

Retraction

Retracted: Wuju Opera Cultural Creative Products and Research on Visual Image Under VR Technology

Yahong Wang; Xiaobing Hu

IEEE Access

10.1109/ACCESS.2020.3019458

<p>Notice of Retraction</p> <p>Y. Wang and X. Hu, “Wuju opera cultural creative products and research on visual image under VR technology,” *IEEE Access*, vol. 8, pp. 161862–161871, 2020, doi: 10.1109/ACCESS.2020.3019458.</p> <p>After careful and considered review by a duly constituted expert committee, this article was retracted owing to irregularities in the peer review process, including acceptance for publication without the minimum number of independent reviews required by IEEE.</p> <p>The authors were contacted about the retraction and did not dispute it.</p>

Received August 8, 2020, accepted August 21, 2020, date of publication August 26, 2020, date of current version September 16, 2020.

Digital Object Identifier 10.1109/ACCESS.2020.3019458

Wuju Opera Cultural Creative Products and Research on Visual Image Under VR Technology

YAHONG WANG¹ AND XIAOBING HU² 

¹Department of Art, Tourism College of Zhejiang, Hangzhou 311231, China

²Fine Art Academy, Anqing Normal University, Anqing 246001, China

Corresponding author: Xiaobing Hu (1976hxb@163.com)

This work was supported in part by the Exploration of Hybrid Teaching Mode of Design Course of Celadon Tea Ware with the Combination of Tea and Porcelain, Tourism College of Zhejiang, in 2018, under Grant 2019YB22, in part by the Key Project of Humanities and Social Sciences in Anhui Province, Research on the Development of Opera Cultural and Creative Products through the Vision of Huangmei Opera, under Grant SK2018A0344, and in part by the Key Project of Humanities and Social Sciences in Anhui Province, Research on the Cartoon Books Based on the Cultural Elements of Wanjiang River, under Grant SK2019A0350.

ABSTRACT Wuju Opera is a form of Chinese traditional culture, and there are many visual elements that provide designers with a source of creativity. This research mainly discusses the development of cultural and creative products of Wuju Opera and the visual image under VR technology. First of all, three-dimensional modeling technology is the basis for establishing virtual scenes, modeling objects on the stage, including stages, props, and the synthesized video lens movement effect is consistent with the lens parameters of the physical camera to avoid causing the target foreground to “float” the situation on a virtual background. Interaction capabilities are given to some objects, such as the opening of curtains and lights, which can be completed through user interaction. Secondly, introduce the related knowledge of Wuju Opera through some text, pictures and other materials, in order to achieve a deeper understanding of Wuju Opera and the purpose of like Wuju Opera. Finally, by connecting the VRML virtual scene with the database, users can quickly call the corresponding virtual Wuju Opera performance fragments. The VR-Platform platform is used to establish a virtual three-dimensional landscape planning scene, and the roaming function can be realized by making cameras and adding collision detection. By connecting to the database, information can be searched, and the audience can be immersed when roaming by adding music and special effects. The similarity of the characters presented under VR technology is 93%, and the audience’s satisfaction with the drama under VR technology is 95%. The research results show that the visual simulation effect developed based on VR technology has the necessary texture, color, shadow and other changes. It feels the same as the drama on the plane. It is vivid and makes people feel the real feeling, which is beneficial to Wuju Opera.


INDEX TERMS Wuju opera cultural creative products, VR technology, visual image, three-dimensional modeling.

I. INTRODUCTION

The biggest feature of Wuju Opera is the dialogue between dancing, singing and music. There are many forms of dance drama, such as dance, music, lyrics, literature, and drama. It is also a very comprehensive art, which is also a unique art of Wuju culture features. Some of the body language in Wuju Opera-the graceful curves formed by throwing sleeves left a deep impression on people. Wuju Opera costumes give people a strong sense of color and strong local characteris-

tics. Wuju Opera uses exaggerated and distorted images to express the character, which is very symbolic. The Wuju Opera Theater uses huge fragmented images to depict characters, which is also very symbolic. In the opera, Wuju’s face is very elegant. It looks like looking for beauty. However, color is the best way to show the audience the position of the character. Due to makeup, costumes, gestures, colors and stage effects, Wuju Opera seems to have a strong sense of humor.

As a national intangible cultural heritage, Wuju Opera was introduced to Jinhua County, Zhejiang Province in the mid-Ming Dynasty. Wu Zhou’s operas are rich, traditional,

The associate editor coordinating the review of this manuscript and approving it for publication was Zhihan Lv .

practical and influential. Hui operas call it “living remains”. Peking opera master Mei Lanfang once praised Peking opera: “The man before Peking opera is a Hui opera.” The combination of Wuju Opera and local folk art has become one of the most important operas. However, compared with other dramas, Wuju Opera’s cultural creativity lags behind in the depth of design and the breadth of implementation. Therefore, the creative products of Wuju Opera have no accurate market positioning cannot truly be integrated into the lives of modern people. Therefore, in the context of the new era, refining and redesigning the cultural elements of Wuju Opera has positive significance for the spread of Wuju Opera culture and the industrialization of Wuju Opera cultural products.

Dramas are often described as unique local cultural customs with Chinese characteristics and sometimes described as “glass windows” and “bridges”, which will attract global attention. L.S inspected the use of song and dance in northern Shanxi to promote joint projects between China’s largest coal company and Dow Chemical Company. Focusing on the speech at the “Far East Encounter” event held by the Yulin Folk Art Troupe at the Dow Global Headquarters in Midland, Michigan in 2008, and the reciprocal performance performed by the National Symphony Orchestra in the second year under Dow’s funding. His research time is too long [1]. Zhao proposed a novel method to select a set of summary images from a large image set through improved Random Sample Consensus (RANSAC) and Affinity Propagation (AP) clustering. It can automatically select a small group of representatives to highlight all the important visual attributes of a given image collection. First, the scale-invariant feature of each image is extracted through the scale-invariant feature transform (SIFT). Second, the key points of the two images are matched and sorted based on the ratio. Third, fit the target homography matrix based on the representative data set. Filter out unmatched items through the homography matrix. His research process is too complicated [2]. Ward proposed a method to effectively detect grid mosaic blocks in the input image using boundary features. Initially, the canny edge is detected from the input image. Then, the boundary characteristics of the mosaic block are extracted from the detected edges, and candidate regions that may contain the mosaic block are detected. After this stage, geometric features will be used to eliminate non-mosaic blocks and select actual mosaic blocks. His research process is too simple and has no practical value [3]. Doeschl-Wilson believes that the random regression model can be used to analyze two hybrids between 75 and 140 days old. The visual imaging system he placed above the feeding station provided planned area and length measurements of different body parts every day. Obtain daily live weight measurements from the platform scale integrated into the electronic feeding station. He compared the curves associated with different measures and types. His research lacks experimental control [4].

This research has done a lot of exploration on the development of Wuju technology, virtual reality technology and its characteristics, and the development history of Wuju

aesthetics, and sorted out the development history of Wuju technology, the changes and development of Wuju form. In this research, firstly, under the continuous development of VR technology, what kind of changes have taken place in the form of Wuju opera, and secondly, what kind of impact this change has on the audience’s aesthetics, and the creation of new aesthetic virtual reality images characteristics. Finally, analyze the beautiful experience brought by VR images. From virtual reality technology to traditional Wuju Opera language, it has changed the aesthetic experience of Wuju Opera in the past, greatly increased the charm of Wuju Opera, satisfies the audience’s aesthetic desire, and maximizes the imagination and superiority of modern technology brought to the audience by the drama. Therefore, virtual reality technology has played many roles to strengthen the mood of the audience and the universal drama value. Only in this way can dramatic art not lose its artistic value in the continuous development of technology.

II. CULTURAL AND CREATIVE PRODUCTS OF WUJU OPERA

A. VR TECHNOLOGY

The characteristics of interactivity in VR videos, on the one hand, refers to the audience’s self-subjective awareness and the right to operate things that exist in the space; on the other hand, the virtual reality space also correspondingly gives feedback and interactive behavior to the audience’s interactive behavior natural and reasonable. The generation of VR video interactivity requires the use of supporting VR equipment (such as VR glasses, VR helmets, data gloves, etc.), so that the audience can have the same feelings in the real world through natural contact. The quality of interactive hardware equipment affects the content of delivery. It is precisely because the realization of interactive features determines that the audience’s results of video delivery vary from person to person. The realization of audience interaction in VR video also reflects the current nature of interaction. This is also an improvement in Internet interaction, realizing interactive behavior. Real-time feedback improves the value of interactive behavior [5].

The weight coefficient $h(i, j)$ depends on the product of the domain $f(k, l)$ and the value domain $\omega(i, j, k, l)$ [6].

$$h(i, j) = \frac{\sum_{k,i} f(k, l) \omega(i, j, k, l)}{\sum_{k,j} \omega(i, j, k, l)} + e^{\frac{(t-k)^2 + (j-i)^2}{\sigma}} \quad (1)$$

Among them, i and j are pixel indexes. After using bilateral filtering to repair holes, there are still isolated gray points that have not been repaired, and the correct pixel gray values around them cannot be used as filling objects. Multi-sensory stimulation mobilizes the audience’s movie-watching emotions, enhances the audience’s taste and pleasure in aesthetic activities, and makes the audience feel the interest and pleasure of watching the movie. However, the all-round sensory experience also has its own limitations. For the existing

VR technology, the all-round sensory experience makes people completely immersed in it. Because of its strong sensory impact, when the viewer takes off the VR equipment It will produce strong incompatibility, such as loss of balance, dizziness, nausea and vomiting, eye muscle tremor and other symptoms. This is not only related to VR equipment, but the most important thing is that the nature of VR interaction is based on the relationship between hands and experience. This kind of mapping is different from reality. Whether it is entering VR or coming out, it takes time to adapt [7].

$$\omega(i, j, k, l) = e^{-\frac{i(i-k)^2 + (j-l)^2}{\sigma^2}} \times \frac{(i-k)^2}{\sigma^2} + f(k, l)^2 \quad (2)$$

k is the normalization constant, and σ is the standard deviation of the spatial Gaussian function. The interactive experience of VR technology enables viewers to have more choices, and the drama has more optional story lines. This makes the creators have to clarify the logical relationship between the story lines, distinguish the primary and secondary story lines, and whether the story lines affect each other during the early layout. Otherwise, the chaotic story line will interfere with the smooth narrative, making the audience unable to accurately perceive the content the creators want to convey. The interactive experience also brings the possibility for the audience to participate in the narrative. When the audience is brought into the narrative, it can make the audience have a stronger emotional identification with the story, but at the same time, it also creates a relationship between the audience and the story, kind of paradoxical relationship. In the early stage of the layout, creators must clearly design the audience's identity positioning, so that the audience can perceive their "identity", so that they can participate in or watch the development of the story from a suitable angle, and will not feel disconnected due to confusion. The distance between two or more points of an image can be expressed using Euclidean formula [8].

$$d(x, y) = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2 + \dots + (x_n - y_n)^2} \\ x, y \in [1, n - 1] \quad (3)$$

x_n is the gray value of the pixel[9].

B. WUJU OPERA

The application level of abstract art in modern art design is constantly improving, and it plays an important role in the connection between art and life. In the design of cultural products, abstract art design can effectively create atmosphere, create artistic conception, and meet the spiritual and cultural needs of modern people. In the process of creation and design, Wuju Opera culture cannot directly use the graphic and symbolic elements of opera. Instead, it needs to expand, extend, transform and reorganize the elements based on the original content of Wuju Opera culture to display the combination of culture and products. Through the collection of Wuju Opera costumes, props, meanings, culture and other elements, the abstract transformation of the craft, shape,

color, and shape of the product is considered in the product creation, so that the shape and vision are unified [10].

Designing products requires designing different shapes according to different materials. The selection of Wuju Opera creation materials should be based on the design method. When choosing traditional materials or new materials as the material carrier, although Wuju culture and crafts (such as wood carving, stone carving, embroidery, etc.) and folk arts (such as paper-cutting, shadow puppetry, kite) do not have the same material basis, careful analysis can reveal that there are also many materials related to Wuju Opera culture can be used. For example, the commonly used creative materials include costume materials in dramas: silk, satin, cloth, enamel, prop metal materials: knives, guns, swords, cymbals, metal crafts and decorative female headdresses. The stage is decorated with wooden materials: a table and two chairs. Materials are the material basis for shaping the form of cultural and creative products. Designing products requires designing different shapes according to different materials. The selection of Wuju Opera creation materials should be based on the design method. When choosing traditional materials or new materials as the material carrier, although Wuju culture does not have the same material basis as crafts and folk art, careful analysis reveals that there are many materials related to Wuju culture that can be used. For example, the commonly used creative materials are costume materials in drama: silk, satin, cloth, enamel, etc. Props metal materials: knives, guns, swords, cymbals, metal crafts and decorative female headwear. The stage is decorated with wooden materials: a table and two chairs. Therefore, through the recombination of materials and culture, the cultural mechanism of Wuju Opera, which is the connotation of products, can form new material effects through the combination of new materials and traditional culture, thereby forming creative products with drama as the content. In short, materials are not only the basic elements of modeling, but also express cultural connotations after shaping the body. Therefore, in the design and development of cultural products, it is necessary to consider the importance of materials for product development [11].

C. VISUAL IMAGE

Form and color are the two basic components of visual images. They are interdependent. If there is no form, you cannot perceive color, and you cannot perceive form without color. The object of perception is only the basic composite of color and shape, and the color relationship is the basic relationship for observing and perceiving the world. The acceptance of visual perception is produced by the formal relationship of colors. Only the visual world can be understood through the relationship of color form. Some organisms use the way of transmitting visual information in visible light to carry out, even basically the instinctive behavior of organisms for survival. The behavior of transmitting information based on vision must fully satisfy its basic efficiency, that is, expression and understanding. Different from the relatively

natural environment with great biological instinct characteristics, the living environment of modern human society can be said to be a noisy environment tightly surrounded by various visual images. People who have a brain that can think, fully and spare no effort to transmit various information through various visual behaviors, and seek different purposes [12].

D. THREE-DIMENSIONAL MODELING

Solid Works is mainstream parametric solid modeling software based on geometric features. Solid Works uses geometric features as a design unit and uses geometric features to build part models. Geometric features are the basic units that constitute a three-dimensional model. In Solid Works, geometric features are divided into sketch features and directly generated features according to different production methods. Before designing a model, it is necessary to decompose the complex model, establish a general function sequence, and clarify how the sketches of each function are and how the reference level is determined [13].

Solid modeling software requires users to have a certain three-dimensional reverse thinking, and can split a complex three-dimensional model into several sets of sketch features or directly generate a combination of feature features. At the same time, in the process of creating basic features, how to choose the datum plane and how to Choosing a sketch plane is a test of user ability and experience. Polygonal modeling software requires users to have a strong sense of space and sense of space, reasonable structure control ability, reasonable wiring ability, 3D model structure control ability and 3D model grid distribution ability are also distinguishing polygon modeling ability An indicator of high and low [14].

III. INQUIRY EXPERIMENT OF WUJU OPERA UNDER VR TECHNOLOGY

A. DATA COLLECTION

Before modeling, we must collect as much information related to the real environment as possible. This part is the basis of the entire modeling process and is very important. If the data is collected more carefully and accurately, the subsequent work will become more convenient. If there is any negligence in the process of collecting data, then there will be a lot of unnecessary troubles in the subsequent modeling process. For this reason, this step must follow a comprehensive and careful principle. After collecting the data, sort out and analyze the relevant information so that you can easily get the data you want when you need it. The key to the construction of the appearance model is the scene light, composition and relational data of the 3D model, as well as the size of the three view objects and external dimensions. The experimental equipment is shown in Table 1 [15].

B. VIRTUAL REALITY 3D STAGE

The selected experiment of this research first uses Arc GIS software to create TIN based on elevation points, converts TIN to DEM, and then uses 3dsMax software for image map-

TABLE 1. Experimental equipment.

Software	Model	Hardware	Model
Windows	2000	Roaming control equipment	Mouse,Keyboard, Camera
Intel	Celeron 2 667MHz	RAM	256M
Development tools	Visual C++ 6.0	Graphics card	TNT2 32M

ping to realize virtual reality 3D terrain. TIN is constructed by forming a triangulated network of nodes with X, Y and Z values. TIN can be created based on points, lines, polygons and other elements that contain elevation information. The scenes of the virtual camera system are all made by 3DSMAX, MAYA, and Lumion. The scene model produced can be edited many times and reused. The actual scene picture taken in advance can also be used as a virtual background after modification, but it can only be used as a two-dimensional background. If it is used alone in Unity3D, it cannot reflect the three-dimensional presentation effect [16].

C. OPTIMIZATION OF 3D SCENE MODEL

The model in Sketch Up is composed of each surface, so the surface can be optimized during data compression to reduce the number of surfaces as much as possible. The reduction of faces can be achieved by deleting the invisible faces inside the model and deleting the faces that intersect between objects. In some dense and regular scenes, we don't need to copy multiple models for combination. You can also use hollowed out transparent and non-transparent PNG, PSD format pictures to map a simple object, not only will not affect the expression effect, but also can reduce the modeling workload. 3Dsmx comes with a baking function, but for more complex scenes, using Render to Textures for baking in 3dsmax, the effect is not very ideal. Lights cape software can be used to track different light effects. Use Lights cape software to bake the 3Dsmx scene model, which can import the scene information in the scene into the VR-Platform platform [17].

D. PRODUCTION OF THREE-DIMENSIONAL HUMAN BODY MODEL

Use the interactive three-dimensional modeling system PRISM to construct an approximate polyhedron of each part of the human body, and set up a joint polyhedron (composed of two overlapping surfaces) at each joint, taking into account the changes in the muscles of the human body and the subsequent stretching and stretching of the skin. Contraction, leaving a proper distance between the joint body and the part body. Connect the item points of the joint polyhedron and the part polyhedron to produce an edge, erase the adjacent faces, and the two entities will be glued into one entity. Repeat this process for each adjacent face to produce an initial rough human body. A rough human body composed of polyhedrons is divided into polyhedrons [18].

E. MAKE COLLISION DETECTION EFFECT

In the three-dimensional scene roaming, as the position and posture of the motion model change, it may collide with the static or dynamic model in the scene. In order to avoid the collision and make the simulation more realistic, we set the collision detection of the model. The efficient and accurate collision algorithm is designed in VRP. Setting the collision effect in the scene can make the roaming in the scene more realistic, just by selecting the collision detection model and setting the relevant parameters [19].

F. VIDEO EDITING AND OUTPUT

After the scene model exported by the computer 3D modeling tool is imported into Unity3D, the texture material and animation of the model can be automatically imported together. When the measurement unit of the model making tool is consistent with the default unit of Unity3D, the model can be directly applied to the scene without any modification. If you need to save the model edited in Unity3D for later use, you can make it as a Prefab. The video captured by the physical camera is transmitted to the computer through the Black Magic Intensity Shuttle video capture card. After the camera parameters are set in the capture card driver, it can be connected to Unity3D for data communication. The parameter settings must be consistent with the output video format of the camera. The camera output is HD1080p video, and the capture card also needs to set the same HD format. Videos are in HD1080p23.98 format. The video is previewed in real time after keying in Unity3D as a texture method. The output composite video is previewed in the Game view interface in real time, and can be edited in the Scene view in real time [20].

G. REALIZATION OF VR ROAMING

After modeling and rendering are completed, for interactive design, VRP will be imported into VRP through the VRP-Mx plug-in. In the scene, multiple cameras such as walking, camera, flying, rotation, and character are added, and the audience can roam. The script editor provided by VRP can realize the interactive function between the user and the computer. At the same time, the process of machine operation is also realized through custom functions. In order to make the scene more real and beautiful, floor, lighting, curtain, music, etc. were added to the scene at last, so that the audience can watch the whole process of the drama happily [21].

IV. INQUIRY EXPERIMENT ANALYSIS OF WUJU OPERA UNDER VR TECHNOLOGY

A. ANALYSIS OF VR TECHNOLOGY RECOGNITION RESULTS

As a new type of face modeling method for drama, the model has many advantages such as automation and presence. This research has made some improvements on the variable model. Due to the large amount of prototype face data of the deformable model, the model is composed of 200 prototype faces, and each prototype face is represented by a shape

vector and a texture vector with a dimension of about 1000, and the process of using the model to match the face image. It is a multi-parameter nonlinear optimization problem, and its computational complexity is very high, and it takes a long time to reconstruct a face. How to speed up the model matching, improve the realistic effect of model matching, and avoid the model from local minimal interference is the key to the further application of the model. Progressive research can consider improvements in optimization methods and strategies. For example, keeping the illumination and pose parameters unchanged during optimization, first iterate the parameters corresponding to the main feature vector of the model, and then gradually add other feature vectors for iteration. This can make the main features of the face converge to the target first, while reducing the impact of secondary features on the model matching. In order to evaluate the face feature detection method based on the combined model, the feature points of the face image in the test set are also manually calibrated. The results of the model detection are shown in Table 2. From the comparison results, the face feature detection method based on the linear combination model has a high feature detection accuracy rate on the MPI face database, but the accuracy rate on the ORL face database has decreased. For the face feature detection method based on the combined model, if the difference between the face and the prototype face in the performance under VR technology to be detected exceeds the representation ability of the combined model, the feature detection effect will not be good. This situation can be improved by adding faces with poor feature detection effects to the prototype face set, that is, by enriching the prototype faces to increase the representation ability of the linear combination model [22].

B. THREE-DIMENSIONAL HUMAN ARM INTERACTIVE MOTION SIMULATION ANALYSIS

The prosperity and development of Wuju Opera is inseparable from the variety of operas, and Wuju Opera has always displayed Jinhua culture in a unique way. The connotation of

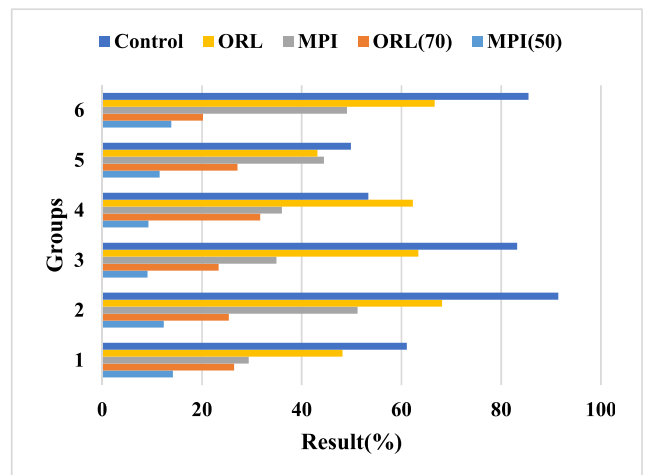


FIGURE 1. VR technology simulation results.

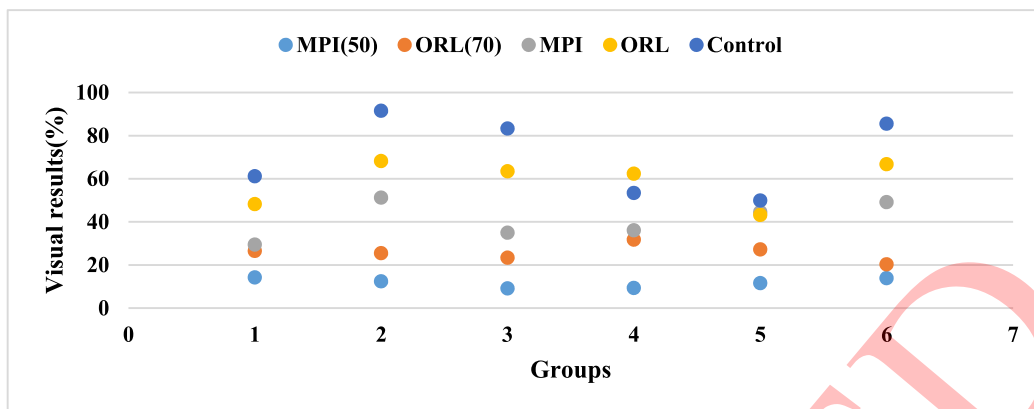


FIGURE 2. Visual image analysis results under VR technology.

TABLE 2. Results of model checking.

Average error				
Error(Pixels)	MPI(50)	ORL(70)	MPI	ORL
3	1	3	1.67	3.50
3	19	33	31.67	37.50
4	38	45	63.33	56.35
5	1	7	1.67	8.75
6	1	3	1.67	3.50
≤3	58	69	96	≤8

traditional opera is based on the theme of loyalty, patriotism and the motherland. The human hand is one of the more flexible and most frequently exercised parts of the human body. In the research of 3D human motion tracking, the tracking of human hand is considered to be the most complicated. Therefore, the research of 3D human arm interactive motion simulation is of representative significance for the motion simulation of the entire human body. Human arm motion simulation is based on the simulation of the motion of the human arm. According to the classification of physiology and anatomy, the human arm can be divided into several simple parts such as shoulder, upper arm, forearm, wrist, palm, and fingers. Each part has a different bone structure. On the other hand, due to different joint shapes and functions, different degrees of movement are reflected. The creative result of VR technology is shown in Figure 1. People understand the world from their senses (such as ears, mouth, nose). These sentences are obtained by several sentences, including vision 83%, touch 4.5%, smell 10% and flavor 1%. In theatrical form, only the requirements for visual and hearing are met. The development of 3D drama has strengthened the visual and auditory experience, but in VR drama, the audiovisual effect is not only more enhanced, but also tactile senses are added. Experience and other sensory functions are also being

further developed. Google is trying to use HapticHelpers to raise the immersion of VR to a higher level. Through a series of daily tools, these VR masters can simulate more than 10,000 unique experiences. The fragrance of the rose, the sonoration of the ocean, and petting the furry dog, all of this can now be achieved in VR. VR drama stimulates the audience’s enthusiasm for active participation by simulating human’s sensory functions such as seeing, hearing, and touching, and interacts, so that people are immersed in the virtual environment, and the relationship between the audience and the image is no longer independent of each other [23].

C. VISUAL IMAGE ANALYSIS

Wuju Opera is a kind of national culture, which emphasizes the promotion of culture through the form of opera. Therefore, trying to use Wuju Opera as the element of film and television works is also a way of conveying culture and times. “Drama” continues the spiritual culture of opera to a certain extent, and contains Wuju opera movies, TV, animation, etc., extracted dance moves, musical elements, and vocal performances. An image is a pattern composed of shapes and colors. The communication process that uses visual image as a carrier to pass persuasive information to the audience indirectly to influence the audience and achieve the purpose of changing the audience’s attitude is called visual persuasion. Compared with other ways of persuasion, visual persuasion is to give full play to the individual advantages of all visual elements as much as possible and form a joint force to influence the audience to achieve the purpose of persuasion. Visual persuasion is one of the most important social functions of visual image, especially in this era of picture reading; its role is becoming more and more obvious. From the perspective of communication science, it is a complete communication process. Like other communication activities, it is composed of three parts: the communicator, the content and the audience. The visual image analysis result under VR technology is shown in Figure 2. In VR technology, 3D rendering is not performed in the same way as 2D. For example, when 2D rendering under Windows, if you want to render 2 triangles, you need to

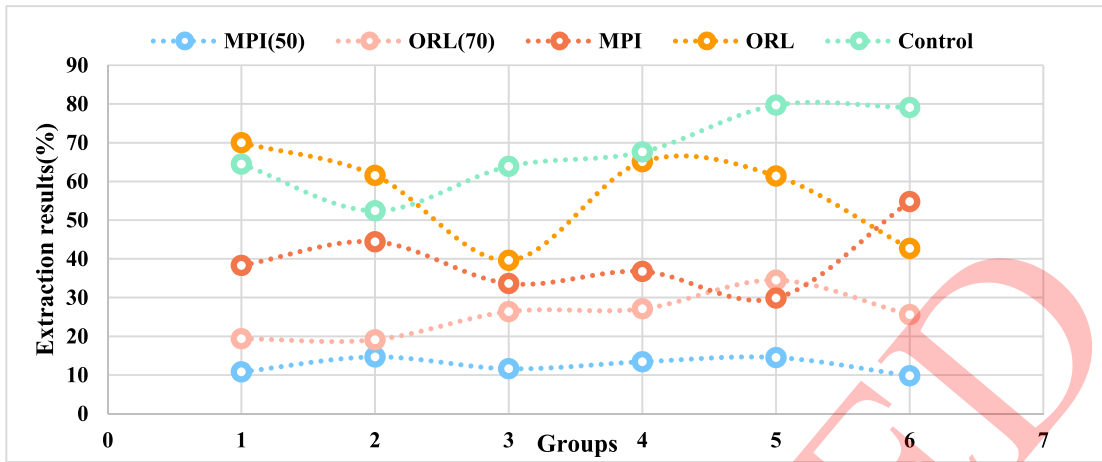


FIGURE 3. Three-dimensional character extraction analysis results under VR technology.

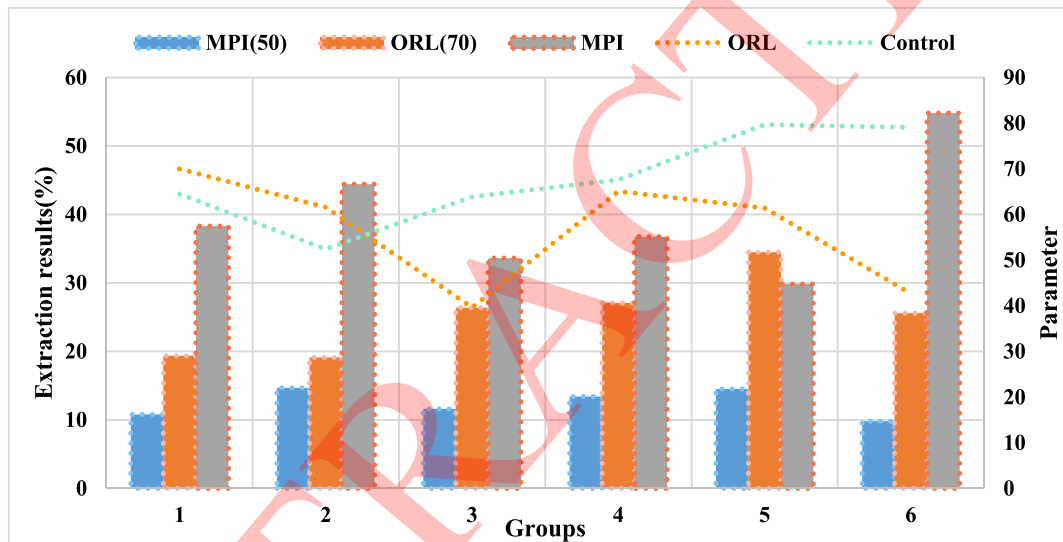


FIGURE 4. Stage modeling results under virtual reality technology.

call the function of drawing triangles twice. In 3D rendering, try to Avoid the extra overhead caused by function calls (such as parameter stacking and stacking operations), with the help of vertex array y, vertex buffer object (VBO) and other technologies, these triangles with the same texture can pass through one drawing operation as much as possible Draw out. Using “drama” to create “drama” can quickly form a film IP image based on Wuju, which in turn reflects the brand value of the market. The film and television elements extracted from Wuju Opera were completely created in the form of “drama” and retained. In the basic form, the brand integrates resources to make it have commercial value. The combination of Wuju Opera and film and television drama is an innovative “drama” form. It is the second creation of Wuju Opera culture. This integration is not a simple “who borrows from whom”, but a comprehensive and in-depth integration. The classic repertoire of Wuju Opera is put on the screen, the char-

acters, story connotation, and costume props in the play are reconstructed through the film and television context, and innovation is made on the basis of tradition, breaking through traditional values, and transforming traditional culture and modern art together to form a new artistic creation [24].

D. THREE-DIMENSIONAL SPACE CHARACTER EXTRACTION ANALYSIS

Can design a series of drama and creative expression packages, mobile themes, board games, etc. In addition, you can also try to incorporate the “intent” in the story into the special tourism, through the combination of drama stories and local tourism, including setting up classic Wuju Opera scenes, standard buildings, special experience halls, stage venues, etc. The formation of the opera cultural tourism industry allows tourists to experience the tourism experience of the hometown of Wuju Opera, forming a famous city of

Wuju Opera. Figure 3 shows the results of three-dimensional character extraction and analysis under VR technology. Analyzing the steps of coordinate space transformation, we can know that in the view space, the Z-axis coordinate of point P must be between the far and near planes of the viewing object. The Z-axis coordinates of the near and far planes of the viewing volume after the projection transformation are respectively 1 and 0, and the subsequent transformations of the projection transformation will not change the Z-axis coordinates. Then, specify the Z-axis coordinates of P_w to be 1 and 0 respectively, and perform two inverse transformations to obtain two points P on the far and near plane of the viewing body. These two points are then inversely transformed to the world coordinate system, and the two each point gets a line segment, called “selection line”. In the world coordinate system, the position relationship between the three-dimensional object in the scene and the selection line is calculated, and the selected object can be found. Therefore, the characters of different professions can be classified in a targeted manner through the character structure of the drama. For example, the character with the headgear as the helmet is basically the role of military commander, the identity of the character in the python robes is basically either the emperor or the role of power, etc., so there is such a “programmed” standard in movie theaters. The result of the test is that the similarity of the characters depicted by VR technology is 93%, and the audience satisfaction of the drama depicted by VR technology is 95%. In some dramas, most other characters in the shadows can be shared by changing their heads and bodies, but the image of each character needs to be different. This is a very convenient and effective resource in shadow art. Use means. Therefore, the standard of “programming” is conducive to sorting out and analyzing the modeling of drama characters and their corresponding professional roles [25].

Compared with the documentary style of traditional drama, virtual reality technology creates another more real world, and has a stronger ability to reproduce reality. In this world, any fantasy and myth can be created, achieving and satisfying more. What a deep desire. In the era of traditional drama, many different drama theory schools have emerged, each with their own set of theories on the creative techniques and expressions of drama. The software uses two approaches when performing solid modeling. One is direct modeling, and the other is to import existing models from the corresponding model library through the scheduling module to model on this basis. Figure 4 shows the results of stage modeling under virtual reality technology. After the model is established, it can be stored in the corresponding model file through the scheduling module. The stage model can be subdivided into a basic stage model and a complete stage model. The basic stage model is used to quickly build a new stage during the modeling process. The complete stage model should correspond to an actual stage, and a certain theater stage can be selected during the scene. For stage design, creators can select corresponding models from each model library for virtual placement through the scheduling module. The

rendering module can render a single 3D model to facilitate user interactive modeling, and it can also render the entire stage set for interactive design. Finally, the virtual display module will allow designers to observe the rendering results from different directions and angles [26].



FIGURE 5. Packaging design.

V. CONCLUSION

The opera element is an art design activity with artistic creativity and artistic expression. Its purpose is to convey information and use artistic conception and artistic creativity to design the overall visual image of human beings. The elements of opera have distinctive artistic characteristics. The extraction of dramatic elements and their use in design can convey fashion information, better show the depth of visual culture, reflect social and human values, and adapt to the trends of contemporary society. The design of dramatic elements is inseparable from visual communication. The art of visual communication develops with the innovation of dramatic elements (Figure 5, Figure 6).

As the birthplace of Chinese Wuju Opera, it is necessary to actively inherit the Wuju Opera culture and carry out “qualitative changes.” It should explore the market; analyze which products can be transformed into cultural creativity, which products have development potential, even to people. Spiritual appeal, as an entry point for the development and utilization of cultural and creative products. In the process of creative development, Wuju Opera culture has been deeply integrated with industrial manufacturing, resulting in a large number of cultural and creative products. The innovation of these resources can not only stimulate the inheritance value of Wuju Opera culture, but also promote the development of “manufacturing” and “drama”. The close integration of culture is a prerequisite for local companies to build brands.



FIGURE 6. Four-color jade tea cup.

The role of VR technology in drama is indeed similar in the traditional period. The effect is the same. Both groups of people who actually read and put into action can understand this. This is a movie about realizing dreams. Unlike traditional cinemas, VR movies are designed for readers. The dream is too sweet and too good to be realized. The combination of art, art and imagery will continue to reflect the ways in which the character, visual effects and aesthetic experience of the film can only be improved under technological conditions. The amazing effects and transformations that VR brings can create a visual experience different from your entertainment experience.

REFERENCES

- [1] S. Gibbs, "Culture paves the way, economics comes to sing the opera: The rhetoric of Chinese folk duets and global joint ventures," *Asian Ethnol.*, vol. 76, no. 1, pp. 43–63, 2017.
- [2] Y. Zhao, R. Hong, and J. Jiang, "Visual summarization of image collections by fast RANSAC," *Neurocomputing*, vol. 172, pp. 48–52, Jan. 2016.
- [3] S.-W. Jang and M. Jung, "Robust detection of mosaic regions in visual image data," *Cluster Comput.*, vol. 19, no. 4, pp. 2285–2293, Dec. 2016.
- [4] A. B. Doeschl-Wilson, C. T. Whittemore, P. W. Knap, and C. P. Schofield, "Using visual image analysis to describe pig growth in terms of size and shape," *Animal Sci.*, vol. 79, no. 3, pp. 415–427, Dec. 2004.
- [5] M. C. Ward, "The 'New Listening': Richard wagner, nineteenth-century opera culture, and cinema theatres," *19th Century Theatre Film*, vol. 43, no. 1, pp. 88–106, May 2016.
- [6] G. Wu, "Chinese opera: The Actor's craft by Wang-NGAI SIU with Peter Lovrick," *Asian Theatre J.*, vol. 33, no. 1, pp. 225–226, 2016.
- [7] A. Madabhushi, "Computerized histologic image based risk predictor (CHIRP): Identifying disease aggressiveness using sub-visual image cues from image data," *Microsc. Microanal.*, vol. 22, no. S3, pp. 1006–1007, Jul. 2016.
- [8] P. Korus and J. Huang, "Multi-scale fusion for improved localization of malicious tampering in digital images," *IEEE Trans. Image Process.*, vol. 25, no. 3, pp. 1312–1326, Mar. 2016.
- [9] K. Naus and M. Waz, "Precision in determining ship position using the method of comparing an omnidirectional map to a visual shoreline image," *J. Navigat.*, vol. 69, no. 2, pp. 391–413, Mar. 2016.
- [10] C. He and H. Hu, "Image captioning with visual-semantic double attention," *ACM Trans. Multimedia Comput., Commun., Appl.*, vol. 15, no. 1, pp. 1–16, Feb. 2019.
- [11] J. H. Kim and N. M. Hyang, "Evaluation of visual image with change in collar design and width," *Indian J. Public Health Res. Develop.*, vol. 9, no. 12, p. 2029, 2018.
- [12] Y. Ma, H. Wu, M. Zhu, P. Ren, N. Zheng, and B. Chen, "Reconstruction of visual image from functional magnetic resonance imaging using spiking neuron model," *IEEE Trans. Cognit. Develop. Syst.*, vol. 10, no. 3, pp. 624–636, Sep. 2018.
- [13] W. Yanqun and L. Yanghua, "Design and practice of cultural creative product of Taining Meilin opera," *Packag. Eng.*, vol. 38, no. 22, pp. 203–206, 2017.
- [14] A. Karim, "Multi-layer masking of character data with a visual image key," *Int. J. Comput. Netw. Inf. Secur.*, vol. 9, no. 10, pp. 41–49, Oct. 2017.
- [15] S. Lee, S. Hyun, S. Han, and H. Lee, "P-39 measurement of mechanical behavior for Au and other FCC metal films using visual image tracing system," *Trans. Amer. Nucl. Soc.*, vol. 7, nos. 2–3, pp. 695–704, 2017.
- [16] C. Zhang, J. Cheng, and Q. Tian, "Multi-view image classification with visual, semantic and view consistency," *IEEE Trans. Image Process.*, vol. 29, pp. 617–627, Aug. 2020.
- [17] O. Gendelman, Y. G. Pollack, and I. Procaccia, "Determining the interparticle force laws in amorphous solids from a visual image," *Phys. Rev. E, Stat. Phys. Plasmas Fluids Relat. Interdiscip. Top.*, vol. 93, no. 6, Jun. 2016, Art. no. 060601.
- [18] A. Loo, C. W. Chung, and A. Lam, "Speech analysis and visual image: Language learning," *Gifted Educ. Int.*, vol. 32, no. 2, pp. 29–116, 2016.
- [19] R. Mehta, N. Rajpal, and V. P. Vishwakarma, "LWT- QR decomposition based robust and efficient image watermarking scheme using lagrangian SVR," *Multimedia Tools Appl.*, vol. 75, no. 7, pp. 4129–4150, Apr. 2016.
- [20] G. H. Otegui, G. Morán, and H. A. Conesa, "Teora Anatomica De La Construccin De La Imagen Visual. Anatomic theory of the visual image construction," *Revista Argentina De Anatomía Clínica*, vol. 5, no. 1, pp. 70–73, 2016.
- [21] Q. Wu, C. Shen, P. Wang, A. Dick, and A. van den Hengel, "Image captioning and visual question answering based on attributes and external knowledge," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 40, no. 6, pp. 1367–1381, Jun. 2018.
- [22] H. G. Kim, H.-T. Lim, and Y. M. Ro, "Deep virtual reality image quality assessment with human perception guider for omnidirectional image," *IEEE Trans. Circuits Syst. Video Technol.*, vol. 30, no. 4, pp. 917–928, Apr. 2020.
- [23] W. Zhong, W. Xu, K. G. Yager, G. S. Doerk, J. Zhao, Y. Tian, S. Ha, C. Xie, Y. Zhong, K. Mueller, and K. K. Van Dam, "MultiSciView: Multivariate scientific X-ray image visual exploration with cross-data space views," *Vis. Informat.*, vol. 2, no. 1, pp. 14–25, Mar. 2018.
- [24] S. Pandey, P. Khanna, and H. Yokota, "Clustering of hierarchical image database to reduce inter-and intra-semantic gaps in visual space for finding specific image semantics," *J. Vis. Commun. Image Represent.*, vol. 38, pp. 704–720, Jul. 2016.
- [25] G. Guo, H. Wang, C. Shen, Y. Yan, and H.-Y.-M. Liao, "Automatic image cropping for visual aesthetic enhancement using deep neural networks and cascaded regression," *IEEE Trans. Multimedia*, vol. 20, no. 8, pp. 2073–2085, Aug. 2018.
- [26] A. Hajiloo, M. Keshmiri, W.-F. Xie, and T.-T. Wang, "Robust online model predictive control for a constrained image-based visual servoing," *IEEE Trans. Ind. Electron.*, vol. 63, no. 4, pp. 2242–2250, Apr. 2016.



YAHONG WANG was born in Henan, China, in 1979. She received the bachelor's degree from the Jingdezhen Ceramic Institute, China. She is currently with the Tourism College of Zhejiang. Her research interests include ceramic design and culture creative products design.



XIAOBING HU was born in Anqing, Anhui, China, in 1975. He received the bachelor's degree from Anqing Normal University, China. He is currently pursuing the degree with the Graduate School, Jingdezhen Ceramic Institute. His research interests include ceramic design and design studies.

...

RETRACTED