.1. Algorithm Analysis of Matching Feature Points. The video capture resolution of the Android mobile phone used is 640 ∗ 480, the SIFT, SURF, and BRISK + SURF algorithms are, respectively, implemented, the corresponding time parameter information is obtained, and the data obtained are tabulated and analyzed, using Open CV for Android SDK 2.0; the results are shown in Tables 1–3.

As shown in Figure 2, 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. Compared with the pure BRISK algorithm, the experimental results of the rotation performance of the method in this paper show that the accuracy is improved by 60%, and the time-consuming is relatively less. Under the premise of ensuring rapidity, the method in this paper ensures the accuracy and time cost of matching as much as possible.

Table 1: Comparison of three feature point detection algorithms.

Feature point detection algorithm	SIFT	SURF	Algorithm
Calculation time (ms)	217.5	92.7	72.5
Feature points	718	725	711

Table 2: Time comparison of three feature point description algorithms.

Feature description algorithm	SIFT	SURF	Algorithm
Calculation time (ms)	261.4	119.3	92.4

Table 3: Comparison of the total time consumption of the three algorithms.

Feature description algorithm	SIFT	SURF	Algorithm
Calculation time (ms)	453.2	195.6	146.8

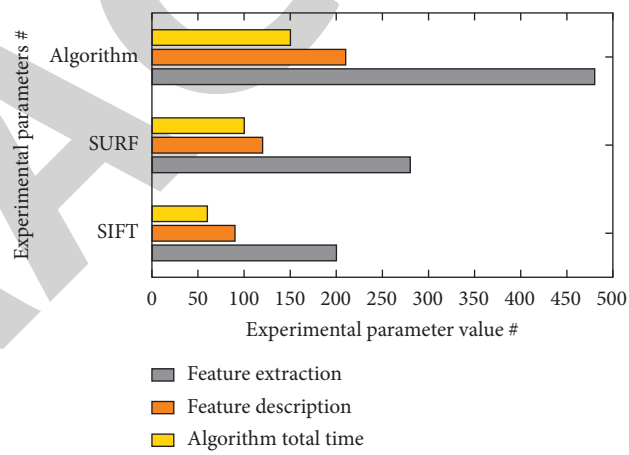

Figure 2: Algorithm histogram.

4.2. Consumer Psychological Value Identification. Before recognizing the functional value of the product, users will first have a functional understanding of the product based on their own needs and product introduction and then evaluate the added value of the product brand or virtual value, whether users agree with the company's values becomes very important. This paper investigates the customer experience and the experimental results are shown in Table 4.

As shown in Figure 3, nearly 2% of people think that VR technology is lacking in value in jewelry display, 25.5% think that it is fair, 22.3% think that it is worth the money, and nearly 50 think that it seems that the application of VR technology in the display of objects needs further technical improvement.

4.3. Functional Analysis of Website Pages. The main functional pages of the product display and evaluation website are divided into the home page, product collection page, product display page, and user information page. The

Table 4: Distribution of consumer psychological value identity.

	A little loss (%)	General (%)	Value for money (%)	Big loss (%)
Male	2.5	23.1	25.3	49.1
Female	1.5	24.7	22.5	51.8

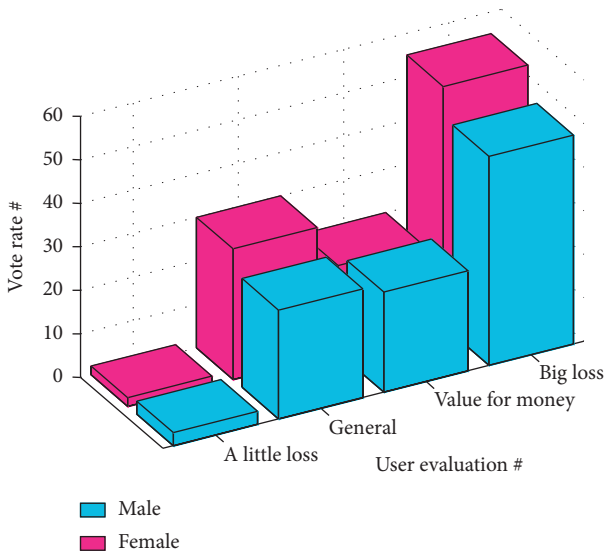

Figure 3: Distribution of consumer psychological value identity.

homepage of the website should highlight themes and provide links to some commonly used functions by users. According to UPS's survey of online shopping user behavior, the survey results are shown in Table 5.

As shown in Figure 4, most users want to add an order query link to their website's home page, and they want to know the products they have more easily and quickly when they want to purchase the available products. According to other researches, most users are browsing the product's website to understand the product's functionality, so the product's display content should indicate the most space on the product homepage. However, the content of virtual display is not suitable for the homepage, because users do not want to know a specific product in detail on the homepage but have an overall impression of the entire brand, and virtual display will reduce the speed of linking to the homepage, to reduce user experience, so the homepage still mainly displays brand products with product pictures. The second function that needs to be possessed is the regular functions of the website including registration and login, product recommendation, and after-sales service.

4.4. User Evaluation and Evaluation Data Processing. Evaluators can use the immersive product virtual evaluation platform to learn about products through kitchen environment roaming, product display, and use display and then enter the product evaluation section. The evaluators are 25 men and 25 women who often use the oven to cook. The ages of the evaluators are between 20 and 40 years old, covering various occupational fields, a total of 50 people, and the data

Table 5: Purpose of browsing product websites by consumers in different cities.

	Learn to use	Desire to buy	Product comparison	Understanding the function
First line	22	25	17	34
Second line	14	21	17	38
Three or four lines	15	20	14	51
Five lines	17	28	18	27

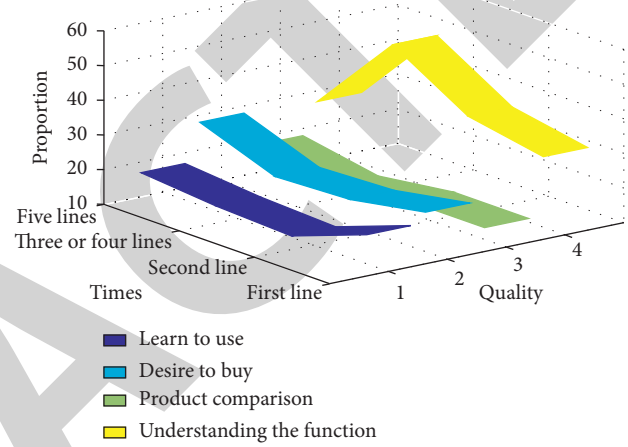

Figure 4: Purpose of browsing product websites by consumers in different cities.

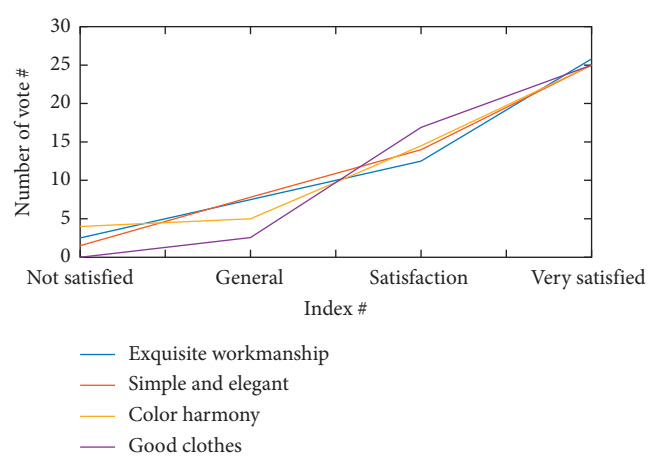

Figure 5: Appearance aesthetic evaluation analysis.

validity rate is 100%. After the user evaluation is over, click submit, the system will automatically record the evaluation data, and you can view the evaluation results after the evaluation. Statistics of all evaluation data and the experimental results are shown in Figure 5.

As shown in Figure 5, most people recognize the appearance of virtual products, and most people are very satisfied. The aesthetic point of appearance is higher than 4

points, which has reached the general satisfaction level of users, and the completion is good.

5. Conclusions

The immersive product virtual evaluation system proposed in this paper is applied to the actual product evaluation. Taking jewelry as an example, the immersive virtual evaluation is carried out. Use quantitative statistics to calculate the weights of each index and each evaluation angle to obtain an evaluation index model, build a virtual evaluation platform, publish the virtual interactive evaluation platform on the smartphone, and put VR glasses into the evaluation personnel; finally, the evaluation data are recorded and processed through the system, and the evaluation results are displayed in the form of charts. Through the analysis of the evaluation results, the shortcomings of the product can be quickly found, and the product design plan can be modified in a guided manner.

This paper designs and implements the MAR system using the feature detection and description method combining the BRISK algorithm and the SURF algorithm on the Android phone. The information transmission function of the camera and its own internal parameters can be used to calculate the external parameters of the camera, and the combination of optical flow algorithms can improve the overall performance of the camera. Then, the Open GL ES technology is used to fuse the virtual information into the real scene to achieve the final AR display effect.

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 towards the evaluation of Internet-based products from the perspectives of psychological value, consumption information, and social inertia, proposes to divide users according to their psychological state, and then revises the product evaluation results.

Data Availability

The data underlying the results presented in the study are included within the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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