

Retraction

Retracted: Design and Research of Interactive Animation of Immersive Space Scene Based on Computer Vision Technology

Mathematical Problems in Engineering

Received 18 July 2023; Accepted 18 July 2023; Published 19 July 2023

Copyright © 2023 Mathematical Problems in Engineering. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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] S. Wu, H. Liu, Q. Xu, and Y. Liu, "Design and Research of Interactive Animation of Immersive Space Scene Based on Computer Vision Technology," *Mathematical Problems in Engineering*, vol. 2021, Article ID 5554879, 10 pages, 2021.

Research Article

Design and Research of Interactive Animation of Immersive Space Scene Based on Computer Vision Technology

Shan Wu, Hubin Liu, Qi Xu, and Yulong Liu 

Graduate School, Sejong University, Seoul 05006, Republic of Korea

Correspondence should be addressed to Yulong Liu; liuyulong@tjarts.edu.cn

Received 3 February 2021; Revised 5 March 2021; Accepted 22 March 2021; Published 9 July 2021

Academic Editor: Sang-Bing Tsai

Copyright © 2021 Shan Wu et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

With the development of computational simulation technology, the need for stable and immersive display effects of space scene animation in the field of life experience and visual art has gradually increased. In this case, the requirements for immersive characteristics of space scene animation have also been strengthened. The existing 3D space scene animation has a limited degree of stereoscopic display model and data visualization. However, the current space scene interactive animation adopts a plane layout as a whole, and the size of the view interface is generally fixed, including the size of virtual elements. However, the immersion in this paper interactive animation of spatial scene can effectively solve the problems of incomplete display of 3D effects and unstable view simulation in 3D effects. This paper takes immersive space scene animation as the research object and studies the 3D and characteristics of space scene animation based on computer parallel computing in different immersive space scenes and different virtual space technologies, as well as the animation effects of different scene transformations and art forms. The result of research shows that, with the continuous increase of the degree of virtuality within a certain range, the immersive effect of spatial scene interactive animation gradually becomes better. When the color of the space scene animation is below 15, the virtual immersive effect changes less. When the space scene is in the range of 15–20, the space scene will make people feel the atmosphere of a beautiful and mysterious illusion.

1. Introduction

Scene interactive animation as a new technology with great application prospects has attracted the attention of many scientific researchers and emerging Internet film and television companies. Scene interactive animation is also simulating the visual effects of the human body. In an immersive space environment, the light and temperature around the body must first be sensed. The body will process the light that the eyes can see and feel the image in the brain. The design of the animation scene has a great influence on the decoration and lyric of the animation. The key to the optimization of the space control of the animation simulation system is the real-time detection of the immersive space environment and the frequency conversion speed control according to the data flow. Real-time detection of data flow is the prerequisite and basis for the overall system optimization of spatial scene control. The use of 3D video data stored on the disk requires

a large experience space and low security and stability. Computer vision technology is used to design an immersive space scene interactive animation model, combined with image processing technology, parallel computing the data flow of the model according to the changing state of the data flow. The LPC fuzzy controller adjusts the output rate of the animation through the control of the frequency converter to enable the development of scene interactive animation enter a new era.

The image collection data are greatly affected by the internal factors of the collector, and it is difficult to adapt the material to the broad population. Lv et al. conducted research on visual animation modeling algorithms and proposed the applicability and theoretical basis of visual animation modeling [1]. Ciccone et al. used the multidimensional data analysis method of space model computer parallel algorithm theory to study the characteristics of immersive space elements [2]. Liu et al. proposed GSI's momentum three-

dimensional space quantization element theory by studying the label operation theory of the basic software technology Internet engineering principles and further processed visual images on the basis of big data to obtain the supernatural characteristics of the elements [3]. Buchanan's application in 3D visual animation mostly focuses on conventional models and researching space scenes, and the research is not accurate to the movements of creatures in immersive space scenes [4]. Gottesman used SGP to study the design and realization of the linkage between physical space and action and proposed a parallel computing immersive space model to accurately and objectively analyze and restore the behavior mode of animation [5].

The main research direction of scene interactive animation is to count the running data from the observation point to the target, the displacement form, and the decent relative reference value based on the virtual picture. Luo et al. analyzed the algorithm of the 3D tuple expected target model based on the GSP technology in the stable operation stage, did not adjust the speed, and proposed the immersive space and the Internet of things vision theory [6]. Colleen and Jones used the spatial distribution data that GSP keeps running at the power frequency, combined with GIS network analysis to determine the optimal configuration of service facilities [7]. Guimaraes et al. proposed that, in the process of actual use of GSP, it is clearly not possible to achieve the immersive effect of the animation system in this operating mode [8]. Lee et al. calculated the number and behavior of models by acquiring images on the spot and proposed a graph matching model under computer parallel computing [9]. Fang and Guo proposed that the digital animation scene is tilted at a certain angle to collect the animation image containing laser stripes in the set area and upload the image data to the ground control center information processing platform through the Ethernet optical cable through the network switch [10].

This paper studies the artistic effects of interactive animation of immersive spatial scenes based on computer vision technology. Immersive spatial scene interactive animation can effectively solve the problems of incomplete display of 3D effects and unstable view simulation in 3D effects. This paper studies the 3D and characteristics of space scene animation based on computer parallel computing in different immersive space scenes and different virtual space technologies, as well as the immersive characteristics of animation effects under different scene transformations and art forms. This paper studies an immersive interaction method based on virtual spatial data, which solves the problem of relying on image interaction in traditional spatial data interaction methods, allowing all users to immerse all attention in the spatial data visualization window and enhance the visualization of spatial data interactive experience.

2. Immersive Space Scene Interactive Animation

2.1. 3D Space Lofting Module. The interaction between vision and light is a typical problem of flexible interactive

animation architecture [11]. The changes of the space scene are divided into different interfaces according to the different animation architectures, and the extremely high distribution and modular characteristics of the deformation field show the animation elements of the space scene and change according to the changes of the space scene. In the process of the interaction of the lofting module, the dividing line of the transmission of the light parameters destroyed the interaction of the space architecture, and the interface of three key factors soon appeared [12]. Using CXF software to calculate the smooth average reynolds equation and the S-shed three-dimensional space calculation method, using the SST model as the prototype, because the STK model has a better ability to capture light passing, the introduction of a new intermittent transition model can be expressed by the following equation:

$$\frac{\partial}{\partial t}(\rho_\gamma) + \frac{\partial}{\partial x_j}(\rho U_{j\gamma}) = P_{\gamma 1} - E_{\gamma 1} - E_{\gamma 2} + \frac{\partial}{\partial x_j} \left[\left(\mu + \frac{\mu_t}{\sigma_\gamma} \right) \frac{\partial \gamma}{\partial x_j} \right]. \quad (1)$$

The reason for the intermittent period characterized by the equal space of elements γ is that the light cannot be stagnant and cannot remain stationary with the state unchanged, while $P\gamma$ and $E\gamma$ pass through the highly balanced space of the format, according to the sequence equation after a certain time [13]. ANSYS software is used to analyze the immersive space architecture of the computer vision architecture and perform 3D analysis, so that the components that can be driven can adapt to the immersive space scene and are limited by capacity. The dispersion control equation is

$$Mu'' + Cu' + Ku = F(t). \quad (2)$$

Among them, M , C , and K are the immersive effect linear table, the parallel calculation table, and the visual stiffness linear table; $F(t)$ is the transient cohesion of the animated pixels acting on the 3D architecture. Hb-Jm multidimensional animation high poly computer MXF (multifield solver) is used to realize image data transmission between ordinary computers and professional image processing computers. In each time state of the state change process, it is applied to the immersive scene and visual effect, respectively, and the interface data are calculated through multiple recursions until the recursive convergence condition is satisfied. In the process of animation adjustment, the computer visualization simulation calculation method must visually model the body structure and deformation parameters of the animation elements and use function analysis tools to adjust the parameters [14]. Among them, the HiHe function is used the most in tuning design. The HiHe type function is based on the original animation ancestor vector line, which can digitally characterize all possible animation model bodies in a given area. It is an intuitive and simple model body digital method. Its general formula is as follows:

$$\begin{aligned}
Y_1(x) &= Y_{10}(x) + \sum_{i=1}^n d_{1i} \times f_i(x), \\
Y_2(x) &= Y_{20}(x) + \sum_{i=1}^n d_{2i} \times f_i(x).
\end{aligned} \tag{3}$$

In the above formula, Y_1, Y_2 are the upper and Y_{10}, Y_{20} are the lower body parameters of the model body; d_{1i}, d_{2i} are the functions of the upper and lower surfaces of the reference model body; n is the design variables of the upper and lower surfaces of the model body; $f(x)$ are the number of design variables and are the control functions corresponding to the design parameters.

The original HiHe function does not have a control function for the trailing edge of the model posture, making the digital space of the trailing edge of the model posture unable to expand, limiting the diversity of model posture adjustments. Therefore, the formula for adding a multitype functional function to the rear edge of the model body is

$$f(x) = \begin{cases} x^{0.2} (1-x)e^{-20x} & (i=1) \\ \sin^P(\pi x^{e(q)}) & (1 < i < n), \\ ax(1-x)e^{-\beta(1-x)} & (i=n) \end{cases} \tag{4}$$

$$e(q) = \frac{\ln(0.5)}{\ln(q)}.$$

In the above formula, P is the image signal range parameter of the control function; q is a one-dimensional array of length $n-2$, which controls the abscissa of the corresponding position of the peak of the $n-1$ round function because the shape of the leading edge of the animation model is in the computer and the spatial scene under vision has a greater impact, so the design variable points are encrypted at the front edge of the animation model [15]. Take $q = [0.25 \ 0.35 \ 0.5 \ 0.75]$; the change of the slope of the coefficient control function, the decay speed of the coefficient function, and other parameters depend on experience. The space scene of the animation optimization mathematical model determines the animation transformation speed and light efficiency of the space scene, and the light that the space scene animation can carry is limited, so the light efficiency is particularly important. For the animation model, the audio-visual ratio is the most important performance indicator, which has a great impact on improving the efficiency of animation [16]. Therefore, taking the audio-visual ratio of the animation model as the objective function, a generalized animation model objective function model is established:

$$\text{objective: } \max\left(\frac{C_E}{C_D}\right). \tag{5}$$

Animation model optimization methods can be divided into single-objective optimization and multiobjective optimization. Single-objective optimization refers to the optimization of a certain element in the optimization process; multiobjective optimization refers to the range of one or

more design intervals. Choose a variety of working conditions in the comprehensive interval of the weight function to optimize the space scene. Single-objective optimization is suitable for a relatively single animation model under target working conditions, and excellent spatial scene conditions can be obtained under target working conditions. The model parameters need to be tested under different GUIs, and they need to be considered to maintain better airflow efficiency at large elevation angles. In this case, multiobjective optimization is more appropriate.

As shown in Table 1, the multiobjective optimization idea of the animation model in the immersive space scene can be expressed as the weight coefficient of the animation model under different working conditions. It is a vector corresponding to different design variables. The animation model optimization process is based on the multiobjective optimization process of the animation model of the improved iterative algorithm. The animation algorithm is used to randomly generate the initial animation; the first generation animation model set is generated within the design interval and output to the animation model; the transformation solver X-fail calculates the performance of the animation model set and then inputs the required data into the main program to calculate the fitness [17]. The performance comparison chart is shown in Figure 1.

The accuracy and reliability of the X-type GUI view have been applied and verified. In the initial stage of optimization, in order to ensure the diversity of the animation, a larger frame volume and cross-mutation probability are required. In the later stage of optimization, the individual differences of the animation model become smaller, and the operator and fitness function must be readjusted to ensure the continuous progress of the animation [18].

2.2. Space Scene Control Equation. The space scene control equation of microanimation model works in an immersive space scene, where the space atmosphere has a greater impact. Therefore, when analyzing the immersion characteristics of the animation model, the influence of the light effect must be considered, so the control equation of the flow field uses the stable incompressible Navier–Stokes equation.

The animation effect equation is

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0. \tag{6}$$

The frame number equations in the X and Y directions are

$$\rho \left(u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} \right) = \mu \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right) - \frac{\partial p}{\partial x}, \tag{7}$$

$$\rho \left(u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} \right) = \mu \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right) - \frac{\partial p}{\partial y}.$$

The light equation is

$$\frac{\partial E}{\partial x} + \frac{\partial E}{\partial y} = Q + W. \tag{8}$$

TABLE 1: Immersion factor of animation effect.

Number	Multiframe	Flash	Virtual	Three-dimensional	Hand painted
1	3	3	3	7	7
2	4	6	4	2	2
3	5	7	6	1	1
4	3	2	3	3	3

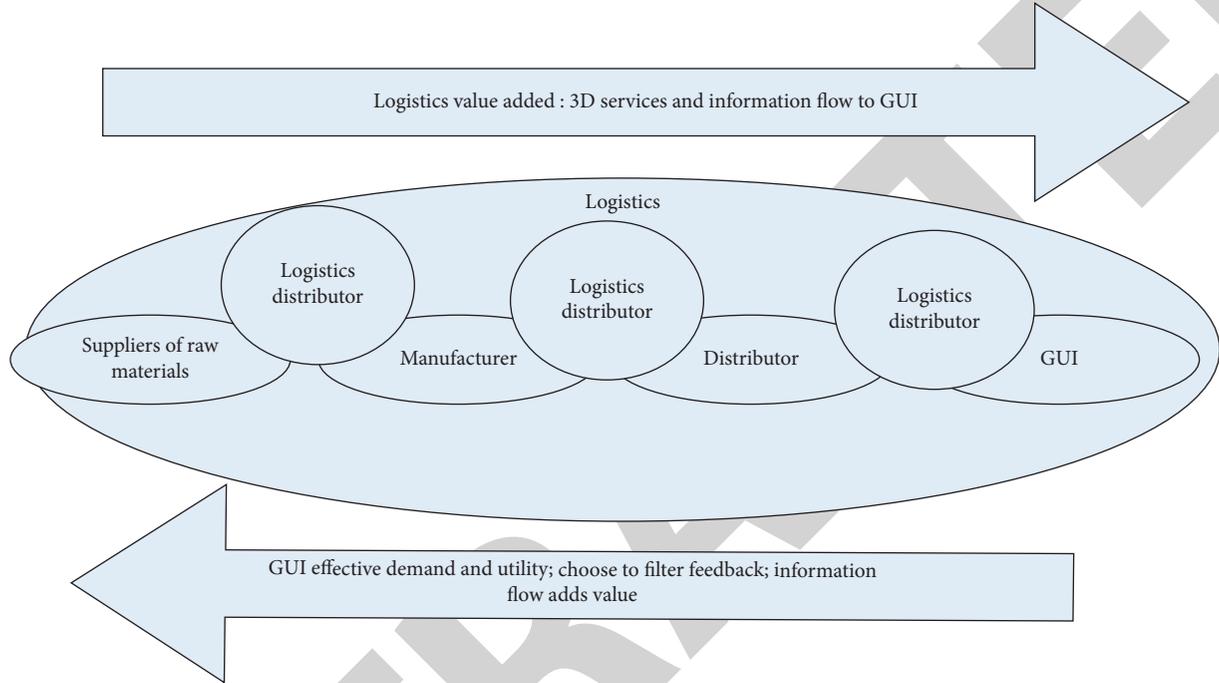


FIGURE 1: 3D animation performance comparison chart.

In the above equation, P is the immersion coefficient, u and v are the components of the 2D animation transformation speeds X and Y , respectively, E is the total light of the system, p is the number of pictures passed into the system, and μ is the parallel calculation coefficient. The spatial scene coefficients suitable for humans are shown in Table 2, and the corresponding visual simulation coefficient diagram is shown in Figure 2.

When the H cluster is selected for the opposition of vision technology, the spatial scene cluster depends on the parallel computing performance of the computer. Consider that the coefficients of computer resource consumption in the first and second groups are 1 and K , respectively, $0 < k < 1$. In this way, rich animation scenes are obtained in the X_1 and X_2 user groups, and the user visual angle of X_2 is

$$\begin{aligned}
 U_1 &= \begin{cases} s - p_1 - x_1 \\ x - p_2 - (1 - x_1), \end{cases} \\
 U_2 &= \begin{cases} s - p_1 - kx_2 \\ x - p_2 - k(1 - x_2). \end{cases}
 \end{aligned} \tag{9}$$

Suppose $x_i (i = 1, 2)$ is the viewing position outside the animation scene, and the second-stage opposing solutions can be obtained from equations (1) and (2) as follows:

TABLE 2: Space scene coefficients suitable for humans.

2D	3D	3D immersive	3D space scene	Space scene change
0.8147	0.3517	0.9058	0.3816	0.8308
0.1576	0.0759	0.9706	0.6797	0.0540
0.6557	0.1622	0.0357	0.2551	0.7943
0.7060	0.4505	0.0318	0.2543	0.0838

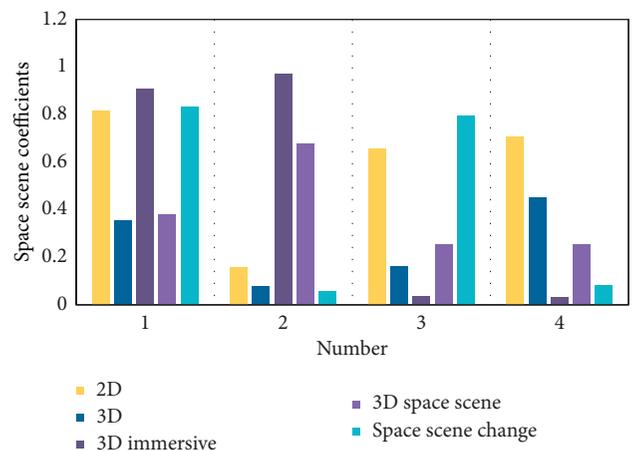


FIGURE 2: Space scene coefficients suitable for humans.

$$\begin{aligned}x_1 &= \frac{p_2 - p_1 + 1}{2}, \\x_1 &= \frac{p_2 - p_1 + k}{2k}.\end{aligned}\quad (10)$$

Therefore, the dynamic functions of 3D space scene A and 3D space scene B are, respectively,

$$\begin{aligned}\pi_B^{LH} &= \frac{(p_1 - c_1)(p_2 - p_1 + 1)}{2} + \frac{(p_1 - c_1)(p_2 - p_1 + k)}{2k} \\&\quad - e(1 - \zeta)t \left[\frac{p_2 - p_1 + 1}{2} + \frac{p_2 - p_1 + k}{2k} \right], \\ \pi_B^{LH} &= \frac{(p_2 - c_2)(1 - p_2 + p_1)}{2} + \frac{(p_2 - c_2)(k - p_2 + p_1)}{2k} \\&\quad - et \left[\frac{1 - p_2 + p_1}{2} + \frac{k - p_2 + p_1}{2k} \right].\end{aligned}\quad (11)$$

So the first-order conditions are

$$\begin{aligned}\frac{\partial \pi_A^{LH}}{\partial p_1} &= \frac{p_2 - p_1 + 1}{2} - \frac{p_1 - c_1}{2} + \frac{p_2 - p_1 + k}{2k} - \frac{p_1 - c_1}{2k} \\&\quad - e(1 - \zeta)t \left[-\frac{1}{2} - \frac{1}{2k} \right] = 0, \\ \frac{\partial \pi_B^{LH}}{\partial p_2} &= \frac{1 - p_2 + p_1}{2} - \frac{p_2 - c_2}{2} + \frac{k - p_2 + p_1}{2k} - \frac{p_2 - c_2}{2k} \\&\quad - et \left[-\frac{1}{2} - \frac{1}{2k} \right] = 0.\end{aligned}\quad (12)$$

Thus, the optimal immersive effects of the balanced 3D space scene in the second stage are

$$\begin{aligned}p_1^* &= \frac{2k}{k+1} + \frac{2c_1 + c_2 + 3et + 2et\zeta}{3}, \\ p_2^* &= \frac{2k}{k+1} + \frac{c_1 + 2c_2 + 3et - et\zeta}{3}, \\ \pi_A^{LH} &= \frac{2k}{k+1} + \left[\frac{1}{2} + \frac{1}{2k} \right] \left[\frac{c_2 - c_1 + et\zeta}{3} \right]^2 + \frac{2(c_2 - c_1 + et\zeta)}{3}, \\ \pi_B^{LH} &= \frac{2k}{k+1} + \left[\frac{1}{2} + \frac{1}{2k} \right] \left[\frac{c_1 - c_2 - et\zeta}{3} \right]^2 + \frac{2(c_1 - c_2 - et\zeta)}{3}.\end{aligned}\quad (13)$$

3D space scene A chooses strategy *H*, and 3D space scene B chooses strategy *L*. The immersive space scene experience obtained by the two types of user experience animations is the same as in case 1. Therefore, the second-stage opposite solution is still

$$\begin{aligned}x_1 &= \frac{p_2 - p_1 + 1}{2}, \\x_2 &= \frac{p_2 - p_1 + k}{2}.\end{aligned}\quad (14)$$

2.3. Space Scene Interactive Animation Model Architecture.

The traditional DMax-Mod model mainly uses computer parallel computing as the basis and uses the associated algorithm view processing system and the analog computing controller and receiver of the DMax-Mod model to generate animation effects [17]. In order to improve the real feeling of space scene animation, the created space scene animation elements adopt compound computing simulation technology to generate immersive space scene animation effects [19]. The scene setting of 3D animation is oriented to scenes such as real space-time, virtual space-time, fantasy space-time, and indoor and outdoor space-time. The visual performance of 3D animation scenes in time and space is affected by factors such as composition form and perspective relationship. For the influencing factors in the scene, designers need to design and operate skillfully to jointly construct a realistic visual experience and make people feel a special sense of beauty. Light is an important part of the visual performance of 3D design, and it is a form of reproducing realistic images through 3D animation data models [20]. Color selection is based on the characteristics of the elements to be represented in 3D animation design. Therefore, the color setting of 3D animation should be able to fully express the main characteristics of the design objects in 3D animation, and at the same time, it must conform to the creativity of 3D animation design. The color design keynote speech of 3D animation is based on the color of the entire animation scene as its support and performance. Therefore, when designing the entire 3D animation scene, color features should be used to express the emotions that the entire animation wants to express and the ideas the author wants to convey [21]. When watching the 3D animation design, the first thing to show the audience is the entire design scene and color characteristics, which makes the images in the animation more prominent and also reflects the design style of the animation.

3. Interactive Animation Experiment Design of Immersive Space Scene

3.1. Research Objects. This experiment takes space scene interactive animation as the research object, adopts a staggered tower layout of upper and lower layers, and further researches on the basis of the existing technology 3D multidimensional animation space scene animation visual effects and immersive concept. The technical scheme adopted in the practical model includes 4 animation attributes, including basic pictures and images, new vision technology, computer parallel computing capabilities, and variable coefficients of immersive space scenes. The immersive effect coefficients of the 3D three-dimensional design model and the practical model are equally distributed in the *x*, *y*, and *z* directions. The three-dimensional display

table is circular, and the interactive scene animation is equally prominent in the three-dimensional direction.

3.2. Interactive Animation Design of Space Scene. Animation development tools combine many of the chaos of traditional animation production to help people who do not have animation development develop new applications. In this regard, this paper uses Scratch (a tool for developing video games) and interactive animation (for developing immersive spatial scenes) to design interactive animation experiments. The advantage of this tool is that it uses a block-based visualization language and it must be assembled to design new 3D visual animation behaviors. This method of animation has become popular and has been used to create many block-based microworlds.

Based on Zie and Internet, the 3D remote animation system is designed, and the low packet loss rate of the node ad hoc network ensures the reliability of remote data transmission and remote real-time control. The feedback feedforward linearization decoupling method is used to realize the decoupling control of the interactive animation network embedded. The integrated use of visual sensor technology, automatic detection technology, and parallel computing technology realizes the remote collection of immersive spatial environment data. The design is based on a commercial cloud platform; the visual animation immersive space environment monitoring system is used for remote monitoring of cloud platform environmental data. The intelligent 3D character attribute model is gradually applied to the animation experience process, which has strong practicality in terms of visual logic feeling. Design a mobile vision robot for the Internet of things to realize interactive animation detection and search through task coordination and control execution of a two-level coupling hierarchical structure. According to the immersive environment, set the best optimization of the environmental variable collection model, monitor the effects of immersive space models of different heights through sensors, and use AMSL technology to achieve autonomous obstacle avoidance. However, in the actual operating design environment, due to the equipment support, the surface of the smallest nanohardware is uneven at the nanolevel, and the unplayed animation interface is easily damaged during the robot's travel, which affects the integrity of the detection data acquisition. The NU-Spider animation system is developed for the acquisition of large-scale interactive animation phenotypes. The movement of the carrying platform is controlled by high-speed immersive space handles. The acquisition of large 3D-APP phenotype data is achieved through equipment such as multispectral cameras and spectrometers. It has not been applied in the relatively closed environment of immersive space. The double-column structure provides longitudinal movement, forming a four-degree-of-freedom movement platform. The bottom is equipped with a high-definition camera, and the fuselage is equipped with a high-efficiency visual sensor model for monitoring the environment, and video, image data, and control commands are aggregated through a wired and

wireless network bridge. Due to the small size of the basic control algorithm data, GPRS/3G/4G/Zig technology is used for transmission. And it is uniformly connected with the big data center server and loops on the basis of combining 3D elements to accurately collect unmanned driving information, so as to realize the unmanned inspection of the test block, and finally the results are uploaded to the mobile phone 3D-APP.

4. Immersive Space Scene Animation Effect

4.1. Effect of Spatial Scene Transformation. As shown in Figure 3, a realistic 3D visual effect can be created efficiently by changing various virtual scene models. Give life and energy to the entire animated film. The interactive animation of the entire space scene is built on the virtual space, which is a technology based on computer parallel computing and computer vision processing.

As shown in Figure 4, different visual forms and creativity can be revealed through different transformations of complex and rich scene spaces. For example, in a wide scene space, the audience will feel a sense of comfort and tranquility, while a closed space will make the audience feel depressed and nervous. By transforming various scene spaces, people cannot help but feel a sense of shock.

As shown in Figure 5, people's perceptions of light and dark tones are very different, and they have no ability to clearly recognize places where the sound is not high, and it is easy to restore the designer's actual prototype to enhance the mystery in the fantasy atmosphere. The combined element technology provides a 3D realistic model and has been simulated in many modern animation production processes, which has a more convincing performance. Film and television animation has developed rapidly in recent years and soon entered our lives, bringing the joy of our culture. In order to bring better visual enjoyment to the audience, we must continuously improve the modeling scene to make room for better film and television works. In the production of cartoons, it can be considered that the space has a stage, and a simple space producer can complete the design process. Most of the local people's space disposal methods are arranged around the horizon in a straight line combination. Using the combination of multiple layers of space and creating a stage, the camera can shoot vertically downwards or pan from top to top to bottom. In the form of questions, you can leave room for the depth of the upper four palm spaces and call these materials in the same order as the stage, and the composition arrangement can be reduced to the extent that only the most important parts are retained.

4.2. Interactive Animation of Spatial Scenes under Computer Vision Technology. As shown in Figure 6, C2–C5 represent different types of immersive spatial interactive animation. The current movies and TV animations are not only diverse in types but also rich in forms. There are two main methods: two-dimensional animation, where the content of the story is displayed in a flat form, presenting decorative features, and appearing early; three-dimensional animation, also

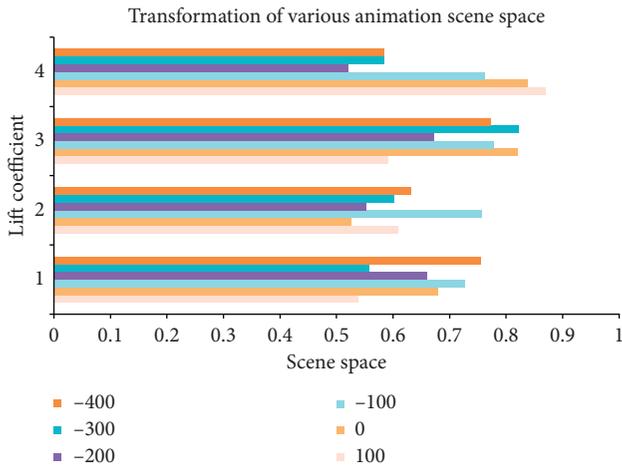


FIGURE 3: Transformation of various animation scene spaces.

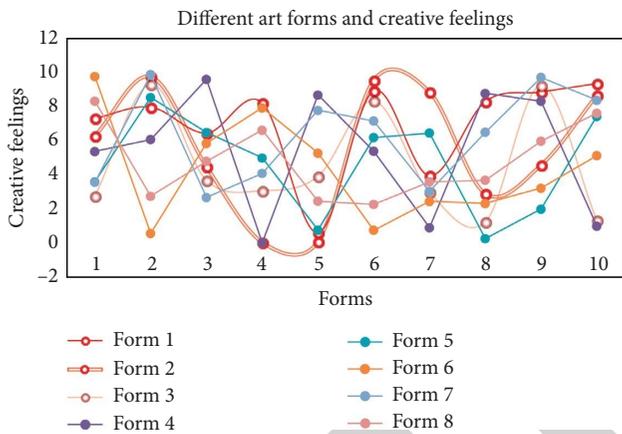


FIGURE 4: Different art forms and creative feelings.

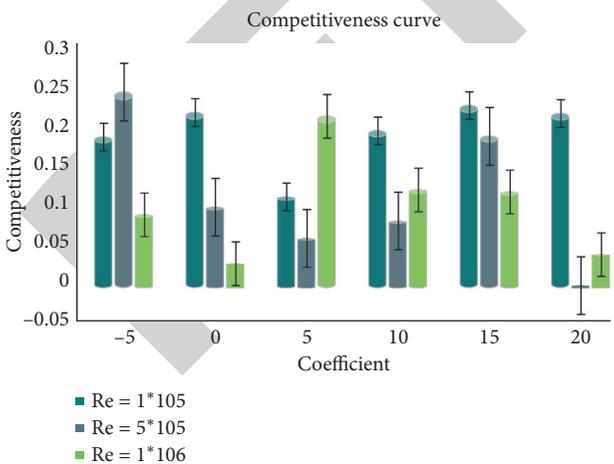


FIGURE 5: Competitiveness curve.

known as digital animation, which presents powerful three-dimensional functions and provides the audience with a true original viewing experience. It mainly depends on computers and various types of software to complete it. It is by far the most popular among audiences. The visual

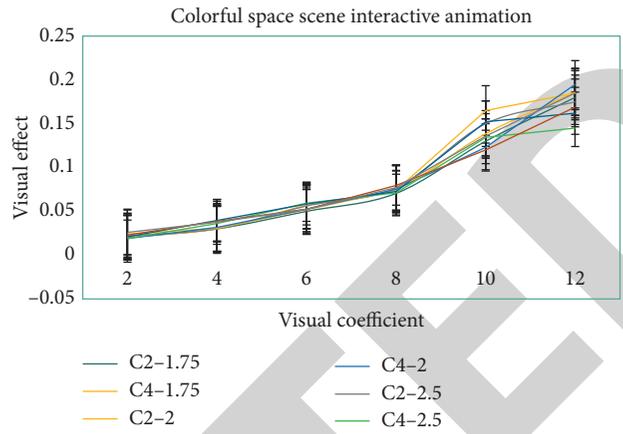


FIGURE 6: Colorful space scene interactive animation.

perception data of different interaction types are shown in Table 3.

The similarity between two-dimensional animation and three-dimensional animation is the animated form of motion, not static. As the time and space of the story change, the scene space also changes. The animation space is constantly changing, and the type of scene can be divided into two parts: virtual and reality. In order to deeply analyze the immersive scene in the virtual scene system, we must first explore its basic elements, that is, how to correctly organize the scene space. Therefore, the scene space can be divided into two types: the real space refers to the real space, and the virtual space can be easily realized in animation production. In fact, it does not exist in the actual range. This is a simulated space and cannot be touched. This type of space focuses on the inner feeling of the display space.

As shown in Figure 7, a vivid virtual scene can be effectively created by changing various virtual scene spaces, and makes the entire virtual film and television full of vitality, avoiding being too boring. The entire virtual film and television are based on the virtual model, which is a kind of virtual art. It is mainly manifested in scenes that are not in real life, such as unrealistic or surreal imagination. To a certain extent, it brought a visual impact to the audience. By linking the illusory feeling with the plot, we can create mysterious and powerful scenes that stimulate the curiosity of the audience and make them interested in the entire virtual film and television.

As shown in Table 4, through different transformations of complex and rich scene spaces, different art forms and creative feelings can be revealed. For example, in a wide scene space, the audience will feel a sense of comfort and tranquility, while a closed space will make the audience feel depressed and unable to breathe. As shown in Figure 8, the transformation of various scene spaces can make people feel scared.

As shown in Figure 9, the immersive animation effect of computer vision can more accurately convey the emotional appeal of the work itself, and the multimedia information presentation method brought by computer vision innovation can be used as a form of multimedia visual display. It can provide users with a more realistic experience to a

TABLE 3: Rich experience of immersive spatial interactive animation.

	C2-1.75	C2-2	C2-2.5	C4-1.75	C4-2	C4-2.5	C5-1.75	C5-2	C5-2.5
2	0.02	0.021	0.022	0.0241	0.019	0.019	0.021	0.023	0.026
4	0.03	0.0301	0.0302	0.0305	0.0315	0.0362	0.0396	0.03875	0.03784
6	0.05	0.0569	0.0561	0.0521	0.0526	0.0596	0.0586	0.0523	0.05236
8	0.0705	0.0759	0.0769	0.0743	0.0754	0.0713	0.07265	0.0796	0.07698
10	0.13	0.1385	0.15	0.165	0.123	0.1345	0.152	0.12	0.136
12	0.18	0.186	0.175	0.185	0.195	0.145	0.162	0.169	0.185

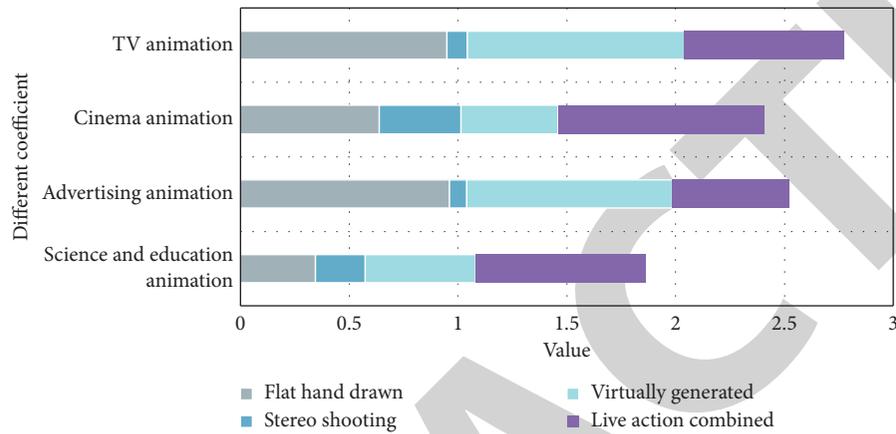


FIGURE 7: The effect of immersive scene space on people's vision.

TABLE 4: Different art forms and creative feelings.

Animation	Stereo shooting	Virtually generated	Live action combined	Experimental
F1	1	6	3	3
F2	3	7	3	6
F3	3	2	6	7

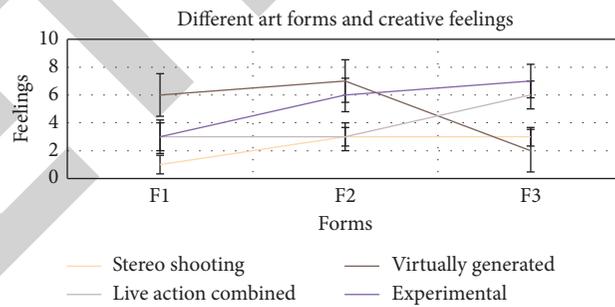


FIGURE 8: Different art forms and creative feelings.

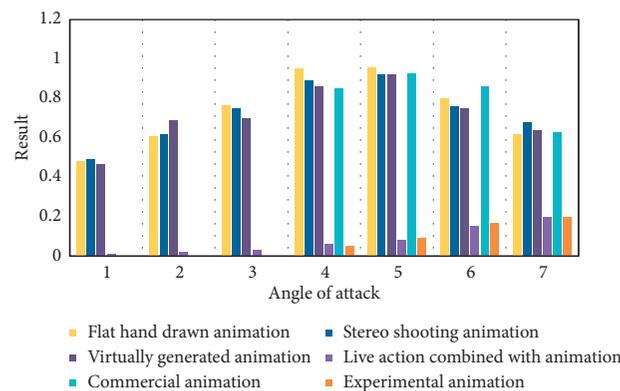


FIGURE 9: The effect of interactive animation with the help of Internet technology.

TABLE 5: Mobile Internet technology changes the way to watch animation.

Flat hand-drawn animation	Stereo shooting animation	Virtually generated animation	Live action combined with animation	Commercial animation	Experimental animation
0.48	0.49	0.465	0.01	Null	Null
0.61	0.62	0.69	0.021	Null	Null
0.765	0.75	0.7	0.031	Null	Null
0.95	0.89	0.86	0.061	0.85	0.05
0.96	0.92	0.92	0.08	0.93	0.09
0.8	0.76	0.75	0.15	0.86	0.17
0.62	0.68	0.64	0.2	0.63	0.2

greater extent. Secondly, user immersive experience communication methods can enrich users' visual experience. As shown in Table 5, mobile computer vision has changed the way people watch animation from the classic flat multimedia way. Then, there are immersive animations, which means that technological innovation brings us into the virtual world, and the additional images generated by this technology bring rich emotional experience to users.

5. Conclusions

The current immersive animation uses a lot of new model algorithms, and this model algorithm can enable users to get more emotional experience when experiencing animation. Successful immersive animation is to bring users into the virtual scene; it can drive the user's mental feelings to participate in this animation. Such animation will not only make the user feel very excited but also more effectively convey the ideas of the animation designer. In addition to the above advantages, immersive animation also has some shortcomings; that is, its data model is relatively large, and specific hardware equipment is required for demonstration. However, these problems cannot hinder the development of immersive animation. It has all the visual characteristics. The way of expression is worth experiencing, and immersive visual animation will also bring people a more multilevel interactive experience.

Immersive animation is a digital product that we often see in our daily lives. Immersive scene design is an important part of immersive animation, providing special time and space to play roles. Relying on the scene suitable for the environment, it showed a more substantial and intense performance. For China, many works are expensive to produce. In terms of special effects and atmosphere, they lag far behind the current special effects in Europe and the United States, and they have a long way to go as in Western countries many years ago.

Space scene animation is an animation mode that has emerged in recent years. Due to its advantages of simple operation and immersion, it is widely used in the civil field. Interactive animation of spatial scene has the characteristics of large demand, variable animation size, and variable number of models. At present, the optimization and debugging of space scene animation are in the climax of the world, and the related immersion effect research is one of the frontiers of space scene animation research. MAV is small in size and high in speed of running animation. Its entire

simulation calculation loop is usually between tens of thousands to hundreds of thousands. If the immersion interference coefficient is further reduced, the immersion effect experience index will be even higher, which is not available in the previous conventional models.

Data Availability

The data underlying the results presented in the study are available within the article.

Conflicts of Interest

There are no potential conflicts of interest in this paper.

Authors' Contributions

All authors have read and approved the manuscript.

References

- [1] Z. Lv, X. Li, and W. Li, "Virtual reality geographical interactive scene semantics research for immersive geography learning," *Neurocomputing*, vol. 254, no. 6, pp. 71–78, 2017.
- [2] L. Ciccone, C. Oztireli, and R. W. Sumner, "Tangent-space optimization for interactive animation control," *ACM Transactions on Graphics*, vol. 38, no. 4, pp. 1011–1012, 2019.
- [3] Z. Liu, L. Zhou, H. Leung, and H. P. H. Shum, "High-quality compatible triangulations and their application in interactive animation," *Computers & Graphics*, vol. 76, no. 12, pp. 60–72, 2018.
- [4] A. Buchanan, "Real-time? Reframing temporal consciousness in time-based and interactive media," *Technoetic Arts*, vol. 16, no. 1, pp. 53–62, 2018.
- [5] Z. S. Gottesman, "The rotoscopic uncanny: aku no hana and the aesthetic of Japanese postmodernity," *Animation*, vol. 13, no. 3, pp. 192–206, 2018.
- [6] Y. Luo, B. Gao, Y. Deng et al., "Automated brain extraction and immersive exploration of its layers in virtual reality for the rhesus macaque MRI data sets," *Computer Animation and Virtual Worlds*, vol. 30, no. 1, pp. 14–16, 2019.
- [7] S.-H. Colleen and C. Jones, "A professional development model to facilitate teacher adoption of interactive, immersive digital games for classroom learning," *British Journal of Educational Technology*, vol. 50, no. 1, pp. 264–279, 2019.
- [8] M. D. P. Guimaraes, D. R. Colombo Dias, J. H. Mota et al., "Immersive and interactive virtual reality applications based on 3D web browsers," *Multimedia Tools & Applications*, vol. 77, no. 1, pp. 347–361, 2018.

- [9] K. Lee, S. Lee, and J. Lee, "Interactive character animation by learning multi-objective control," *ACM Transactions on Graphics*, vol. 37, no. 6, pp. 1–10, 2018.
- [10] N. Fang and Y. Guo, "Interactive computer simulation and animation for improving student learning of particle kinetics," *Journal of Computer Assisted Learning*, vol. 32, no. 5, pp. 443–455, 2016.
- [11] R. Fazlay, P. Taiwoo, F. Biyi et al., "When virtual reality meets Internet of things in the gym: enabling immersive interactive machine exercises," *Proceedings of the Acm on Interactive Mobile Wearable & Ubiquitous Technologies*, vol. 2, no. 2, pp. 1–21, 2018.
- [12] Z. Chen, H. Li, Y. Bao, N. Li, and Y. Jin, "Identification of spatio-temporal distribution of vehicle loads on long-span bridges using computer vision technology," *Structural Control and Health Monitoring*, vol. 23, no. 3, pp. 517–534, 2016.
- [13] P. Kiedrowski, "Driver's head tracking with pose estimation using computer vision technology under 2D environment," *Advances in Computational Encees and Technology*, vol. 11, no. 11, pp. 887–895, 2018.
- [14] S. Barnard, S. Calderara, S. Pistocchi et al., "Quick, accurate, smart: 3D computer vision technology helps assessing confined animals' behaviour," *Plos One*, vol. 11, no. 7, pp. 15–19, 2016.
- [15] A. Petrov and A. Popov, "Overview of the application of computer vision technology in fish farming," *E3S Web of Conferences*, vol. 175, no. 1, pp. 17–19, 2020.
- [16] J. Park, Y. Hwang, J. H. Yoon et al., "Recent development of computer vision technology to improve capsule endoscopy," *Clinical Endoscopy*, vol. 52, no. 4, pp. 26–29, 2019.
- [17] H. Tian, T. Wang, Y. Liu et al., "Computer vision technology in agricultural automation-a review," *Information Processing in Agriculture*, vol. 7, no. 1, pp. 13–15, 2019.
- [18] Z. Wang, H. Li, and X. Zhang, "Construction waste recycling robot for nails and screws: computer vision technology and neural network approach," *Automation in Construction*, vol. 97, no. 7, pp. 220–228, 2019.
- [19] M. Manasi and S. Chaudhary, "Computer vision technology using gesture recognition," *International Journal of Computer Applications*, vol. 179, no. 19, pp. 1–4, 2018.
- [20] S. Chen, F. Liu, X. S. Tang et al., "Research on on-line watermeter verification system based on computer vision technology," *Jiliang Xuebao/Acta Metrologica Sinica*, vol. 38, no. 4, pp. 473–476, 2017.
- [21] F. Lijun and C. Yueqin, "Detecting chlorophyll content of soybean leaves based on ComputerVision technology," *International Journal of Software Engineering and Its Applications*, vol. 11, no. 5, pp. 87–94, 2017.