Research on 3D Animation Production System of Industrial Internet of Things under Computer Artificial Intelligence Technology

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***Abstract*—Animation production technology has a long history of development. With the continuous reform and innovation of science and technology, traditional animation production technology has opened a new development door. Among them, 3D animation production is an important core of film and television animation, digital media and other majors. The course can also enhance the visual effects of animation production. This paper proposes research on the 3D animation production technology of the Industrial Internet of Things based on computer artificial intelligence technology. In this paper, a multimedia database is introduced to establish a 3D model, combined with the 3D animation theory and the determination of the 3D animation production process, to realize the 3D animation production of the Industrial Internet of Things.**

Keywords—multimedia database, three-dimensional animation, production technology, virtual reality technology, computer, artificial intelligence

I. Introduction

3D animation, also known as 3D animation, refers to an emerging way of using computer technology to complete animation production in three-dimensional space. The so-called three-dimensional animation is mainly relative to the two-dimensional animation. With the development of modern computer technology, the introduction of the three-dimensional concept makes the animation more three-dimensional and realistic, and more in line with the real world that people know [1]. Based on machine vision technology, this paper combines motion capture and expression capture to build a set of auxiliary systems for 3D animation production. On the Unity platform, the actor's motion and expression data are output to the 3D animation model in real time, which greatly improves the performance of 3D animation production. speed and quality.

II. Demand analysis of 3D animation production system

A. Demand Analysis of 3D Animation System

Generally speaking, there are clear system requirements in the process of 3D animation production. The first is the system business requirements. When making animations and programs, TV stations at all levels must ensure that the 3D animation system can be integrated into the current TV program production system, especially the processing of some details and special effects. Create save or transfer can be very effective. Then there are functional requirements [2]. In the construction of various space models, including lighting settings, material editing and function assignment, etc. the application of animation production software can carry out clear animation settings and character animation design in different scenes, and realize various film and television special effects processing. It can store, synthesize and transmit 3D animation materials and animation programs correctly while ensuring the authenticity of 3D animation scene construction video performance.

B. Analysis of animation production

In order to further analyze the relationship between the node structure of the animation production software and animation production, this paper takes the animation effect of the shell falling to the ground and exploding as an example. If you want to create the effect of the shell falling to the ground and exploding, the simplest animation production logic needs to be obtained first. A cannonball, then find an open space and launch the cannonball, the cannonball falls to the ground and explodes, which is divided into the above 4 steps. The application of animation production software can make the shell fall to the ground and explode as a natural production logic, and then use the software modeling tool to build a shell from the three aspects of the point, line and surface through the basic assembly, and to determine the appearance and material of the shell [3]. Attributes were constructed, then the scene was illuminated with build lights, and multiple cameras were used to capture the effect of the shells falling on the ground and exploding. Special scenes require shape modeling, such as open spaces, dead trees, wild grass, and even some relatively dilapidated houses to create a sense of shock. Use multiple means such as key frames or some dynamics to simulate the process of projectile flight. After the projectile explodes on the ground, it will crack itself, fly out shrapnel, and produce seemingly simple animations such as firelight and smoke. In fact, the animation production process behind it is very complicated. Therefore, the 3D animation software must be very flexible and advanced. The structure system can meet the special production requirements of different animations.

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III. 3D ANIMATION PRODUCTION AUXILIARY SYSTEM ARCHITECTURE DESIGN

A. System Architecture

Figure 1 shows the process of traditional 3D animation production. On the basis of animation creation, 3D models of animated characters are produced, and each storyboard is prepared according to the storyline. In the choreography of the storyboard, it is necessary to model the environment and scene, and at the same time design and animate the actions and expressions of each character [4]. Finally, the character animations and scenes of each storyboard are rendered and combined with dubbing to complete the production of animation clips. The 3D animation production assistant system proposed in this study is aimed at the model animation production of character movements and expressions in each storyboard. It uses the motion capture and expression capture technology of visual recognition to realize the rapid production of actor performance-driven model animation, thereby improving the research efficiency of the entire 3D animation production (Figure 1 is quoted in 3D Film Animation Image Acquisition and Feature Processing Based on the Latest Virtual Reconstruction Technology).

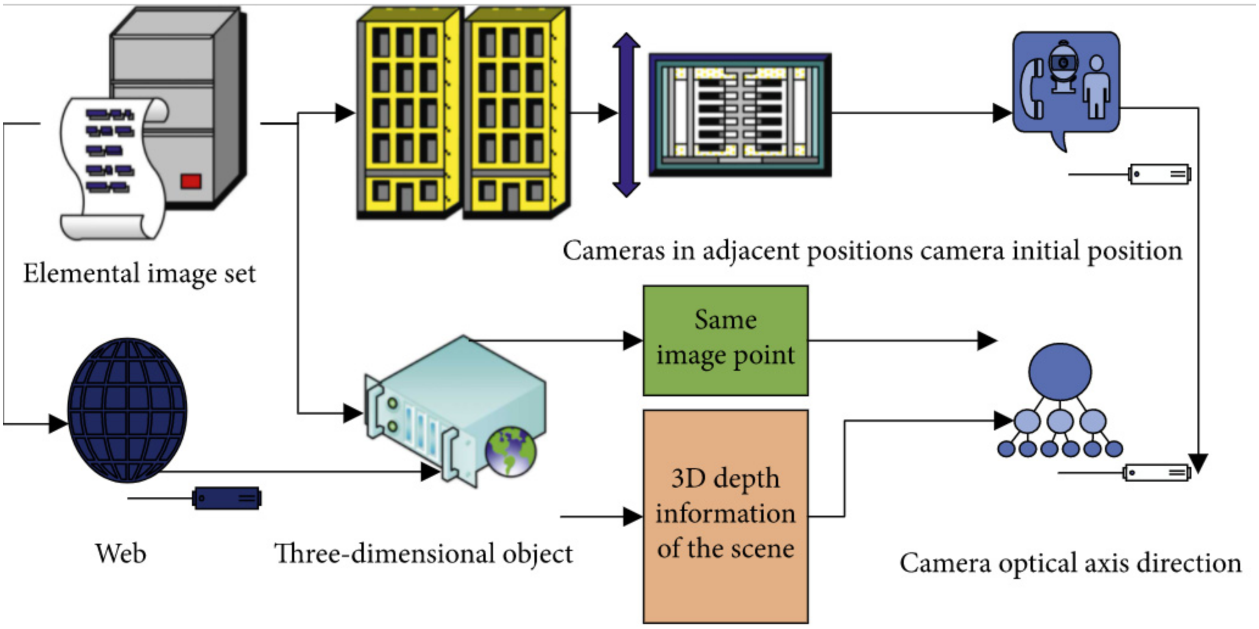

Fig. 1. Production process of 3D animation of auxiliary system based on visual recognition

The core of visual recognition-assisted animation production is motion capture and expression capture and real-time rendering. The motion capture includes two parts: optical-based full-body motion capture and inertial hand motion capture (Figure 2 refers to 3D Film Animation Image Acquisition and Feature Processing Based on the Latest Virtual Reconstruction Technology). In practical applications, the calibration of the camera in the performance environment is the key to ensure the capture accuracy. Theoretically, at least 3 cameras are needed to calculate the three-dimensional space coordinates of a marker point. By calculating the camera's internal coefficient matrix, rotation offset matrix, and focal length, the transformation matrix between the camera's projection plane and the world coordinate system can be finally obtained.

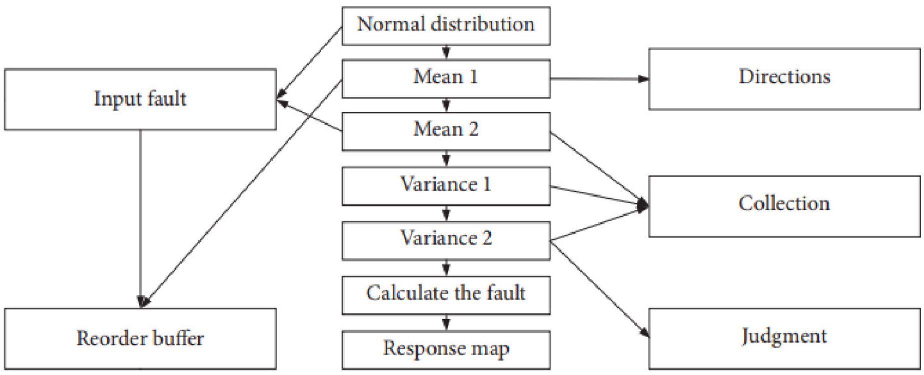

Fig. 2. Motion capture architecture in animation production assistance system

Figure 3 shows the architecture of expression capture in the animation production assistant system (the picture is quoted from Informal Learning Spaces in Higher Education: Student Preferences and Activities), which includes image segmentation, face registration, shape fusion deformer production, feature point tracking and real-time Rendering and other aspects. First, image segmentation of the video is required to obtain a series of typical facial images of the performer, and then the images are further matted to reduce the interference of hairs [5]. We use the Lazy Snapping

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segmentation algorithm, and the main algorithm flow is as follows:

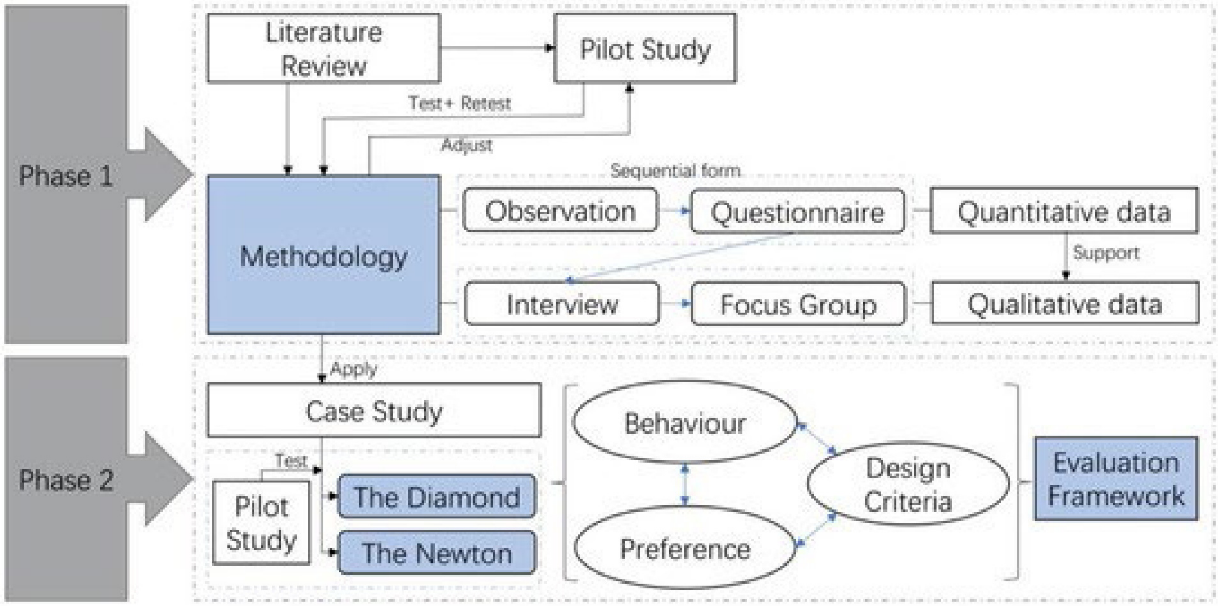

Fig. 3. Expression capture architecture in animation production assistant system

1) The image is preprocessed using the watershed algorithm to convert the segmentation to be based on super pixels (collections of pixels). 2) Minimize the energy function $E(X) = \Sigma_{i\in V} E_1(X_i) + \lambda\Sigma_{(i,j\in\varepsilon)} E_2(X_i, Y_i)$, where $E_1(X_i)$ is the cost of assigning label X_i to vertex i in the image, and $E_2(X_i, Y_i)$ is the cost of assigning label X_i, X_j to adjacent nodes i and j in the image. 3) The user autonomously roughly labels to distinguish the foreground and background, compares all super pixels with the labeled pixel set and calculates the cost function. 4) Optimize the segmentation boundary. In the second link of face registration, the AAM model is used to achieve face registration. A neutral expression (no expression) plus 46 other expressions is required in face registration. Figure 4 shows the motion capture system module [6].

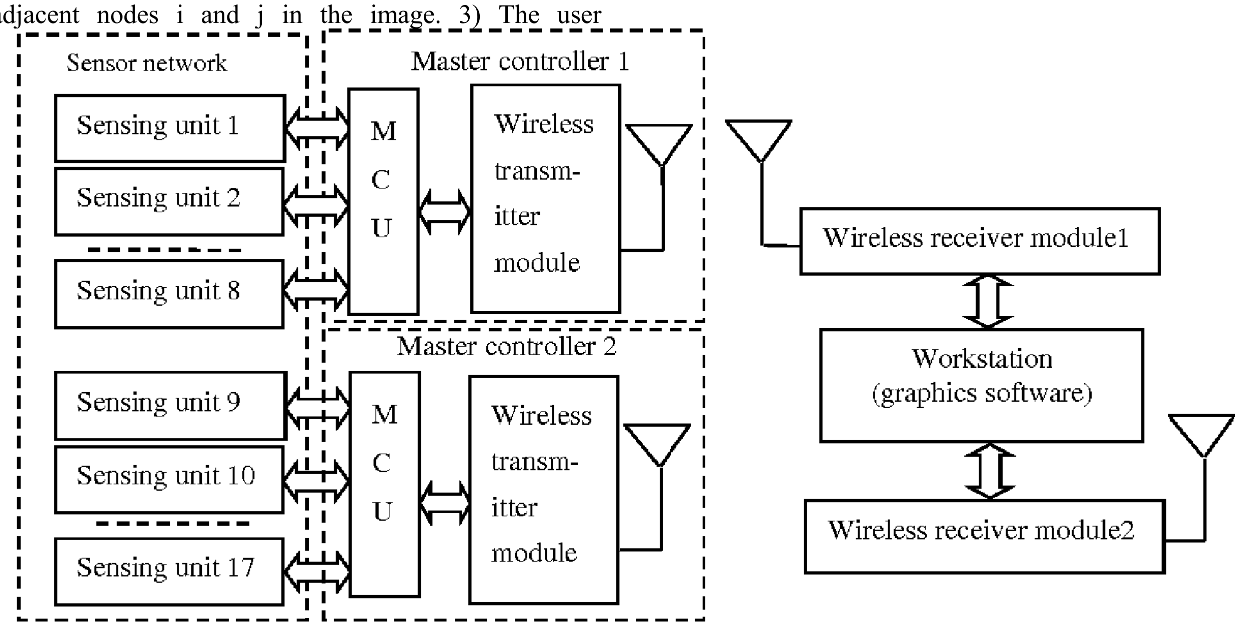

Fig. 4. Motion Capture Module

B. Establishment of 3D scene database

When building a virtual environment, in order to keep the logical relationship between interactivity and real-time 3D performance stable, and to ensure that various elements in the environment can respond quickly to control behaviors, designers should use a real-time 3D visual database to build models. The way modeling and optimization tool platforms are combined. The initial modeling process can be completed with common modeling tools, and then use the 3D visual database to describe complex scenes [7]. At this stage, technologies such as roaming path establishment, LOD settings, and 3D model data hierarchical storage can be used.

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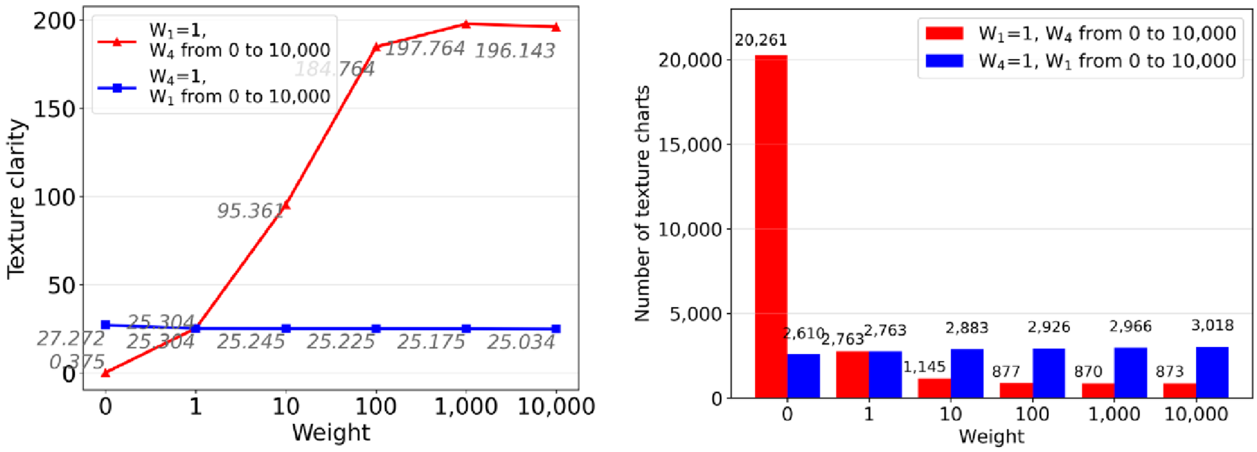
IV. Experimental Detection

According to the experimental results of 3D animation definition obtained by different 3D animation production technologies (as shown in Figure 5, the picture is quoted from A Novel OpenVMS-Based Texture Reconstruction Method Based on the Fully Automatic Plane Segmentation for 3D Mesh Models), the two technologies the definition of 3D animation is very different. The 3D animation production technology based on multimedia database designed in this paper has a higher definition for 3D animation production, about 1008 pixels, while the definition of 3D animation produced by traditional 3D animation production technology is high. It is 552 pixels, which shows that the three-dimensional animation production method in this paper has higher definition and can better meet the actual needs.



(a) Texture clarity (b) Number of texture charts

Fig. 5. Experiment results of 3D animation sharpness

V. Conclusion

This paper proposes a pre-stereoscopic effect adjustment method for parallax visualization. This method solves the problems of high cost, strong subjectivity, low equipment adaptability, and repeatability of results in the pre-production link of the current stereoscopic animation production process. The relationship between parallax and stereo perception depth, viewing comfort zone and stereo shooting parameters is analyzed, and a set of methods from accurate analysis to generate stereo image effects to accurate adjustment of stereo shooting parameters according to the analysis results are given; and the Maya plug-in is used. The method is implemented in the form of, the operation is simple, and the effect is significantly improved compared with manual adjustment, and this method can be directly applied to the early stage of stereoscopic effect adjustment in stereoscopic animation production.

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