Research on Teaching System of Sports Demonstration Based on Kinect

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Abstract: with the Development of Mass Sports and the Information Technology Represented by Computer Technology, the Rapid Progress Has Been Made in the Rapid Progress. At Present, China's National Sports Coaches' Physical Education and Guidance Level is Very Low, Resulting in Many Sports Fans Lack of Professional Guidance Level, and Even Serious Problems Such as Sports Injuries. Therefore, It is Imminent to Develop a Kind of Public Sports Teaching System with Low Cost and High Performance. the Public Sports Teaching System Should Have the Function of Motion Capture, Reconstruction and Analysis. First of All, in the 3d Human Motion Capture, We Use the Latest Microsoft Kinect Depth Information Detection Device to Calculate the Key Data of Human Skeleton and Transform It into Motion Data Level and Skeleton Matching. in the Process of Collecting Depth Information, Kinect Adopts Advanced Optical Coding Technology (Optical Coding). in the Process of Motion Data Generation, the Hierarchical Structure of Human Skeleton Motion Data is Generated, Which Matches the Data of Single Hand Motion, Greatly Reduces the Amount of Data Recording Movement, and on the Other Hand, Facilitates Reconstruction and Analysis of Subsequent Motion. Secondly, the 3d Human Motion of Human Body is Reconstructed by Using the Bone Skin Animation and Personalized Human Body Technology. According to Different Application Needs, Two Human Body Motion Reconstruction Methods Based on Standard Human Model and Motion Reconstruction Method Based on Personalized Human Model Are Designed. These Two Reconstruction Methods Can Be Used to Observe the Action Sequence or the Fixed Position in the Opengl Environment. Finally, Several Alignment Analysis Methods Are Designed in the Comparison and Analysis of 3d Motion, and the Experimental Verification of the Problems in the Motion Data is Carried out. This Part is Mainly to Reduce the Error of the Artificial Alignment, and Gives the Results of the Intelligent Quantitative Evaluation.

1. Introduction

With the Rapid Development of China's Economy, the Continuous Improvement of People's Living Standards, People's Living Pressure is Also Increasing, P Fill the Enormous Social Needs, Why Not Design a Sports Teaching System Can Provide Professional Technic of This Subject Can Bring Enlightenment to Other Subjects in Theory and Research Methods. Kinect Based Motion Demonstration System Schematic Shown in Figure 1 and 2.



Fig.1 .Sketch Map of Sports Teaching System Based on Kinect.

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Fig.2 .Sketch of Working Logic of Sports Teaching System Based on Kinect.

With the Improvement of People's Living Standards, People No Longer Meet the Basic Material Needs, More Demand for People with Physical, Mental and Spiritual Aspects. Physical Activity Can Not Only Exercise, Stimulate the Fighting Spirit, But Also to Promote Communication, the Majority of People's Favorite. Along with the Birth of Sports Training is Also Much Attention, Traditional Sports Training Are One or Many coach's Face to Face Training, Not Only by the Limitations of Time and Place, and the High Cost of Training, Coachaid Can Be Widely Used in Running, Jumping, Weightlifting, Shooting, Golf and Other Sports Teaching Demonstration Projects[4].

2. Key Technologies Involved in System Design Process

2.1 Three Dimensional Motion Capture Technique

Motion Capture Can Be Defined as "the Use of Specific Sensors, Such as Mechanical, Electromagnetic, Optical, Human or Animal (Joint) and Record the Real Motion Sequences Retained for Process Analysis, Processing and Application". According to the Capture Equipmenh is to Understand the Technology of Human Motion Based on Video Content, Applied to the Battlefield or Business Scene. Recognition of Real-Time Visual Surveillance System Can Not Only Realize the Body Position and Body Parts, But Also through the Establishment of the Appearance Model to Realize Multi Human Tracking, and Can Detect the Judge Whether to Carry Objects with Simple Behaviors. the Three-Dimensional Motion Capture Schematic is Shown in Figure 3.



Fig.3 .Schematic Diagram of 3d Motion Capture System.

2.2 Three Dimensional Motion Reconstruction Technique

The action is 3D reconstruction based on the reproduction of existing motion data movement, it has two meanings: one way to preserve motion data, such as image key frame and key frame

animation parameters and algorithm; second, motion data presentation, such as lines or rules of geometry simulation movement etc. Considering the topic is the depth information of 3D reconstruction based on the action, we on the reconstruction of the two meanings are discussed respectively, and only discussed the first level of the meaning of the former two (images of key frames and key frames, and no parameters) to discuss the suitable production o contour from the image and synthesizing the action panorama and the action video superposition contrast two methods. The dance movement must appear in the music time accurate [7], directly on each time point of the action by using the method of analysis of Euclidean space distance, and achieved good results. The practical application of this subject is more complex, we start from the European distance based method and the correlation coefficient method; we get a more suitable for the subject of the section matching method.



Fig.4 .Schematic Diagram of Key Frame Animation



Fig.5 .Schematic Diagram of 3d Image Reconstruction.



Fig.6 .Schematic Diagram of Kinect System Application.

2.3 Kinect Technology Introduction

Kinect is Microsoft in June 14, 2010 XBOX360 somatosensory peripheral peripherals officially

released name. With the name of the Kinect officially released, Kinect also launched a variety of supporting games, including Lucasarts produced the "Star Wars", MTV launchede of Technology Research Institute of Cambridge ShahramIzadi said: "people often mention Kinect, perhaps just think it's just a place in the room of static sensors, but with now, the user can freely pick up the camera, image reconstruction and print out the map 3D perfect effect." Kinect application schematic shown in Figure 6.

2.4 Three Dimensional Motion Capture Based on Depth Information and Human Skeleton Principle

The human skeleton can represent the three-dimensional motion of the human body to the greatest extent. In fact, the traditional motion capture equipment is also set up sensors at the key bone nodes to obtain human skeleton information. In recent years, the mainstream non-invasive capture equipment, often extract the human contour from the scene, and then estimate the human skeleton joint position. How to extract body contour accurately and steadily from the scene is the primary problem. It is gradua u should be small enough to accurately locate the bones of the body joints; on the other hand, the number of regions should not be excessive and affect the efficiency of the classifier. The body area recognition mentioned earlier is based on the information of each pixel. This information must be gathered from the pixels to obtain reliable estimates of the three-dimensional position of the bone joint. A simple method is based on known measurements of depth information, for each region possible three-dimensional center of a cumulative speculation. However, falling pixels will seriously reduce the quality of such a global inference. A local model lookup method based on mean shift using Gauss weight kernel is adopted.



Fig.7 .Schematic Diagram of Structured Light 3d Reconstruction System



Fig.8 .Schematic Diagram of the Internal Structure of Kinect

3. Overall Design of Sports Demonstration Teaching System Based on Kinect

3.1 Overview of the Overall Design of the System

Equipment package includes a phone-sized USB input devices (Figure below black object) and corresponding software platform. The device is via an gnificance provides motion detection technology and testing chips PS1080 and use code patented technology. Kinect data acquisition process is shown as Figure 9.



Fig.9 Kinect Data Acquisition Process.

3.2 Requirement Analysis for Sport Demonstration Teaching System Based on Kinect

With the continuous improvement of China's rapid economic development, people's living standards, people's life pressure is also increasing, physical and mental health has become a problem cannot be ignored. Numerous scientific studies have shown that physical exercise is the most eucation system Kinect Sports is based, its frame as shown in Figure 10. In order to meet people's needs, idealized mass sports education system should have from the complex environment and human body and other factors, student movements accurately perceive and be analyzed, appropriate improvements. Consider the user cognitive ability is uneven, hardware and software design of the system should have a good interaction, and easy to learn. Popular Sports universality determines the entire system is only to ensure that the lower price, every family can really play its due role [12].



Fig.10 .Framework of Sport Demonstration Teaching System Based on Kinect.

3.3 Overview of the Overall Design of the System

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universality determines the entire system is only to ensure that the lower price, every family can really play its due role [13].

4. Design and Implementation of the System

Although we introduced the action of reconstruction in the last chapter, it gives us a specific gesture can be observed from any angle, but it is still based on visual inspection, it is inevitable to carry the subjective error and difficult to quantify etc. Therefore, in order to action alignment, evaluation results more accurate and objective, and this topic also in the capture of action data comparative analysis done related research. Action matching analysis here refers to the subsequent treatment according to the data obtaine; according to the comparison results are given coaching recommendations to quickly raise the level of trainers. Animation playback data produced by the movement of the motion capture file, the virtual drive body [15], thereby reproducing operation system frame body shown in Figure 11.



Fig.11 .Kinect-Based Sports Model Education System Structure.

5. Summary and Prospect

In the rapid development of mass sports, and professional teachers and related facilities are relatively scarce in the background, this paper aims to achieve a set of public sports teaching system, in order to ease the public demand for professional guidance and overcome the limitations of the human eye based on. The universality of mass sports determines that the whole system only ensures the low cost and good accuracy, and can truly enter into the role of thousands of households. Through the unremitting efforts of the research group, we successfully realized a set of mass sports teaching system which has three dimensional action capture, motion reconstruction and action comparison analysis based on depth information detection. In the thre capture to. Experiments show that human skeleton animation effect and accuracy are in line with the requirements, and three-dimensional animation can observe the characteristics of any angle, for the naked eye provides a full range of information.

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