RESEARCH ON THE FUNCTIONAL GAME INDUSTRY EXPANDABLE BASED ON VR REALISTIC TECHNOLOGY

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Reception: 02/03/2023 **Acceptance**: 25/04/2023 **Publication**: 21/05/2023

Suggested citation:

Liu, S. (2023). **Research on the functional game industry expandable based on VR realistic technology**. *3C TIC. Cuadernos de desarrollo aplicados a las TIC, 12(2)*, 244-259. https://doi.org/10.17993/3ctic.2023.122.244-259

ABSTRACT

In order to make the game industry chain be developed structurally, this paper designs a functional game industry expansion path based on VR realistic technology to enhance the interactivity of functional game industry expansion. The interactive 3D model is used to integrate the professional game engine and design the functional game expansion process. The motive of game expansion is guided by the ARCS model to support the construction of functional games. According to the VR realistic game experience, analyze the expandable paths from the modules of technological innovation and industrial integration in order to enhance the realistic experience of integrated industries in functional games. The simulation analysis of the expansion path of the functional game industry based on VR realistic technology shows that VR realistic technology improves the signal-to-noise ratio of functional games by 50% on average, height and cross-roll angle changes by 6.65f/ms and 6.79f/ms respectively, and the number of textures is up to 16.68MB. Therefore, VR realistic technology is beneficial to promote the transformation of the functional game industry it can ensure that the functional game industry steps into a sustainable and expandable track of transformation and upgrading.

KEYWORDS

VR real-world technology; interactive 3D model; ARCS model; game industry; signal-to-noise ratio.

https://doi.org/10.17993/3ctic.2023.122.244-259

INDEX

https://doi.org/10.17993/3ctic.2023.122.244-259

1. INTRODUCTION

As a branch of the video game industry, the functional game industry can integrate the knowledge and skills of different industries into games, so that they have the dual attributes of entertainment function and learning function [1]. Functional games mainly adopt the form of fun and educational games, allowing users to receive information and gain a personalized new learning experience in the process of playing, thus stimulating the creativity and innovation of learners [2-3]. The functional game industry is actually a cross-border concept, that integrates the knowledge and skills of different industries into the game, which can make the participants acquire knowledge and master skills while relaxing and entertaining, and improve their abilities in a subtle way.

With the rapid development of information technology, the chain of functional games has been systematically supported. For example, the literature [4] stimulates the cognitive processes of mathematical learning through functional game challenges in order to increase students' effectiveness in mathematical learning. In an experimental setting, the surprise condition was set as an emergent condition and the non-game characters that characterized the problem were changed. The experiment combined the intensity of expectation with the surprise condition and demonstrated that surprise conditions can play a key role in mathematics learning by comparing the overall difference between the surprise and control conditions in the student population. The literature [5] applies cognitive load to the contextual setting of functional games and proposes a concept of workload predictors. Functional games were used to reflect the predictors of game participants, to observe the proportional relationship between attention attraction time and the total time consumed by the task at hand, to simulate real-time-critical situations with gamified scenarios, and to assess individual performance. The literature [6] uses functional games to provide talent development for school communities, using a systematic review approach in experiments to increase gamers' social learning opportunities. In functional games, gamers explore different climatic risks in an interactive manner, build the ability to cope with complex challenges and socialize the adaptive matters of the game. The literature [7] reviews the current state of learning analytics, and data standards in functional games, examines how functional games distill technical indicators from player interactions, and analyzes the data collection standards currently used in the field. Based on this review, an interaction model was designed to lay the groundwork for the application of learning analytics in functional games. The literature [8] evaluates the effectiveness of empirical support for functional games. The experimental search strategy included categories such as: gamification and functional games, home energy consumption, and relevant vocabulary combinations, and more comprehensive selection criteria were used throughout the selection process. The results indicate that gamified and functional games have a higher value in terms of energy consumption, conservation, and efficiency. In summary, the current research level of the functional game industry in the academic field is relatively shallow, and all of them are researched mainly on game principles, without considering the industrial

https://doi.org/10.17993/3ctic.2023.122.244-259

development effect at the technical level, lacking design thinking exploration, and not realizing the benign combination of game industry and technical development.

Based on this, this paper applies VR realistic technology to the expandability study of the functional game industry and designs a functional game industry expansion path based on VR realistic technology. In the design process, firstly, the real world is realistically restored to the game through three-dimensional virtual space. The process of functional game expansion is designed by using the interactive 3D model to integrate a professional game engine. Secondly, the ARCS model is used to stimulate the learning motivation of functional game industry expansion, so that the expansion links such as virtual environment, learning content, and interaction means can directly support the meaningful construction of VR realistic functional games, and the expansion path of interactive functional games is designed through VR realistic technology. Finally, the feasibility of the functional game industry expansion path is verified by comparing strong noise points, interactive 3D scene frame rate, and the number of model textures.

2. THE VR TECHNOLOGY-BASED GAME INDUSTRY CAN EXPAND THE PATH

2.1. ENHANCE USER EXPERIENCE

Functional games pursue virtual reality and are dedicated to providing the most sensible experience for players. From the first simple text games to later massively multiplayer 3D games, games have been developed to provide users with a better sense of realism and interactivity to perceive the virtual world. The development of VR realistic game optimization technology is mainly aimed at improving players' combat morale, focusing more on the core optimization settings of the online game world rather than ignoring players' gaming experience. The functional games based on VR realistic technology have a different design concept from traditional video games, through the headset device and somatosensory technology, players can map their own movements to the game world simultaneously. There are two main impact perspectives of VR realistic technology for user experience enhancement.

One is to enhance the interactive effect between game players and the game environment so that functional games can break through spatial constraints. Early functional games in the design can only take the light gun mode to broaden the game content. But along with the continuous development of VR real-world technology, the virtual sex environment can restore the player's sense of immersion in the functional game to the greatest extent.

The second is the shaping of the game environment. The reason why VR real-world technology is so desirable to game companies is that it can provide players with a different game experience without any change in the game content. For the direction

https://doi.org/10.17993/3ctic.2023.122.244-259

of industrial expansion of functional games, VR real-world technology is very suitable for a series of functional games such as role-playing, reasoning, etc. to expand to the social industry, and the expansion content includes the game itself, peripherals, and all other products related to the game.

2.2. IMPROVE GAME FLUENCY

The interactive 3D model provides multi-faceted opportunities for the industrial development of games by integrating various professional game engines. VR realistic technology divides the expansion of the functional game industry mainly into the processes of resource management, scene construction, and game release to ensure the flow of game scenes after expansion. Resource management can realize resource presetting and processing functions, and after adding resources to the game scene, multiple files need to be fused to aggregate and integrate the added resources, which is called game scene construction. Game scene construction is to restore the real world in the game by using the three spatial dimensions of the three-dimensional longitudinal direction through the performance principle of three-dimensional virtual space [9-10]. The smooth construction of game scenes using VR realistic technology requires a modular management method so that the particle modules cooperate with the particle curve editor to create various colorful and complex particle effects. The particle system can be intuitively controlled in terms of duration, cyclic mode, and rhythm control so that the particle effects can play a role in rendering the environment atmosphere in the game scene and improving the smooth quality of the game.

2.3. MOTIVATION TO LEARN

ARCS (design motivation) model is a model that aims to stimulate users' motivation to learn [11]. Based on the characteristics of human psychology and physiology, motivating learning is a continuous work, so the ARCS model is also an important factor throughout the expansion process of the game industry [12]. As shown in Figure 1, the ARCS game guide motivation model contains an association strategy, confidence strategy, and satisfaction strategy.

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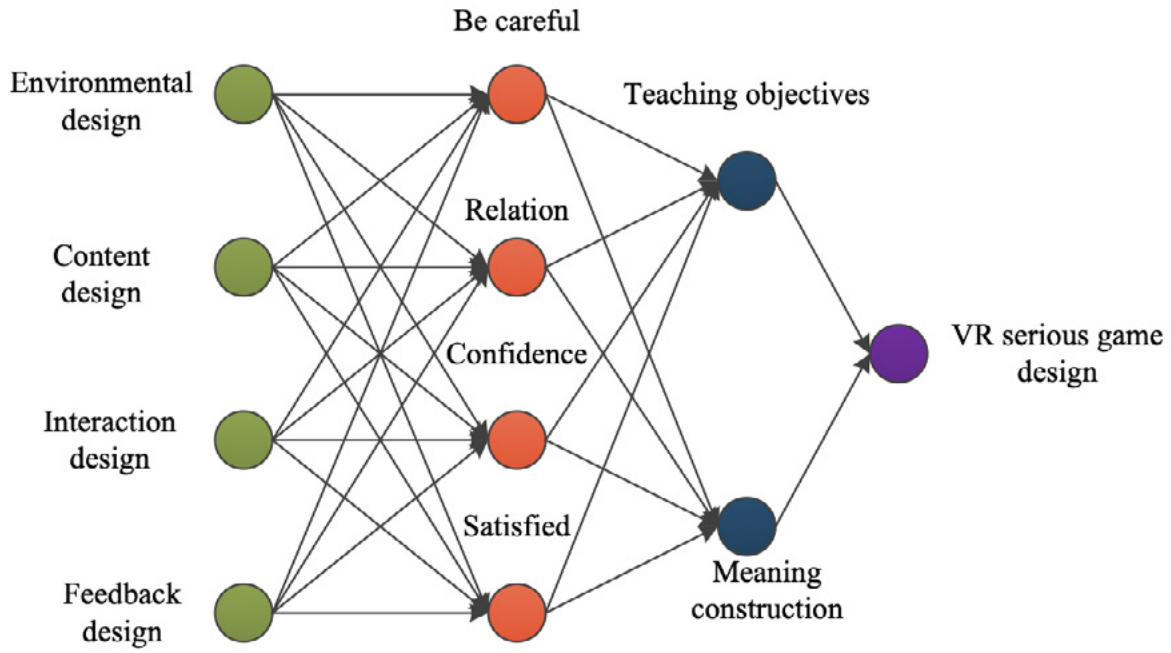

Figure 1. Guided tour motivation model for ARCS game expansion

The association strategy in Figure 1 means that the functional game industry should have clear self-knowledge in the process of expansion, with a view to gaining the experience of industrial upgrading in the expansion, helping to solve certain problems that arise at present or in the future, and transforming the experience into its own management skills in the process of experience.

Confidence strategy encourages functional game companies to develop interest into positive expectations to achieve their goals and helps functional game companies to build confidence in upgrading during the process of expansion. It also provides rich and diverse ways to present resources and educational activities for related industries to sustain the interest in industry transformation.

Satisfaction strategy provides both external and internal reinforcement for functional game enterprises. When game enterprises complete certain stages of goals in the process of expansion, the satisfaction strategy provides functional game enterprises with appropriate rewards to help them gain expansion satisfaction and further enhance the motivation of upgrading.

In the actual expansion process of functional game industry, the expansion of virtual environment, learning content, interaction means and learning feedback all reflect the motivation of ARCS at all times, which directly supports the ultimate expansion purpose of VR realistic functional game industry, i.e. learning objectives and meaning construction.

https://doi.org/10.17993/3ctic.2023.122.244-259

3. INTERACTIVE INDUSTRY EXPANSION PATH

3.1. GAME DEVELOPMENT TECHNOLOGY INNOVATION

In the expansion path of functional game industry, improving the innovation ability of game technology is one of the important ways to realize the upgrade of functional industry [13-14]. Unlike traditional functional games, VR realistic functional games can provide force feedback and haptic feedback to the user's hands to create more realistic simulations in the virtual world through sensing technology. A variety of tactile feedback is given to the gamer's body through electronic pulses, and data is collected on various biometric parameters of the game user. It not only provides gamers with the ability to observe and experience virtual reality, but also empowers users to feel their own behavior in the virtual world to produce perceptual changes, improving the functional gaming experience for gamers.

Game development technological innovation is a techno-economic activity that can promote the expansion of functional industrial structure to the rest of the industry. Game technology innovation affects the structure of production technologies, production processes and market demand conditions in the industrial sector, thus providing mechanisms that can effectively trigger industrial expansion and have a profound impact on the changes in the industrial structure [15]. Innovations in game development technology will enable the emergence of new technologies, and along with the birth of new industries, promote the qualitative evolution of the industrial structure.

The technological breakthrough of functional game industry and the widespread application of VR real-world technology will cause structural changes in this industry and related industries, and drive the development of a series of other related industries through forward, backward and sideways correlation. For example, in the process of expanding into the social industry, functional games can promote the technological change of the social industry through the diffusion and penetration of VR real-world technology. Integrating functional games into social software can provide players with the opportunity to meet and interact with others in the virtual world. Players express themselves through movements and gestures by choosing or creating an avatar to support the communication of full-body movements. And the difference in the level of functional games determines the number of downloads of social software. After the functional game industry enters the maturity period, the results of technological innovation drive the game dominant industry to carry out sequential turnover until it becomes a significant feature and sign of industrial structure upgrade. Among the many categories of industry expansion, the leading game industry with advanced technology can absorb a large number of innovative achievements, which leads to the increase of the integration rate of game industry.

https://doi.org/10.17993/3ctic.2023.122.244-259

3.2. DRIVE-RELATED GAME INDUSTRY

The upgrading of related expansion industries is driven by strengthening the high technology transformation efforts of the functional game industry [16]. The high growth of the game industry itself cannot bring about substantial adjustment of industrial structure and structural upgrading of related expansion industries, but only when the industry has great industrial correlation and can produce integration, penetration and diffusion effects through correlation with other industries, the game industry has high structural growth effects. The high-tech connotation of the functional game industry determines that it can be expanded to the sports and athletic industries, and the way to expand to the sports and athletic industries is mainly reflected in the following two aspects:

First, increase the investment of VR real experience transformation in sports and athletic industries, and use VR real technology to transform the technical equipment and processes related to sports and athletic industries in order to improve labor production efficiency and product quality, and rapidly improve the industrial base and enhance economic strength.

Second, the use of VR game's realistic operation to upgrade sports and athletic products, prompting the development of sports and athletic products in the direction of multiple types and multiple experiences. Through the upgrading of VR realistic products, the vitality and vigor of the sports and athletics industry will be rejuvenated. Accelerating the separation of the functional game industry and the formation of the game industry system promotes the relevant development of the modern industrial system. Introduce the operation experience of VR realistic games in sports athletics, enhance the smoothness of sports game scenes by updating the operation of gamepads and keyboards, make weak performance processors load high-quality resource content, improve the endurance while reducing costs, and promote the development of functional games in the direction of scale.

3.3. ACCELERATE INDUSTRIAL INTEGRATION

Industrial integration refers to the dynamic development process in which different industries or different industries within the same industry interpenetrate and intersect with each other, eventually merging into one and gradually forming new industries [17-19]. Industrial fusion is a form of industrial innovation, and the proliferation of this industrial innovation method drives the adjustment and upgrading of the related industrial structure [20-23]. The directionality of the change in the industrial structure of functional games is the effective accumulation of industrial expansion innovation within a certain industry.

Technical elements such as information technology, network technology and digital technology in the functional game industry sector are being integrated into the education-based industry sector one after another, putting it on the path of

https://doi.org/10.17993/3ctic.2023.122.244-259

informatization and network development. It has profoundly changed the production and service methods of traditional education-based industries and promoted the upgrading of their industrial service structures [24]. The expansion of the functional game industry based on VR real-world technology to the education-based industry aims to improve students' motivation and participation in learning and sublimate them from passive receivers to active participants. Through the effective combination with online information resources, the delivery of educational contents is realized in a more approachable way to provide students with better and broader educational information. In addition, the continuous renewal of game products and educational services drives the upgrading of the demand structure of educational commodities, which in turn pulls the upgrading of the structure of education-related industries.

4. THE FUNCTIONAL GAME CAN BE TOPOGRAPHIC INDUSTRY SIMULATION RESULTS ANALYSIS

In order to verify the feasibility of the design path of this paper, the results of strong noise points, interactive 3D scene frame rate and model texture quantity are now analyzed, and the feasibility of functional game industry expandable based on VR realistic technology is analyzed by comparing with the 3D game industry transformation model for mobile terminals.

4.1. STRONG NOISE POINT DISTRIBUTION

When the static feature parameters in the 3D scene remain unchanged, while the angular velocity and rotation angle in the dynamic feature parameters change at the same time, the 3D game industry transformation model for mobile terminals is compared with the functional game industry expansion path based on VR real-world technology, and the display of strong noise on the client side is shown in Figure 2.

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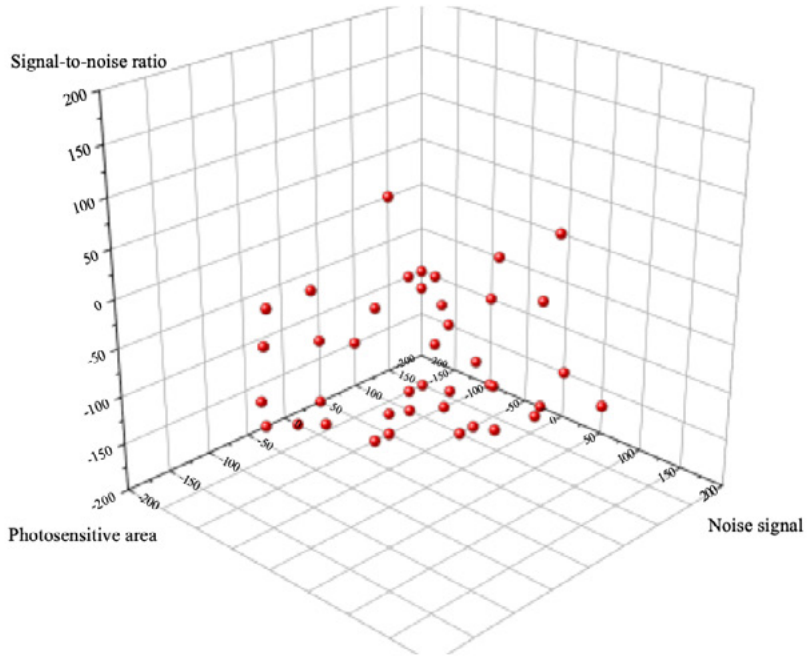
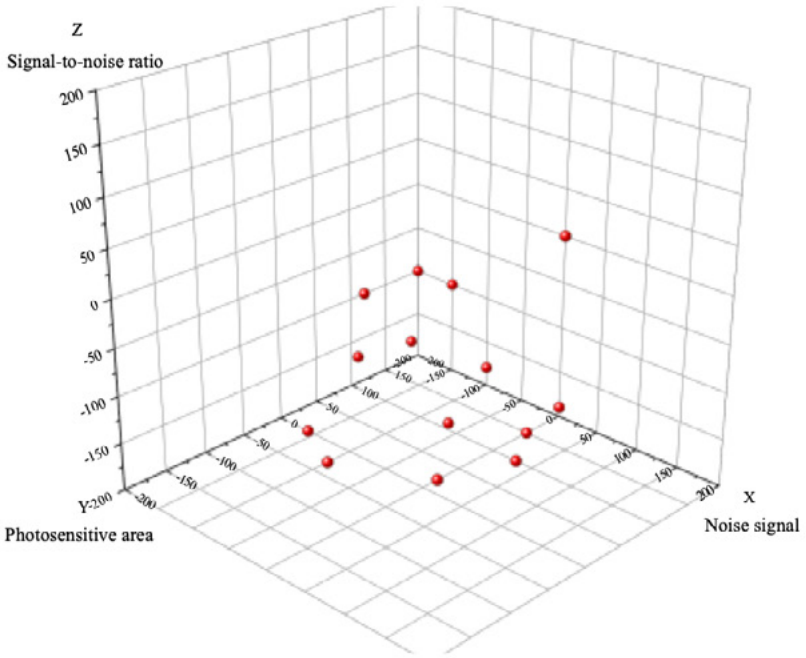


(a) Mobile terminal-oriented model



(b) Based on VR realistic technology

Figure 2. Experimental distribution of strong noise points

As can be seen from Figure 2(a), the number of strong noise points of the 3D game industry model for mobile terminals is high. It is mainly concentrated in the -200 to 100 interval on the sensing area axis and in the 0-100 interval on the noise signal axis, with an average signal-to-noise ratio of -150% and poor noise immunity and perceptual interaction ability, which cannot adapt to the future development direction of the social class industry.

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As can be seen from Figure 2(b), the number of strong noise points of the functional game industry expansion path based on VR real-world technology is small and the distribution is more dispersed. The distribution is mainly concentrated in the -100 to 0 interval on the sensing area axis, which improves the distribution efficiency by 50% compared with the 3D game industry transformation model for mobile terminals. On the noise signal axis mainly concentrated in the 100 to 200 interval, the distribution interval of the noise signal was adjusted upward by 100 points, the signal-to-noise ratio was -100% on average, which improved by 50%, the noise resistance was better, and the reconstruction effect was significantly better than that of the 3D game industry transformation model for mobile terminals. It indicates that the functional game industry based on VR realistic technology has better adaptability in terms of computational game image display and complex game operation, etc., and has better performance capability in both immersion and interactivity, which can be combined with social industry for the operation of functional game industry transformation and upgrading.

4.2. SCENE FRAME RATE COMPARISON RESULTS

Scene frame rate is the number of frames per second to refresh the picture during the game, and the increase in scene frame rate can make the game picture more smooth. In order to make the measurement results have an accurate operation, this paper uses the timing function in the control system of the computer to calculate the frame rate of an interactive 3D scene. According to the standard variation value of the frame rate, the theoretical contrast value of the 3D scene frame rate is shown in Figure 3.

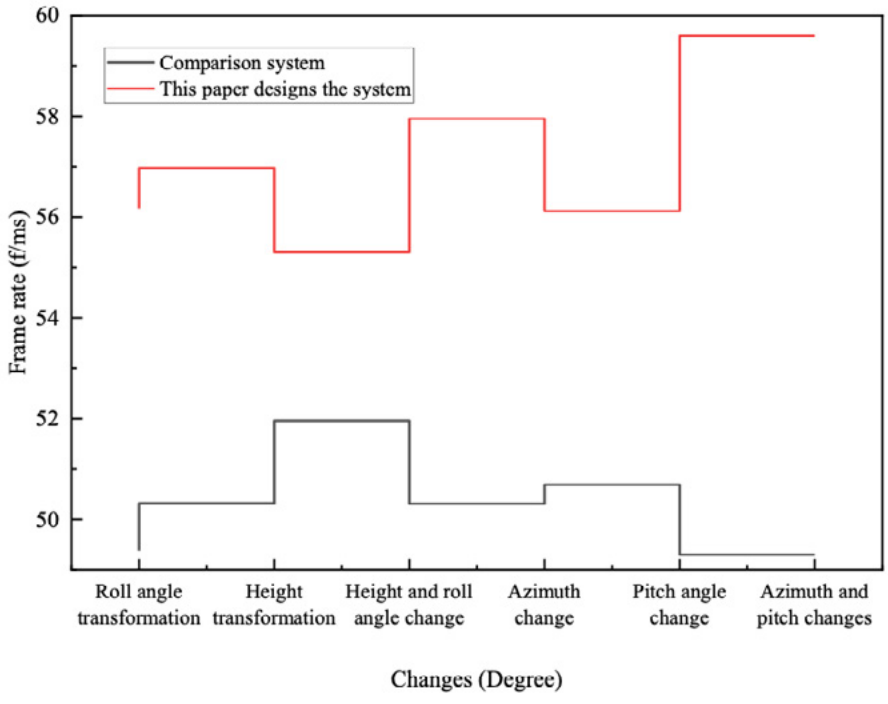

Figure 3. Comparison results of frame rate of scenes

https://doi.org/10.17993/3ctic.2023.122.244-259

As can be seen from Figure 3, compared with the 3D game industry transformation model for mobile terminals, the functional game industry expansion path based on VR real-world technology has selected entities with better performance in the process of industry integration, which can be configured for screen playback by the animation industry. The height angle change is improved by 6.65f/ms and the cross-roll angle change is improved by 6.79f/ms. This change reduces the complexity of dynamic and static feature parameters, making the restored interactive 3D images clearer and more intuitive. Azimuth and pitch angle relative to the 3D game industry transformation model for mobile terminals improved by 15.18% and 10.83% respectively, making the picture quality obtained after behavior control better and the animated character behavior connection more smooth, improving the real-time game scene change. It can be seen that the functional game industry based on VR real-world technology can upgrade the physical combination experience of the game, with a new operating feel and three-dimensional audio-visual cooperation, to the sports competition industry for integration development.

4.3. NUMBER OF MODEL TEXTURES

In the process of establishing the 3D model of the game animation character, the behavioral realism of VR natural interaction method plays an important role in the preliminary judgment of the society, and the number of model textures can intuitively reflect the picture quality and connection smoothness after the behavioral control. The comparison results of the number of model textures between the 3D game industry transformation model for mobile terminal and the functional game industry expansion path based on VR realistic technology are shown in Figure 4.

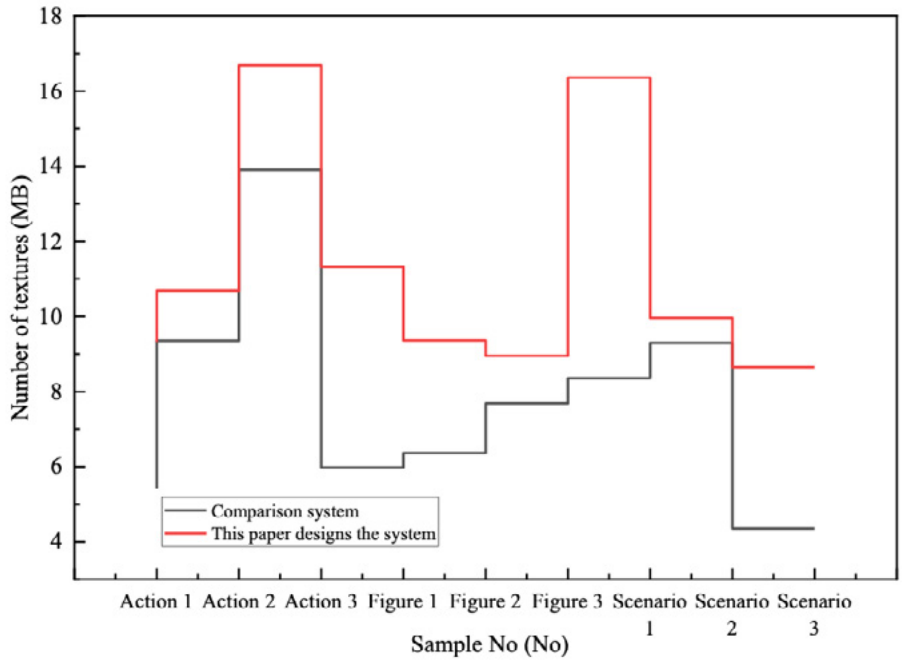

Figure 4. Model texture number comparison results

https://doi.org/10.17993/3ctic.2023.122.244-259

As can be seen from Figure 4, the functional game industry expansion path based on VR real-world technology can reach a maximum texture number of 16.68 MB in the three elements of action, character, and scene. compared to the 3D game industry transformation model for mobile terminals, the texture enhancement of the action sample is between 3 MB and 4 MB, the texture enhancement of the character sample is between 2 MB and 7 MB, the texture of the scene sample The texture of the scene sample has the largest enhancement, from 0.69MB to 9MB, and the overall enhancement of the model texture number is between 0.69 and 9MB. This indicates that the functional game industry based on VR real-world technology is highly motivated and engaged in specific knowledge areas and is conducive to expansion in the direction of the education industry, with the ability to provide scaled scenes, visualize complex abstract information or operational mechanisms, and create a highly immersive game-based learning experience for learners at relatively low cost.

5. CONCLUSION

This paper explores the expandable direction of the functional game industry based on VR realistic technology and designs the expansion path of the functional game industry from the perspective of game realistic interactive experience, and the conclusions obtained are as follows:

1. The distribution of the number of strong noise points in the design path of this paper is more dispersed, the distribution interval of the sensing area is adjusted downward by [-100,100], the distribution interval of the noise signal is adjusted upward by 100 points, and the signal-to-noise ratio is improved by 50% on average. It indicates that the functional game industry can use VR realistic technology to transform and upgrade the operation of the game to the social class industry.

2. Based on VR real sensory technology relative to the 3D game industry transformation model for mobile terminals, the height, and cross-roll angle changes are improved by 6.65f/ms and 6.79f/ms, respectively, and the azimuth and pitch angles are relatively improved by 15.18% and 10.83%. It shows that with the support of VR real-world technology, the functional game industry can develop into the sports competition industry by upgrading the physical combination experience of the game.

3. On the three elements of action, character, and scene, the number of textures of VR real-world technology can reach up to 16.68 MB, with an improvement range of 0.69 to 9 MB. It indicates that the functional game industry based on VR realistic technology has the ability to provide scaled scenes that can create a highly immersive game learning experience for learners and can be expanded in the direction of the education industry.

https://doi.org/10.17993/3ctic.2023.122.244-259

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