

Application of Modern Computer Technology in Physical Training Model Simulation

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Keywords: modern computer technology; physical training; simulation; multimedia

Abstract: In order to improve the visual level of physical training and promote the optimization of sports training, the computer multimedia technology is used to simulate the sports training model. Traditionally, the design complexity and control performance of the high-dimensional spatial sports training model are high, and the control performance is poor. A design method of computer multimedia simulation sports training model is proposed based on attitude change space fast exploration control, and computer multimedia simulation method is adopted to construct human body sports training and body movement mathematical model. In the physical training and kinematics model of human body, the position and pose feature information of human body is extracted quickly. Multimedia image analysis and intelligent control are used to simulate the process of human sports training and analyze the constraint parameters of motion planning in attitude change space to realize the optimal control of physical training and body motion planning. The simulation results show that the design of sports training model based on computer multimedia simulation is more controllable, the prediction error of motion attitude parameter is lower, and the multimedia control ability of sports training model is stronger, the effect of physical training is improved.

1. Introduction

In the process of physical training and teaching, students get information through sensory organs in time, of which vision is the main one. The application of computer technology in physical education teaching stimulates students' senses with dynamic factors such as sound, light, color, shape, etc. The visual images formed are relatively clear, and the visual images and kinesthetic images are integrated to form the dynamic and visual integrated images. In order to complete the above process of perception. Attention should be paid to the rules of attention in teaching. Attention is the direction and concentration of human psychological activities to a certain object. The use of computer technology in teaching helps to cultivate students' interest in learning. If teachers want to teach well, they should constantly explore and study the means to improve students' interest^[1]. If the teaching materials made by computer technology are properly used in the teaching process, the students will have a fresh feeling, which can enhance the students' interest in learning, stimulate the students' desire for knowledge, and optimize the teaching effect. The application of computer technology in physical education teaching is novel and enlightening^[2]. To cultivate students' thinking habits can arouse students' imagination more effectively, so that students can devote themselves to it and fulfill the action index actively. The application of computer technology in physical education also consciously penetrates the scientific and technological consciousness and imparts scientific and technological knowledge to the students. It can be seen that modern computer technology has a good application value in sports training model design^[3].

With the development of modern computer technology, intelligent control technology for kinematics planning can improve the ability of motion feature extraction and attitude correction. Kinematics planning control has been widely used in robot control design. In the artificial intelligence design and the human body kinematics research, the sports training model design is taken based on the computer multimedia simulation foundation to the human body movement

behavior, a multi-constraint motion planning problem is constructed by analyzing and extracting the data of human motion behavior by computer multimedia simulation. The design model of sports training model is a nonlinear kinematics model in high dimensional space^[4-6]. The design model of sports training model based on computer multimedia simulation is constructed by using probabilistic RoadMap (PRM) to analyze the dynamics of human body in various motion modes. Lagrange dynamic equation is constructed with probability map to realize motion planning, rapidly-exploring Random Tree (RRT) is a high-dimensional space reconstruction of walking and attitude transformation using Jacobian matrix transposition method. Based on the behavioral analysis and distance measurement of human motion, the joint spatial configuration feature is extracted to construct the random tree model of the motion state, which can guide the human body to control its kinematics behavior, and show a high control performance. However, the computational cost and complexity of the above methods are high^[7].

In order to solve the above problems, this paper puts forward a design method of computer multimedia simulation sports training model based on attitude change space fast exploration control, and it adopts computer multimedia simulation method to construct human body sports training and body movement mathematical model. In the physical training and kinematics model of human body, the position and pose feature information of human body is extracted quickly. Multimedia image analysis and intelligent control are used to simulate the process of human sports training and analyze the constraint parameters of motion planning in attitude change space to realize the optimal control of physical training and body motion planning. Finally, the performance test is carried out through the simulation experiment, which shows the superior performance of this method in improving the effect of physical training and the ability of simulation.

2. Problem description and kinematics modeling

2.1. Design parameter model of sports training model based on computer multimedia simulation

In order to provide accurate data input for physical training and body motion planning, computer is used to reconstruct human body sports training and body motion space and collect data by using computer multimedia simulation technology. The information of configuration space (C- space) is obtained by media simulation, and the kinematics analysis model of human body sports training and body motion is set up, which is composed of posture and initial configuration of human body, in which the initial position of human body is recorded as $\{A^0, A^1\}$. The shape A^0 is regarded as the root of the kinematic chain, which includes the attitude bias angle α_0 of the inverse motion of the human body, the joint constraint parameter β_0 and the body bending parameter $\mathbf{q}_0 = [\alpha_0, \beta_0, \gamma_0]^T$, which are expressed as three rotational degrees of freedom. The position and pose of elbow joint is composed of 7 elements, such as shoulder, elbow and wrist, which are expressed as $\mathbf{q}_1 = [q_1, \dots, q_7]^T \equiv [\theta_4, \dots, \theta_{10}]^T$; The parameters of human sports training and body movement information outputted by computer multimedia simulation are composed of the information fusion of decision variables of individual longitudinal motion, which are expressed as follows:

$$\begin{aligned} \min \quad & F(x) = (f_1(x), f_2(x), \dots, f_m(x))^T \\ \text{s.t.} \quad & g_i \leq 0, \quad i = 1, 2, \dots, q \\ & h_j = 0, \quad j = 1, 2, \dots, p \end{aligned} \quad (1)$$

Multimedia simulation of human body is a nonlinear system. It needs to linearize the governing equation of multimedia simulation of human body. In the chain of human body motion, take $\sin \theta_p = \theta_p$, $\cos \theta_p = 1$, exercise in human body and exercise in body. In trajectory tracking control, it is assumed that θ_p is the moment of inertia of the human body moving around the vertical axis (Y axis) by computer multimedia simulation^[8]. The motion control model of human body is related to θ_p , which is carried out by computer multimedia simulation. The information

features are collected, and several constraints of posture evaluation and behavior tracking control of human sports training and physical movement are obtained as follows:

$$X_{RL} = R \times \theta_{RL} \quad (2)$$

$$X_{RR} = R \times \theta_{RR} \quad (3)$$

$$X_p = X_{RM} + L \sin \theta_p \quad (4)$$

$$\dot{X}_p = \dot{\theta}_p L \cos \theta_p + \dot{X}_{RM} \quad (5)$$

$$Y_p = L \cos \theta_p \quad (6)$$

$$\dot{Y}_p = -\dot{\theta}_p L \sin \theta_p \quad (7)$$

$$X_{RR} + X_{RL} = 2X_{RM} \quad (8)$$

The analytical form of inverse kinematics of arm and joint of human body is derived. Considering the nonlinear characteristics and uncertainty of computer multimedia simulation system to control the position and attitude information of human body, the nonlinear disturbance suppression method is used to carry out the human body computer^[9]. The reconstruction of two-bit motion space V_2 in multimedia simulation includes:

$$V_2 = \{p(x, y) | x \in (0, width), y \in (0, height), x, y \in N\} \quad (9)$$

Where, $width \times height$ is a grid domain composed of $width$ rows and $height$ columns. In the grid domain, discrete feature sampling of computer multimedia simulation is carried out, so every grid in human sports training and body motion space can be described by $p(x, y)$, the motion trajectory of volume computer multimedia simulation is a grid composed of $width$ row and $height$ column^[10]. The physical training model based on computer multimedia simulation is presented in this paper. The spatial distribution structure of the physical training model based on computer multimedia simulation is shown in figure 1.

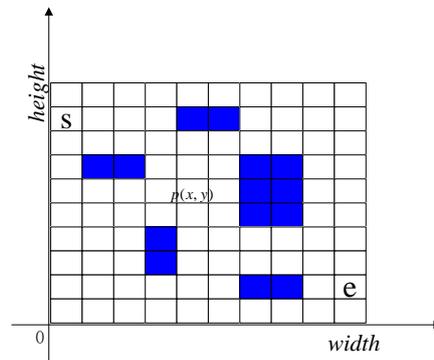


Figure 1. Spatial distribution structure of sports training model design based on computer multimedia simulation

2.2. Human physical training and C-space kinematics model based on computer multimedia simulation

In the C-space of computer multimedia simulation, physical training and physical kinematics modeling are carried out. Under the constraint condition of human joint, given the initial configuration $\theta_{start} \in C_{free}$ (free C-space) of human body, the pose p_{obj} of human body and the motion joint of human body are given. The computer multimedia simulation information set g_c is obtained by analyzing the dynamic characteristics of each joint in the motion process.

3. Acquisition of pose feature information and implementation of motion planning

3.1. Computer multi-media simulation of human posture and feature information grabbing

In the physical training and kinematics model of human body, the position and pose feature information of human body is quickly captured, and multimedia image analysis and intelligent control are used in attitude transformation space, and the quantization feature $E[M_B]=1$ of human body configuration posture is obtained as N random sample.

3.2. Steps of physical training model design

The sports training model is designed with Adams software, the simplified human body kinematics model is established by SolidWorks, the 3D computer multimedia simulation and visual simulation are carried out, and the sports training model based on computer multimedia simulation is set up.

4. Analysis of simulation experiment

According to the design steps of the sports training model of the computer multimedia simulation, the performance test is carried out in the simulation environment, and the control and parameter grasping performance of the sports training model design are analyzed. The simplified technology is established with SolidWorks. The feature extraction model of sexual sports items is constructed, and the model is saved as Parasolid (.xt) file. Then, the analysis data is imported into Adams software, and the physical training model is simulated, and the position and pose information of human body is extracted by computer multimedia simulation.

5. Conclusions

In this paper, a design method of computer multimedia simulation sports training model is proposed based on attitude change space fast exploration control, and computer multimedia simulation method is adopted to construct human body sports training and body movement mathematical model. In the physical training and kinematics model of human body, the position and pose feature information of human body is extracted quickly. Multimedia image analysis and intelligent control are used to simulate the process of human sports training and analyze the constraint parameters of motion planning in attitude change space to realize the optimal control of physical training and body motion planning. The simulation results show that the design of sports training model based on computer multimedia simulation is more controllable, the prediction error of motion attitude parameter is lower, and the multimedia control ability of sports training model is stronger, the effect of physical training is improved. This article method has the very good instruction significance in the physical education training teaching.

References

- [1] BI Anqi, DONG Aimei, WANG Shitong, (2016). A dynamic data stream clustering algorithm based on probability and exemplar. *Journal of Computer Research and Development*, 53(5), pp. 1029-1042.
- [2] JIANG Y Z, CHUNG F L, WANG S T, et al. (2015). Collaborative fuzzy clustering from multiple weighted views. *IEEE Transactions on Cybernetics*, 45(4), pp. 688-701.
- [3] FU Z, SUN X, LIU Q, et al., (2015). Achieving efficient cloud search services: multi-keyword ranked search over encrypted cloud data supporting parallel computing. *IEICE Transactions on Communications*, 98(1), pp. 190-200.
- [4] DENG Zhongliang, ZHANG Senjie, JIAO Jichao, et al., (2016). Research and application of high-precision indoor location-aware big data. *Journal of Computer Applications*, 36(2), pp. 295-300.