Research on Sports Training Model Based on Training 3D Modeling Technology

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Abstract. The Visual C++ development environment is used, combined with computer simulation software programming and programs to realize the virtual reality of sports training, and realize the comprehensive attack drill of sports training in various sports training environments. Finally, a simulation study is carried out on the 3D model of basketball movement. Research has shown that simulation techniques are able to achieve better training scenarios than reality. It can be used for full attack practice in sports. This system provides a rich set of teaching methods for athletes' comprehensive attack, which helps athletes to have a correct understanding of various tactical systems in the game. It can promote the scientific development of sports teaching.

Keywords: Three-dimensional modeling, Physical training, Basketball technology simulation, Simulation and simulation, programming.

1. Introduction

The reconstruction of outdoor sports rehabilitation training is to use laser scanning technology, information technology and other technologies to use the obtained information to establish a visual modeling of outdoor sports teaching. In urban landscape planning, architecture, national defense and military, precision industrial measurement, etc., it is an important technical support for the realization of digital intelligence. The reconstruction of outdoor sports teaching is a research hotspot at home and abroad, and it is also a research hotspot at home and abroad. The design of the reconstruction system of outdoor sports rehabilitation training has always been a hot issue concerned by scholars at home and abroad. Using computer programming, literature, simulation technology design and other methods, using the "programming + prediction" method, integrating simulation technology with football, has significant advantages and effects in sports teaching, in order to improve the sports training of Chinese athletes. The level has a certain reference effect.

2. Virtual reality motion simulation system

VR sports simulation is a method of simulating competitive sports using VR technology. The use of this high-tech sports method can enable coaches and players to innovate in technology, achieve the best training results, and ensure their physical fitness. In addition, with the widespread use of system simulation, virtual technology can be further developed [1]. Therefore, the use of this technology for sports training has a large market space and broad application space. It has a variety of output forms, can handle multiple input devices, realize complex behavior modeling, real-time interaction and conflict detection and other characteristics. In the training of competitive sports, coaches and remote personnel can use virtual technology to conduct simulations and simulations and carry out various interactions. With the help of virtual reality competitive simulation technology, the scientific and technological quality and overall quality of athletes are improved. The organic integration of virtual reality technology and sports simulation technology can be divided into 3 different subsystems. The architecture of the system is shown in Figure 1 [2].

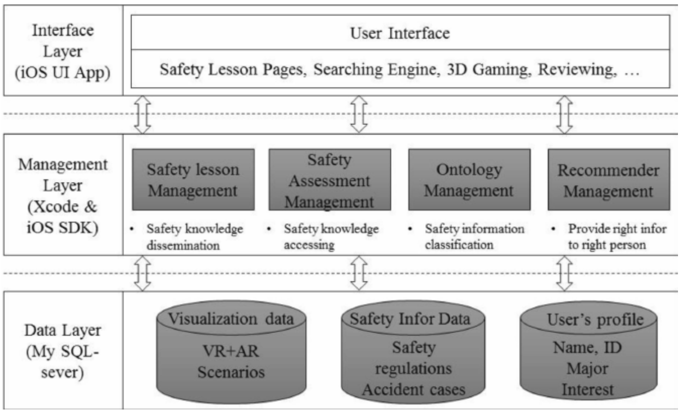

Figure 1. System structure

3. Function based on VR simulation in competitive sports system

This paper mainly introduces the three parts of the VR motion simulation system: virtual reality generator, input system and output system. Among them, the user system, high-performance computer, simulation manager, 3D modeling database, etc. are all composed of these systems. The system consists of an effect generator and a signal conversion device; an input converter, a glove input converter, a position tracker and a data glove make up the input device. In such a background, the user will feel that everything around them will become real, so as to achieve a real interaction with the surrounding, and give the user an immersive feeling (Figure 2) [3].

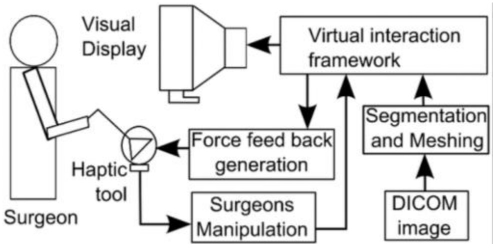

Figure 2. Structure diagram of competitive sports simulation system based on VR

4. Basketball training model based on three-dimensional modeling

Based on the tandem processing shown in Figure 3, the video colors in basketball games are first detected [4], and then described using the RGB color space method, and expressed as:

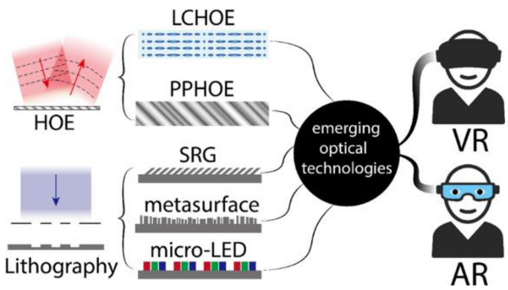

Figure 3. Feature cascade process

$$\begin{cases} R = \int_{\theta} E(\theta) S_R(\theta) d\theta \\ G = \int_{\theta} E(\theta) S_G(\theta) d\theta \\ B = \int_{\theta} E(\theta) S_B(\theta) d\theta \end{cases} \tag{1}$$

S_R, S_G, S_B in the formula (1) is the different color of the respective filter. $E(\theta)$ is the light entering the filter and θ is the wavelength of the ray. Basketball game video is a dynamic process, in which the color components in the video are expressed in the form of color transformation [5].

$$\begin{cases} H = \arctan\left(\dfrac{\sqrt{3}(G-B)}{(R-G)+(R-B)}\right) \\ W = \dfrac{R+G+B}{3} \\ Y = 1 - \dfrac{\min(R,G,B)}{W} \end{cases} \quad (2)$$

In formula (2), H, W, Y is the color space after color transformation, and other parameters remain unchanged. A segment [0, 1] in the above calculation formula is given, which constitutes a detected range, and the entire embedded basketball game video is divided into 3 sectors, and its area can be expressed by the following methods [6].

$$A = r\frac{S\cos H}{2\cos(60^\circ - H)} \quad (3)$$

In equation (3), A is the area, r is the sector, and the meanings of other parameters remain unchanged. By setting the number of features of the Gabor filter and the control error accumulation of the dimension frequency, the real and imaginary parts of multiple features in the basketball image are used as cascade targets, and a series of steps is constructed to extract the image color characteristics of basketball. The RGB color space method is used to describe the color components when concatenated, and it is divided into different colors [7]. The sectors formed by these sequence characteristics are used as detection areas to detect the embedded basketball moving images.

5. Video Object Recognition Based on Embedding Basketball Motion

After completing the extraction of the embedded basketball video sequence features, take the detection area composed of the above-described sequence features as the primary target, and in this sector, a complete image can be obtained at any pixel point , and its calculation formula is as follows:

$$ii(x,y) = \sum_{x' \le x, y' \le y} A(x', y') \quad (4)$$

x', y' is the coordinate of any point within the detection range described in equation (4). By performing the subtraction of the vertex integral graph on the pixel points obtained by the above formula, the calculation of the integral image value is simplified (Figure 4).

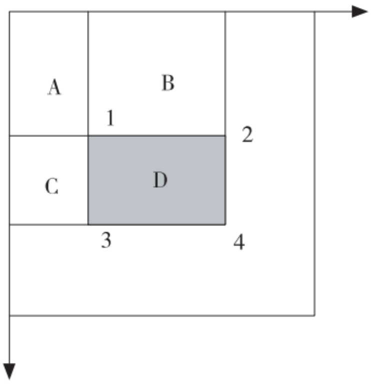

Figure 4. Pixel subtraction process

By cropping it, a continuously cropped basketball motion image detector is obtained, and finally a target detector D is formed. To ensure that the position of the object under test is correctly detected in a basketball game, a powerful classifier with overlapping weights is used to construct a recognition criterion for image transformation.

$$h_j(x)=\begin{cases}1\sum_{t=1}^{T}a_t h_t(x)\geq\frac{1}{2}\sum_{t=1}^{T}a_t\\0, other\omega ise\end{cases}\tag{5}$$

h_t represents the classifier characteristic, a_t represents the transformation threshold, and T represents the frame frequency of the moving image. Since there are many detection factors in the embedded basketball moving image, when a strong classifier is used, the transmission speed is too high, which will cause a delay in detection and cannot achieve the expected tracking effect. Using the embedded sub-window of basketball image images, a robust classification sequence can be constructed to classify detection objects (Figure 5) [8].

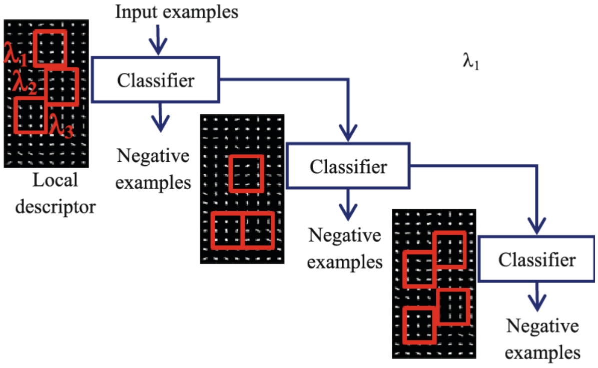

Figure 5. Strong classifier cascade structure

Using the hierarchical structure of the strong classifier, the basketball moving image is divided into a pixel ratio of 20*20, and then it is incorporated into the hierarchical division of the strong classifier. The classifier determines the range of the basketball moving image and assigns the The segmented image is excluded, and then the image is sent to the next category, and finally, a hierarchical classification is performed to realize the recognition of the moving image object. On this basis, a post-weight strong classifier is used to construct image transformation recognition criteria for images, and a powerful hierarchical cascade is constructed to effectively identify embedded basketball images. An embedding-based moving image tracking method is constructed [9].

6. Implementation method of basketball video tracking based on embedded

After the detection of embedded basketball video objects is completed, the method is used to classify them, and then an image tracking method of embedded basketball images based on image features is constructed.

$$\min_{\omega}\sum_i(f(x_i)-y_i)^2+\varepsilon\|\omega\|^2\tag{6}$$

In Equation (6), ε represents the normal parameter, ω represents the number of classifiers, f represents the training function, x_i, y_i represents the independent variable and reason of the function, and i represents the number of the exercise. In order to avoid excessive fitting in the training of the classifier, the optimal solution of (6) described above is adopted. The calculation formula of the optimal solution is as follows:

$$\sum a_i\varphi(x_i)\tag{7}$$

In Equation (7), a_i represents the transformation solution, $\varphi(x_i)$ represents the kernel function to the high-dimensional space, and x_i represents the correlation between the two samples.

$$\varphi^T(x)\varphi(\dot{x}) = k(x,\dot{x}) \tag{8}$$

$$F(a) = \frac{F(y)}{F(k^{xx}) + \lambda} \tag{9}$$

In Equation (10), F represents the discrete Fourier transform, and k^{xx} represents the 1st row vector of the kernel matrix, with the optimal factor obtained by the above-described operation as the object paradigm, when performing real target tracking , take the object as a new input image, use the Gaussian kernel to find the similarity between the image and the template, and use KCF to perform periodic shift operations on the input image to form a basketball action image sample group, the processing moment C of the cyclic displacement can be expressed as K^z.

$$K^z = C(k^{xx}) \tag{10}$$

k^{xx} represents the first row of the K^z matrix, C represents the matrix periodic motion factor, and $f(z)$ is used to express the similarity between the candidate image block and the tracking object:

$$f(z) = F^{-1}(F(k^{xz}) \odot \hat{a} \tag{11}$$

$\odot$ is the dot product process, $f(z)$ is the probability estimation of the tracking object for the candidate image of the basketball activity video, and $\hat{a}$ is the Fourier transform to express the conversion factor. After the above calculation and processing, the tracking program is converted into a diagonal matrix, and then the product of it and a one-dimensional vector is converted into a dot product operation, so that the tracking algorithm can obtain target tracking, and finally obtain a target tracking flow (Figure 6) [10].

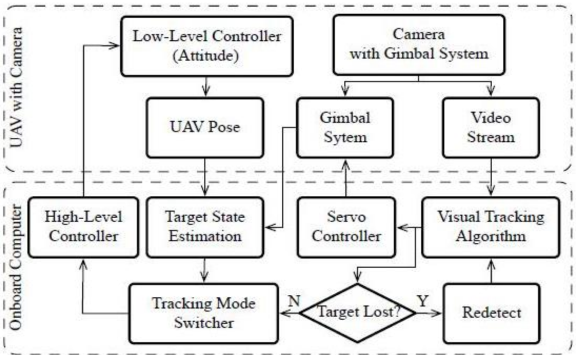

Figure 6. Target tracking process

It can be seen from the process of target tracking that, according to the characteristics of basketball, the histogram of the slope and amplitude in the image elements of basketball is used as its feature, and a moving image classification algorithm suitable for basketball is obtained. The corresponding transformation factor is obtained, and the corresponding transformation factor is obtained by this method, and the similarity between the model and the target model is calculated by using the Gaussian operation, so as to generate a video sample library of basketball sports, thereby obtaining basketball sports video sequence. Combined with the above methods and algorithms, the video object tracking based on embedded basketball is completed.

7. Simulation test

By comparing two different methods, an embedded basketball video image tracking algorithm with the characteristics of comparative analysis, comparative analysis and comparison is carried out respectively. The real-time performance of the proposed tracking method and the effectiveness of the tracking results are tested. It can be seen from the test results that the running time of the three tracking methods increases with the increase of data sets. Among the 7 data sets, the completion time of 1 tracking is 8 seconds, and the completion time of 2 tracking is 11 seconds. seconds, and the proposed tracking completion time is 4 seconds, so it can be seen that 2 is the largest tracking completion time, followed by the smallest is Algorithm 1, and the smallest is the proposed tracking running time [11].

The three tracking methods track the basketball game videos prepared for the test respectively. The results show that: before the test, each tracking has 15 successfully tracked targets, and the tracking success rate is the lowest. The average number of tracking marks of this method is 24, which greatly exceeds the number of effective tracking marks in method 1, and this method has the smallest gap with the number of labels, which can accurately track the marked objects and achieve the best tracking results. This paper proposes a fast tracking method based on image tracking technology, which can effectively track more objects, especially for video object tracking based on embedded basketball.

8. Conclusion

On this basis, through the optimization of data acquisition, data transmission, data processing, scene reconstruction and modeling of outdoor sports simulation. The use of noise reduction, smoothing and other methods improves the accuracy of each angle in motion simulation; the use of surface modeling methods optimizes the depth of motion exercises, thereby reducing the time required for motion training reconstruction.

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