Hindawi
Mobile Information Systems
Volume 2022, Article ID 7438159, 11 pages
https://doi.org/10.1155/2022/7438159

Research Article

Artificial Intelligence Aerobics Action Image Simulation Based on the Image Segmentation Algorithm

Tao Jiang

School of Physical Education, Hebei Normal University, Shijiazhuang 050000, Hebei, China

Correspondence should be addressed to Tao Jiang; jiangtao0727@hebtu.edu.cn

Received 2 August 2022; Revised 17 September 2022; Accepted 26 September 2022; Published 10 October 2022

Academic Editor: Shadi Aljawarneh

At present, aerobics is becoming a popular fashion with the continuous development of cultural needs. Because aerobics has the characteristics of many movements, rapid changes, strong complexity, and difficult performance of difficult movements, the current aerobics teaching still presents shortcomings such as low teaching level, limited teachers' resources, and energy. Therefore, it is difficult to effectively meet the actual learning needs of students. Based on this point, artificial intelligence can be used to simulate and guide the technical movements of aerobics to effectively teach students. In this paper, an artificial intelligence aerobics image simulation system is researched and developed and the GrabCut image segmentation algorithm is mainly used. After analyzing some shortcomings of the algorithm, the GrabCut algorithm cascade and graph-based are selected to complete the optimization, so as to lay a good system foundation and then build the aerobics artificial intelligence image simulation system according to the algorithm foundation. Finally, it analyzes and researches the actual problems of aerobics teaching activities in colleges and universities and focuses on the problems, achievements, and personal satisfaction of students who use the system in actual learning, which proves that the system can effectively assist aerobics teaching activities. By studying the image segmentation algorithm and artificial intelligence technology, this paper applies it to the field of aerobics action image simulation, so as to promote its technological development.

1. Introduction

In the early 1980s, aerobics became popular all over the world with the global fitness boom because of its strong vitality. The success of Beijing's bid for the Olympic Games in 2008 greatly affected national fitness awareness, and more and more people participated in sports activities [1]. Aerobics is one of the ten most popular "national fitness" sports in China. It not only has the unique charm of sports but also can help people maintain themselves and pursue the spirit of the times. It is a fashionable sport and is favored by people [2]. In modern society, due to environmental reasons and various other factors, people's living standards are improving day by day. Aerobics is widely valued by people due to its many advantages and practicability and attracts enthusiasts of all ages to participate, forming a certain large-scale loyal consumer group [3]. Various media took the opportunity to produce and promote aerobics-themed TV programs, thus earning enough ratings. Aerobics can be performed in a variety of environments, and its use of venues has a certain collective nature, so it provides a variety of opportunities for corporate advertising. Aerobics is favored by many companies [4, 5]. However, due to the complexity and professionalism of the technical movements of aerobics, ordinary people often face different situations in the learning process. Therefore, it is important to perform image simulation for the aerobics exercise process, which can be realized using artificial intelligence and image segmentation algorithm. Image simulation based on computer technology has completely changed the camera imaging process. It can study the influence of each imaging link on the imaging results and qualitatively or quantitatively describe the comprehensive performance of the measurement system. This helps us understand many factors that affect system performance. It also provides data support for the parameter optimization and design of the system modules. In addition, this paper also designs a kind of virtual experimental platform, which can save a lot of costs compared with the field test, and provides an analysis method for forming related strategies to further improve the actual imaging system. This paper studies the artificial intelligence aerobics action image simulation system, introduces the principle and optimization of the image segmentation algorithm, the artificial intelligence aerobics action image simulation design, and the aerobics exercise action image, and introduces the effect of the simulation application. Finally, the system is evaluated, and it is found that the system can effectively assist teachers in aerobics teaching.

2. Related Work

tThe literature proposes an image-oriented object detection algorithm, which is based on YOLO's traditional convolutional neural network Gaussian model. The article first analyzes the target image detection algorithm, explains in detail the YOLO convolutional neural network, summarizes the advantages and disadvantages of such algorithms, and solves problems such as the defect of candidate frame accuracy, based on this algorithm optimization [6, 7]. The literature proposes a target tracking algorithm for video, which has the characteristics of multifeature fusion and can filter the target video to identify its target features. The literature proposes a fusion target tracking algorithm, which can be simulated based on CN features. The HOG and LBP features are simulated, experiments are designed to prove the superiority of the fusion algorithm, and then the optimal parameters are selected [8]. The simulation results show that the optimization of the target detection algorithm can effectively improve its tracking accuracy. However, due to the increase in segment size, the complexity of the algorithm increases slightly, which can achieve a certain optimization effect [9]. The literature uses the transfer function method to explain the basic theory of image simulation, and then based on the analysis of the principle of the physical image of the camera, from the perspective of the modulation transfer function, the mathematical model of the spatial filtering effect is established [10]. Each sublink is studied from the camera imaging link, focusing on analyzing the influence of the changes in the model parameters on the imaging results. The literature establishes the corresponding calculation simulation model of each model, realizes the graphical modeling of each module under the Simulink platform, and completes the design and parameter setting of the input and output ports [11]. Based on the establishment of the model library, the imaging system of the target space measurement camera and the space measurement camera imaging system based on the Earth's atmosphere background were developed, respectively, and then the imaging correctness of the simulation model was verified [12].

3. The Principle and Optimization of the Image Segmentation Algorithm

3.1. Principle of the Traditional Image Segmentation Algorithm. The pixel value vector of an image consisting of N pixels is Z ($Z1$, $Z2$, $Z3$,. . ., ZN), and the pixel values can be grayscale values or RGB values. The segmentation of this image is represented by a mask vector. In general, determining the value of the mask vector is the solution to an optimization problem, i.e., x is the solution of the following optimization problem:

$$\begin{aligned} &\min_{r}\ f(\alpha) \\ &s.t. \\ &\alpha_i \in \{0,1\}, i = 1, \ldots, N. \end{aligned} \tag{1}$$

In general, the objective function $f(a)$ is the cost function of the segmentation.

The objective function $f(a)$ of the GrabCut segmentation algorithm is an energy function, which consists of two parts: one is the energy of the data element, and the other is the energy of the smoothing term.

In order to give the specific mathematical expression of the energy function, the s-t network diagram corresponding to the image is first introduced, as shown in Figure 1:

Figure 1 shows a schematic diagram of an s-t network graph. The sum of all t-links edge weights is called the energy smoothing term, denoted by V; the sum of all "n-link" edge weights is called the energy data term, denoted by U. The weighted average of the energy data term and the energy smoothing term is called the graph energy.

Define the matrix:

$\Phi_i = (\varphi(\alpha_i, k_i))_{2\setminus K'}, i = 1, \ldots, N;$ $\Phi = (\Phi_1; \Phi_2; \ldots; \Phi_N)_2 < NK, \Omega_i = (\mu(\alpha_i, k_i))_{2\setminus K}, i = 1, \ldots, N;$ $\Omega = (\Omega_1; \Omega_2; \ldots; \Omega_N)_{2\times NK}, \Sigma_i = (\Sigma_i(\alpha_i, k_i))_{2K},$ $i = 1, \ldots, N; \Sigma = (\Sigma_1; \Sigma_2; \ldots; \Sigma_N)_{2\setminus NK}.$(2)

Then, define the GMM model parameter set matrix Θ as follows:

$$\theta = (\Phi; \Omega; \Sigma)_{2\cdot 3NK} \triangleq \theta(\alpha, \mathbf{K}). \tag{3}$$

Let U be the data object energy, i.e., the edge weight between the pixel and the source and sink points of the s-t grid; then, U can be expressed as follows:

$$U(\alpha, \mathbf{K}, \theta, \mathbf{Z}) = \sum_{i-0}^{N} D(\alpha_i, k_i, \theta_i). \tag{4}$$

The expression of D (a_i,k_i, θ_i) is as follows:

$$D(\alpha_i, k_i, \theta, z_i) = \log\ \varphi(\alpha_i, k_i) p z_i \mid \alpha_i, k_i \theta, \tag{5}$$

where p ( ) is the probability density function of the Gaussian model function. Further calculation can be obtained as follows:

$$\begin{aligned} D\left(\alpha_i, k_i, \theta_{,z_i}\right) = -\log\ \varphi(\alpha_i, k_i) + \frac{1}{2}\log\ \det\ \Sigma(\alpha_i, k_i), \\ + \frac{1}{2}[z_n - \mu(\alpha_i, k_i)]^T \Sigma(\alpha_i, k_i)^1 [z_n - \mu(\alpha_i, k_i)]. \end{aligned} \tag{6}$$

Let C be the neighborhood of a pixel (usually four neighborhoods or eight neighborhoods), and let V be the energy of the smooth term, that is, the weight of the edge between each pixel in the s-t network, then V can be expressed as follows:

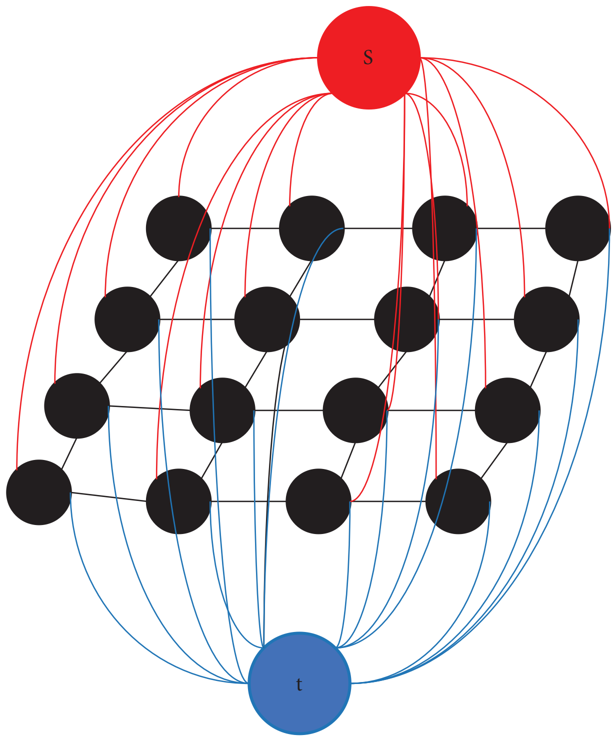

Figure 1: s-t network structure diagram.

$$V(\alpha, \mathbf{Z}) = \sum_{(m,n)iC} \left(1 - \delta_{a_m {}^a}\right) \| m - n\|^1 \exp - \beta 3 z_m - z_n \|, \quad (7)$$

where m *and* n are the positions of the pixels and δ_{aman} is the discrete δ function:

$$\delta_{\alpha_m \alpha_n} = \begin{cases} 1, & \alpha_m = \alpha_n, \\ 0, & \alpha_m \neq \alpha_n. \end{cases} \quad (8)$$

The parameter β has the following representation:

$$\beta = \left(2\langle \| z_m - z_n \|^2 \rangle\right)^1. \quad (9)$$

The Gibbs energy E of an image is defined as follows:

$$E(\alpha, K, 0, Z) = U(\alpha, K, 0, Z) + \gamma V(\alpha, Z), \quad (10)$$

where Υ is a coefficient greater than 0, representing the weight of the smoothing term.

3.2. Improvement of the Image Segmentation Algorithm. Aiming at the segmentation defect of GrabCut, this paper proposes a segmentation algorithm based on graph-based + GrabCut, which improves the segmentation performance. The specific flow of the algorithm is shown in Figure 2.

The specific steps to optimize the GrabCut algorithm are as follows:

(1) Perform graph-based region segmentation on the input image, maintain segmentation labels, and calculate segmentation results.

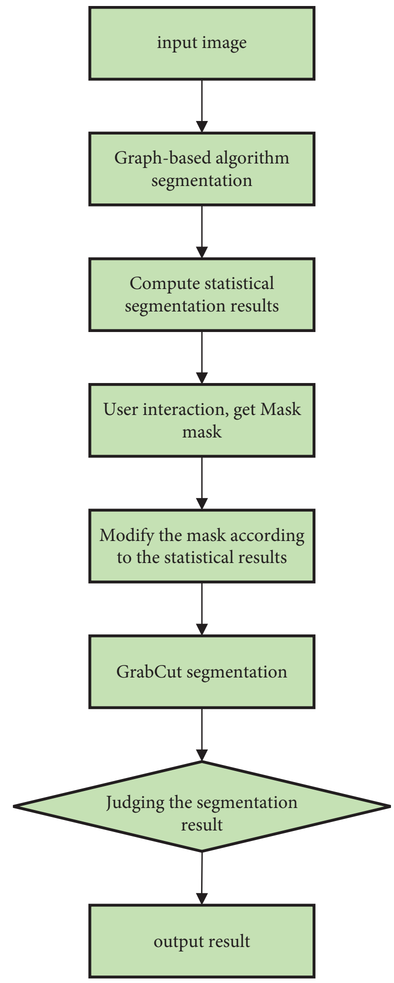

Figure 2: The improved GrabCut algorithm.

(2) Foruser interaction, start the mask graph and modify the mask according to the result of step 1. The scale of each label in the graph-based section that defines the user's rectangular area is L_i; then,

$$L_i - \frac{R_i}{S_i} i - 1, 2, \ldots, n, \quad (11)$$

where R_i is the number of labeled pixels i in the rectangle, S_i is the number of labeled pixels i in the entire image, and n is the number of all annotations in the rectangle. If L_i is less than a certain threshold, then it means that most of the pixels in this area are distributed outside the rectangular box, so changing the mask map of this area can be easily segmented.

(3) GrabCut segmentation is performed on the image to judge the segmentation effect.

3.3. Analysis of Image Segmentation Results. In the data point competition algorithm, the data point aggregation can be defined as the sum of the first r maximum similarities of the data points and the aggregation energy can be used to determine the result of the data point competition. The smaller the relative energy, the more likely it is to become a member

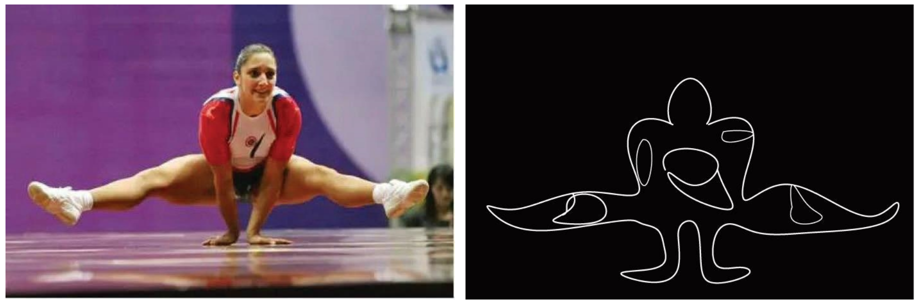

Figure 3: Image segmentation of aerobics movements.

of the class. The data point competition clustering algorithm performs clustering according to the aggregation energy defined by the data similarity matrix to obtain the final image segmentation result. The image segmentation result of aerobics is shown in Figure 3.

The optimized Jetson Nano model is deployed for testing. The accuracy and real-time performance of PR_Yolact before and after using TensorRT are compared. At the same time, TensorRT-based model inference accelerates and compares low-precision operations with different optimization precisions in the test set and test video. The experimental results of the inference acceleration control are shown in Table 1.

As can be seen from Table 1, the initial Yolact network model is not very good in terms of recognition time and accuracy. In terms of accuracy, the mAP changes on both the device side and the PC side are the same, but the delay speed is very different. At the same time, the influence of data types between different FPS models is also obvious. It can be seen that compared to the PR_Yolact model, the fp32-optimized half-precision TensorRT model increases the FPS by 2.65 times. Compared with the Yolact model, the FPS of the half-precision network hybrid fp32 model is improved to 2.70. Compared to the unoptimized Yolact model in the table, TensorRT fp16 loses 4% mAP when accelerated with TensorRT inference but improves the frame rate by 3.3x. Compared with TensorRT fp32, TensorRT fp16 has the highest optimization structure loss, reaching 56.74 and 34.38, respectively, while the FPS is increased to 2.70, and the converted model parameters are the lowest, which basically meet the expected design indicators.

Table 1: Inference effect on Jetson Nano.

Model	mAPBbox	mAPMask	FPS
Yolact	56.12	36.03	0.79
PR-Yolact	61.40	38.00	0.82
TensorRT fp32	58.33	35.76	2.17
TensorRT fpl6	56.74	34.38	2.70

4. Artificial Intelligence Aerobics Action Image Simulation Design

4.1. Image Simulation Process. The simulation calculation must use the input conditions, calculate, and output the correct simulated image according to the pixel equation. To achieve the goal of fast frame-by-frame computing, it is necessary to rely on GPU (Graphics Processing Unit) programming technology.

According to the calculation order and logical structure, GPU programming units are divided into vertex processors and fragment processors. Among them, the vertex processor first converts the 3D model: converts the top-level mesh data of the 3D model from the model coordinate system to the world coordinate system, and then converts it to the observation coordinate system by position. This process is based on the direction of the camera view surface and finally passes steps such as frustum clipping being mapped to the screen coordinate system; the fragment processor first calculates the pixel equation: first rasterizes the output data of the vertex processor to obtain two-dimensional data in the screen space, and then inputs the coordinates of the texture unit and simulation input. The data is substituted into the pixel equation for calculation, and finally, the simulated image is output pixel by pixel. In the GPU programming language, Cg can be used to write node and fragment handlers that perform grayscale calculations on the target background image. Synthesizer techniques are required for backscatter, noise, and MTF effects where pattern grid peaks are difficult to pinpoint. In essence, the synthesizer technology still uses the Cg language, but it belongs to the image postprocessing operation, that is, after the rendering is completed and before the image is output, the fragment processor is used again to perform operations such as grayscale superposition and convolution.

As shown in Figure 4, in the simulation calculation of aerobics motion, firstly, the vertex processor sends the vertex coordinates of the aerobics motion image grid to the fragment processor, such as factors and grid vertex positions, to calculate the aerobics motion image and the ambient light BRDF of the fragment processor; then, according to the pixel equation of the aerobics action image, the grayscale of the image is calculated pixel by pixel on the GPU; finally, according to the backscatter pixel equation, the noise is equal to the energy and the MTF convolution kernel and the post adds a synthesizer to the scattering, noise, and MTF effects to get a graphic simulation of aerobics movements and output.

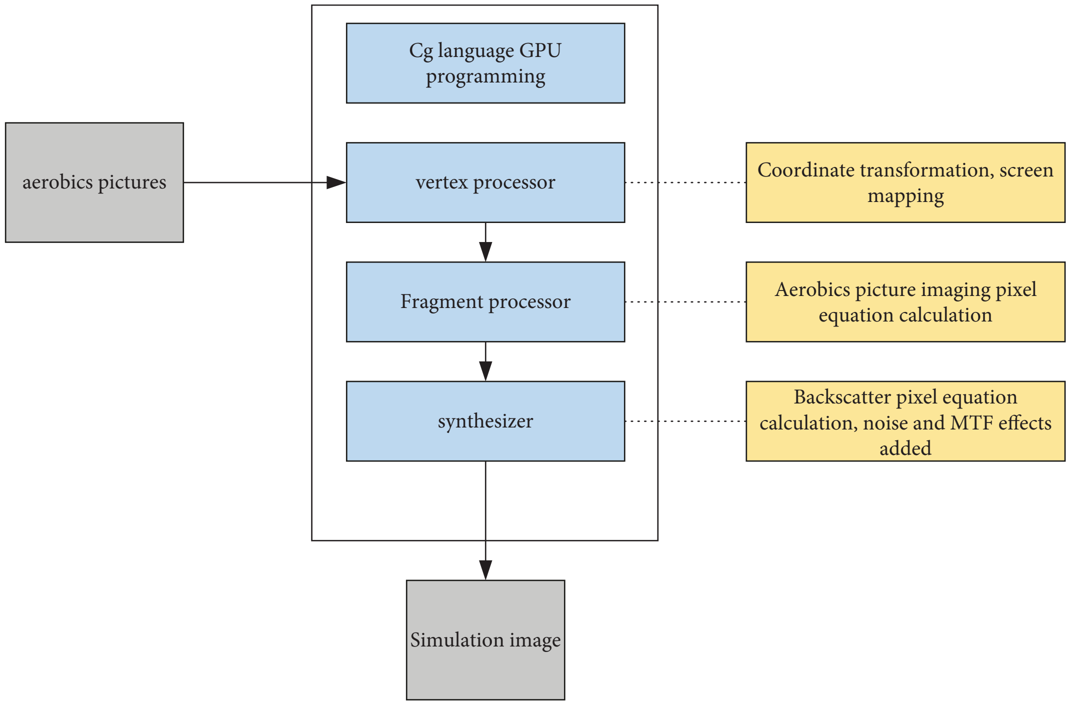

Figure 4: Schematic diagram of simulation calculation flow.

4.2. Design of Aerobics Action Image Simulation Module Library. A more powerful module is built based on Simulink's own module, which is equivalent to a subsystem of the simulation system. By encapsulating this subsystem, a user-defined function module can be obtained. The module library developed in this paper is mainly based on the existing Simulink module library and a small number of user-defined function modules built with function *S*. The current module library is as follows:

(1) Analyze the module to be created according to user needs and usage, and determine the module's function, name, input and output interfaces, and internal parameters.

(2) According to the function of the module, establish a mathematical model, analyze the data flow of the model, and establish a calculation model corresponding to the mathematical model.

(3) Convert the computational model to a Simulink model according to the data flow direction. The specific operation is as follows: open Simulink, first create an mdl file, then drag the required modules into the mdl file, connect the modules with connecting lines, and obtain the Simulink model corresponding to the mathematical model.

(4) Perform standard module encapsulation, and sett parameters, names, display icons, background colors, and so on.

The coordinate change module group is usually divided into the basic coordinate change module group of aerobics action shots and the common coordinate change module group. When the coordinate system is transformed, the main function of this group of modules is to translate and rotate the point or space vector according to the transformed value, as shown in Figure 5.

This group of electronic circuit filter modules consists of the CCD charge transfer module, low-pass filter module, high-pass filter module, and high-frequency lift module, which are used to simulate the effect of spatial signal modulation. It is established based on the mathematical model of the formula, as shown in Table 2. Parameter settings for all electronic circuit filter modules are listed.

The platform motion module group is composed of the linear motion module, high-frequency axial motion module, vertical axis high-frequency motion module, low-frequency axial motion module, vertical axis low frequency, and random module. They are used to simulate blurring of images due to platform movement. It is mainly based on the mathematical model acquisition of formulas. Table 3 lists the parameter settings of all platform motion filtering modules.

4.3. Experimental Environment Construction. The purpose of the scene management layer is to create and manage dynamic 3D scenes that can be rendered in real time. The scene should include the target background element and the camera element. By integrating the target background, controlling the camera window, and calculating the simulated image, the simulation results of any spatial position can be dynamically output.

This section mainly depends on the environment configuration of OGRE 3D image rendering engine and image simulation platform. Among them, OGRE is an open-source multi-GUI 3D rendering engine, which implements the core encapsulation of Direct3D and

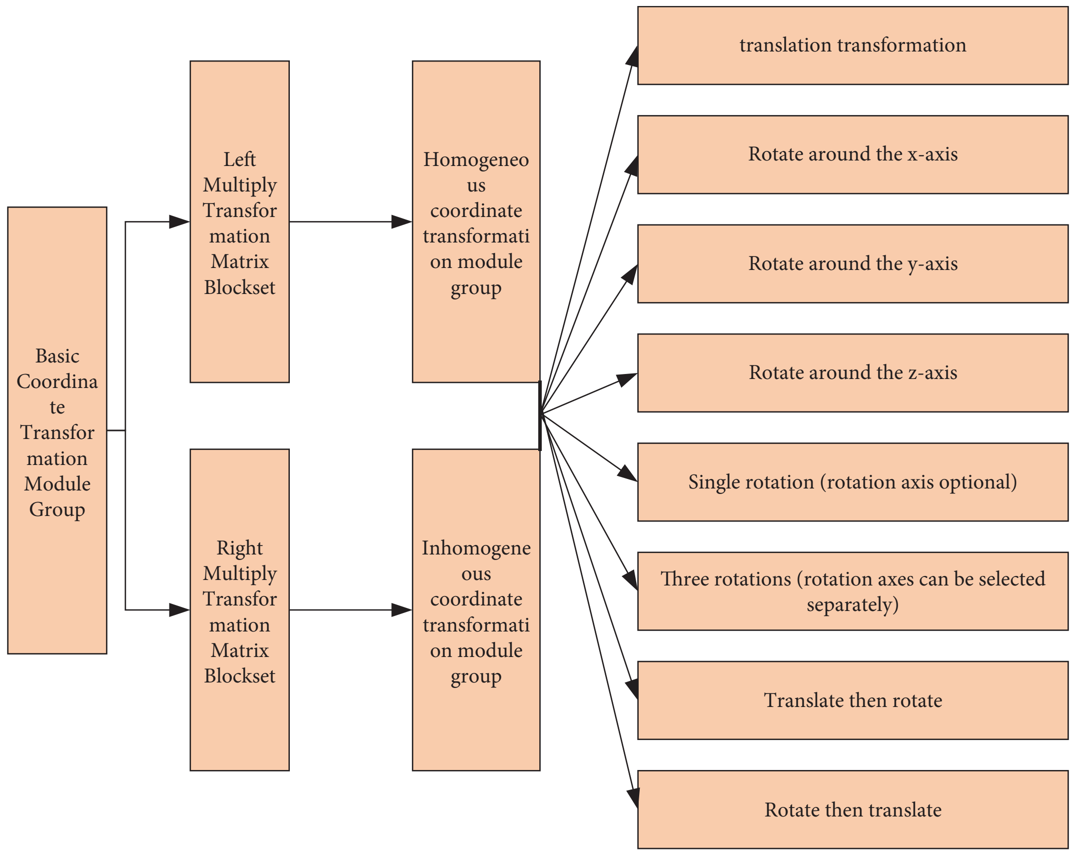

Figure 5: Basic coordinate transformation module group.

Table 2: Electronic circuit filtering Simulink block parameter settings.

Electronic circuit filter module	Parameter settings
High lift	Maximum lift frequency, lift multiple and order
High-pass filter	High-frequency cut-off frequency, filter order
Low-pass filtering	Photosensitive element center distance, low-frequency cut-off frequency, clock frequency of transfer output area, filter order
CCD charge transfer	Total number of charges transferred, charge transfer efficiency, pixel size

Table 3: Simulink block parameter settings for platform motion filtering.

Platform motion filter module	Parameter settings
Random jitter	RMS displacement
Nonaxial low frequency vibration	The equivalent image movement in the x-direction during the integration time and the equivalent image movement in the y-direction during the integration time
Axial low frequency vibration	Equivalent defocus amount during integration time
Nonaxial high frequency vibration	Amplitude in the x-direction, amplitude in the y-direction
Axial high frequency vibration	Amplitude, F-number of optical systems
Linear motion	Exposure time, image movement speed

OpenGL, supports Cg language and synthesizer technology, and only exposes an easy-to-use API (application programming interface). Using the C++ programming language to call the API, real-time interaction and data calculation can be realized, and simulated images can be dynamically generated in the screen space. In addition, the operation of the simulation platform depends on the reasonable configuration of the environment. The configuration used for development is shown in Table 4. At about 120 frames, the measured frequency can be stable and the output is smooth.

4.4. Quality Evaluation of Aerobics Action Image Simulation. Evaluating the quality of the simulated images can directly identify the imaging performance of the current system and

Table 4: Environment configuration of the image simulation platform.

Hardware Configuration	Central processing unit (CPU)	Intel(R) core(™) i5-12400 CPU @ 3.00 Hz
	Memory and hard disk capacity	16.00 GB RAM + 256 GB HDD
	Graphics card model	NVIDIA GeForce GTX 2080s
	Monitor	1920 × 1080 resolution
Software configuration	Operating system	Windows 10 64 bit
	Dependency library	Microsoft DirectX SDK (August 2021) vcredist x86
	Rendering engine	OGRE SDK 1.6.4

can also provide direction for further system design and optimization. In this section, the physical effect model and simulated images are comprehensively applied. By controlling the detection conditions and image effects, the degree of image blurring is studied, the target and background, signal-to-noise ratio, and action distance and influence are compared, and the influencing factors and system performance evaluation charts under each index are obtained. Due to the large number of parameters, the default input data selected in this section is only explained when data is replaced.

There are many factors that affect the degree of image blur, which can be quantified by entering fidelity. If the image size is $N \times M$, $f_s\,(I, j)$ is the grayscale of the simulated image pixel, and $f\,(i, j)$ is the grayscale of the image pixel after deblurring; the fidelity formula is as follows:

$$\text{fidelity} = 1 - \frac{\sum_{i=0}^{N-1}\sum_{j=0}^{M-1}\left(f\,(i, j) - f_s\,(i, j)\right)^2}{\sum_{i=0}^{N-1}\sum_{j=0}^{M-1} f^2\,(i, j)}. \tag{12}$$

The closer fidelity is to 1, the greater the image similarity and the clearer the simulated image.

The background contrast of the target mainly affects the detection and recognition of the target in the background. The higher the contrast, the sharper the target segment. For the aerobics action image imaging system, the background can be divided into the ground object background and the sky background. When taking the grayscale of the image as a parameter and referring to the concept of relative contrast, this paper defines the target background contrast as follows:

$$C = \frac{|\ \text{Gray}_t - \text{Gray}_b\ |}{\max\left(\text{Gray}_t, \text{Gray}_b\right)}. \tag{13}$$

In the formula, Grayt is the average gray level of the target area, and Grayb is the average gray level of the background in a smaller area outside the target contour.

5. Effect of Aerobics Action Image Simulation

5.1. Analysis of the Current Situation of Aerobics Teaching. From the results in Table 5, it can be seen from the students' point of view that the most obvious disadvantage of traditional aerobics teaching is that the teaching is too mechanical, and it is difficult to enhance students' interest in learning, accounting for 54.8%. 39.1% of people have different understandings of technical movements due to different angles. Because they know themselves better than others, students have little understanding of the influence of teachers on aerobics teaching and the same principle applies to teachers. From the teacher‘s point of view, 58.9% of the teachers believed that in the traditional teaching method, the nonstandard teacher's demonstration actions affected the teaching quality. 52.6% of teachers believe that teachers' performance in the classroom affects the quality of teaching. With the increase of age, their physical quality gradually declines. In teaching, there are many movements that may not be perfectly realized and the demonstration is not in place, thus affecting students' learning of skill movements; 31.6% of teachers mentioned that teachers' professional skills affect the teaching quality. In the aerobics teaching process there are multiple aerobics teachers at the same time. However, due to the different styles of aerobics, teachers are good at different styles. In teaching, they prefer their own teaching style. Some teachers may not change their teaching style for many years. The main disadvantage of the traditional teaching mode is that the method of acquiring information and knowledge is relatively conservative, and it is not easy for students to learn. Statistical table of problems in the auxiliary teaching of aerobics system in a university is as shown in Table 6.

Comparing Table 5 with Table 6, it can be seen that aerobics teachers and students in a certain college clearly feel the advantages of multimedia-assisted teaching and the ratio of teachers is higher than that of students. Teachers need to pay attention to the learning situation of students and the use of multimedia equipment in actual teaching. There are many tasks that should be held responsible. Therefore, they feel that controlling the classroom is no easier than traditional teaching methods. 37.9% of the teachers believed that the teachers could not use the aerobics auxiliary teaching system skillfully, which affected the teaching level; 29.5% of the teachers believed that the teachers failed to adapt to the current teaching mode, which led to the disorder of the teaching order. Similarly, when students see that teachers do not use or are not proficient in using equipment, they will think that teachers have poor teaching ability; 41.1% of students think that the effect of action image simulation is slightly lower than that of real-life demonstrations, which affects students' learning and understanding ability. This is because students learn by themselves based on the aerobics system. If the video effect is not good, such as failure to play, blur, irregular movements, and wrong teaching methods, it is easy to cause misunderstanding or direct learning of wrong actions, which will lead to the learning of teaching content. The progress is slowed down, which affects the teaching progress; teachers not only teach students knowledge but also take the responsibility of educating students' mental health. Therefore, some teachers (46.3%)

Table 5: Statistical table of problems in the traditional teaching mode of aerobics in a university.

Problems in the traditional teaching mode of aerobics	Teacher ratio (%)	Student ratio (%)
Teaching is too mechanical; it is difficult to enhance students' interest in learning	16.9	54.8
Teachers' professional skills affect the quality of teaching	31.6	18.2
Teachers' performance in the classroom affects the quality of teaching	52.6	26.8
Teachers' nonstandard demonstration actions affect the quality of teaching	58.9	23.0
Students from different positions and angles have different observation effects and different teaching results	40.0	39.1
Other	0.0	10.9

Table 6: Statistical table of problems in the auxiliary teaching of aerobics system in a university.

Problems in assisted teaching of aerobics system	Teacher ratio (%)	Student ratio (%)
Teachers fail to adapt to the current teaching model, leading to disordered teaching	29.5	16.0
Teachers are not proficient in using the aerobics auxiliary teaching system, which affects the teaching level	37.9	10.6
Compared with the real-life demonstration, the action image simulation is slightly less effective, which affects the students' learning and comprehension ability	23.1	41.1
Facing the camera and image collection may affect the sports confidence of some students	46.3	24.5
Other	8.4	8.6

still think that video feedback is useful for students to discover mistakes and correct themselves, but they are worried that doing so would affect their psychological level and students' self-confidence, so they did not use video feedback for teaching. But if the students cannot face the facts correctly, is this a good form of education? Therefore, it is unscientific to refuse to use video feedback for teaching. Instead, students should understand what it means before using it and should have a good attitude to get more benefit from it. In addition, some students resist the aerobics system-assisted teaching because of poor teaching quality and their ability to learn and understand cannot keep up with most of their peers. Therefore, different levels of teaching are carried out according to their needs.

5.2. Problems Existing in the Teaching of Aerobics in Colleges and Universities

5.2.1. Some Teachers Have Too Deep Traditional Teaching Concepts. Many teachers still feel that multimedia teaching is far removed from the teaching methods they usually use. Modern teaching emphasizes taking students as the main body, allowing students to be independent, innovative, and individualized. The teaching method of teachers is important, but more important is the education of students [13]. If the learning method becomes monotonous, it will burden the students' subtle thinking, which will reduce the students' future development space, which is an unsustainable teaching method. Without the aid of computerization, teaching will soon become out of date. Outdated concepts of teachers are a potential large-scale risk [14].

5.2.2. The Level of Production and Use of Aerobics System Courseware in Aerobics Theory Class Are Relatively Low. The problems existing in the production of aerobics theory courses are mainly that the courses come from a wide range of sources, the courses lack a unified orientation and systematization, and the courses designed by teachers themselves are of low quality and lack of focus. There are difficulties in the content, the content is too much, the teaching method is single, and there is a lack of characteristic image. The advantages of the aerobics system have not been fully utilized, the content of the teaching materials is simply copied in the course, and the aerobics system is like a projector [15]. In use, because the lecture speed is too fast and the content is too large, it is difficult for students to understand the key points and it is inconvenient to take notes, which affects the learning effect and has a specific impact on the review effect and after-class exams. Some teachers' teaching process is as rigid and mechanical as chanting scriptures [16]. Combined with the dim lighting in the classroom, it is easy to make students feel bored and sleepy. Over time, students get bored and lose their initial interest and enthusiasm [17].

5.2.3. Teachers Rely Too Much on the Aerobics System in Teaching. Due to the many advantages of the aerobics system teaching, it has become an important part of the physical education teaching method, but in the process of using it, some teachers have a wrong understanding of the aerobics system teaching and think that a good class should use the aerobics system. Many teachers blindly rely on the aerobics system technology, continue to use the aerobics system technology, but do not focus on improving their own teaching quality, so that if the equipment fails during the class, the teaching will not continue.

5.3. Analysis of Aerobics Action Image Simulation. The comparative analysis of the accuracy, proficiency, coordination, and expressiveness of aerobics movements in the experimental class and the control class is shown in Table 7:

Table 7: Comparative analysis of the accuracy, proficiency, coordination, and expressiveness of aerobics movements between the experimental class and the control class.

Accuracy	Very accurate (%)	More accurate (%)	Precise (%)	Inaccurate (%)
Experimental class	34	56	8.4	1.6
Control class	20	57	16.4	6.6
Proficiency	Very skilled (%)	More proficient (%)	Proficiency (%)	Unskilled (%)
Experimental class	36.2	50	8.8	5
Control class	33.1	51	10.9	5
Coordination	Very coordinated (%)	More coordinated (%)	Coordination (%)	Dissonance (%)
Experimental class	40	40	15	5
Control class	35.4	51	4.6	10
Expressiveness	Very good (%)	Good (%)	Fair (%)	Poor (%)
Experimental class	21	55.5	16	6.5
Control class	8.4	62	13	16.6

Table 8: Comparative analysis of the experimental class and the control class.

Group	Mean	SD	*T* value	*P* value
Experimental class	72.28	4.577	0.198	0.355
Control class	73.47	4.866		
—	Girls class		Boys class	
	Number	Percentage	Number	Percentage
Excellent	16	80.00%	10	50%
Good	4	20.00%	8	40%
Pass	0	0	2	10%
Failed	0	0	0	0
Total	20	100%	20	100%
The average score	83.2	81.4		
P value	0.0136			
—	Boys control class		Girls experimental class	
	Number	Percentage	Number	Percentage
Excellent	3	15.00%	16	80.00%
Good	10	50.00%	4	20.00%
Pass	7	35.00%	0	0
Failed	0	0	0	0
Total	20	100%	20	100%
The average score	78.6		83.2	
P value	0.0746			

From the data analysis in Table 7, it can be seen that there is a certain gap between the motion accuracy design of the experimental class and the control class, and the score of the experimental group is higher than that of the control group. Therefore, adding a video feedback mode during the teaching process can effectively improve the accuracy of students' movements. There is only a small gap between the technical ability of the students in the experimental group and the control group. The former has a higher coordination score than the latter, and most of the latter's data are in a relatively coordinated stage. Multimedia assistance for the actual teaching of aerobics can effectively promote the development of students' coordinated physical quality.

As shown in Table 8, the results of the girls' experimental class are higher than that of the boys' experimental class, but there is no significant difference.

As shown in Table 9, 15% of aerobics teachers are very satisfied with using the aerobics system to teach aerobics practice classes, 25% of teachers are relatively satisfied, 35% of aerobics teachers are basically satisfied, 15% of teachers are not satisfied, and only 10% of teachers expressed dissatisfaction. From the data in the table, we can draw the following conclusions: most aerobics teachers believe that it is necessary to use the aerobics system for auxiliary teaching in aerobics classes, which can give full play to the advantages of the aerobics system and make up for the shortcomings of traditional aerobics teaching. Some aerobics teachers with backward educational concepts feel that it is meaningless, and they are not satisfied with the use of aerobics system to assist teaching.

The survey results in Table 10 show that 40% of the students are very satisfied with the use of the aerobics system for auxiliary teaching in aerobics teaching, 30% of the students are relatively satisfied, and only 5% of the students are dissatisfied with the aerobics system for auxiliary teaching.

5.4. Application Strategy of Aerobics Action Image Simulation

(1) According to different teaching stages and different teaching tasks, we grasp the time and frequency of using the intelligent aerobics action simulation system.

Table 9: Statistical table of satisfaction of teachers using the aerobics system in practice class of aerobics teaching in a university ($n = 20$).

Teacher satisfaction	Frequency	(%)
Very satisfied	3	15.0
Quite satisfied	5	25.0
Basically satisfied	7	35.0
Not so satisfied	3	15.0
Not satisfied	2	10.0

Table 10: Statistical table of students' satisfaction with the use of aerobics system in practice classes of aerobics teaching in a university ($n = 100$).

Student satisfaction	Frequency	%
Very satisfied	40	40.0
Quite satisfied	30	30.0
Basically satisfied	15	15.0
Not so satisfied	10	10.0
Not satisfied	5	5.0

(2) People should summarize various experimental research results and create a comprehensive and complete theoretical system of the intelligent aerobics exercise simulation system.
(3) Teachers should adjust the teaching plan in time, update the teaching method in time, and find the most suitable teaching method according to the teaching effect of each class and the feedback of students.
(4) The teaching method of intelligent aerobics action simulation system not only cultivates students' action imitation thinking but also helps teachers to improve their own teaching level. Teachers should not only operate the software system proficiently but also use it freely in the classroom, which is a test of teachers' ability to accept new things. Therefore, teachers should always learn and improve their abilities according to the requirements of the times.

6. Conclusion

Aerobics is an emerging sport that combines gymnastics, dance, and music. It has unique creativity and unique sense of rhythm and is an organic combination of art and sports, fitness, and beauty. There are many movements in aerobics, which help to improve the coordination and flexibility of the movement, but its own technical movements are more complicated. Based on this point, this paper studies an artificial intelligence aerobics action image simulation system using artificial intelligence technology and the image segmentation algorithm and uses image simulation feedback as a new method of aerobics teaching, which can be used to improve and adjust the movement requirements of aerobics teaching. This paper mainly introduces the image simulation and system design in detail and analyzes and improves the image segmentation algorithm, which is superior to the traditional GrabCut algorithm in segmentation accuracy and can be well divided. In terms of movement teaching, the system can help students who are exposed to aerobics to effectively reduce the injury rate of aerobics.

Data Availability

The data used to support the findings of this study are available from the author upon request.

Conflicts of Interest

The author declares that he has no conflicts of interest.

References

[1] L. Fuxiang, "Adaptive recognition method of aerobics decomposition action image based on feature extraction," *Science Technology and Engineering*, vol. 19, no. 7, pp. 148–153, 2019.
[2] P. Zaletel, G. Gabrilo, and M. Perić, "The training effects of dance aerobics: a review with an emphasis on the perspectives of investigations," *Collegium Antropologicum*, vol. 37, no. Suppl 2, pp. 125–130, 2013.
[3] A. Vitartaite, A. Vainoras, V. Sedekerskiene, and J. Poderys, "The influence of aerobics exercise to cardiovascular functional parameters of 30-40 year old women," *Medicina*, vol. 40, no. 5, pp. 451–458, 2004.
[4] M. Said, N. Lamya, N. Olfa, and M. Hamda, "Effects of high-impact aerobics vs. low-impact aerobics and strength training in overweight and obese women," *The Journal of Sports Medicine and Physical Fitness*, vol. 57, no. 3, pp. 278–288, 2017.
[5] M. MacKay-Lyons, S. A. Billinger, J. J. Eng et al., "Aerobic exercise recommendations to optimize best practices in care after stroke: AEROBICS 2019 update," *Physical Therapy*, vol. 100, no. 1, pp. 149–156, 2020.
[6] L. Yang, Z. Wang, and S. Gao, "Pipeline magnetic flux leakage image detection algorithm based on multiscale SSD network," *IEEE Transactions on Industrial Informatics*, vol. 16, no. 1, pp. 501–509, 2020.
[7] L. Qi, B. Li, L. Chen et al., "Ship target detection algorithm based on improved faster R-CNN," *Electronics*, vol. 8, no. 9, p. 959, 2019.
[8] D. Smith and S. Singh, "Approaches to multisensor data fusion in target tracking: a survey," *IEEE Transactions on Knowledge and Data Engineering*, vol. 18, no. 12, pp. 1696–1710, 2006.
[9] É. L. Souza, E. F. Nakamura, and R. W. Pazzi, "Target tracking for sensor networks: a survey," *ACM Computing Surveys*, vol. 49, no. 2, pp. 1–31, 2016.
[10] Z. Wang, Z. Zhou, H. Zhang, G. Zhang, H. Ding, and A. Farouk, "AI-based cloud-edge-device collaboration in 6G space-air-ground integrated power IoT," *IEEE Wireless Communications*, vol. 29, no. 1, pp. 16–23, 2022.
[11] L. Zhou, W. Min, D. Lin, Q. Han, and R. Liu, "Detecting motion blurred vehicle logo in IoV using Filter-DeblurGAN and VL-YOLO," *IEEE Transactions on Vehicular Technology*, vol. 69, no. 4, pp. 3604–3614, 2020.
[12] B. Y. Lee, K. M. Bacon, M. E. Bottazzi, and P. J. Hotez, "Global economic burden of Chagas disease: a computational simulation model," *The Lancet Infectious Diseases*, vol. 13, no. 4, pp. 342–348, 2013.

[13] J. Peng, W. Xu, and H. Yuan, "An efficient pose measurement method of a space non-cooperative target based on stereo vision," *IEEE Access*, vol. 5, pp. 22344–22362, 2017.
[14] L. Huang, "Research on the application of the function of computer management system in college aerobics teaching," *Journal of Physics: Conference Series*, vol. 1744, no. 3, Article ID 032148, 2021.
[15] C. Deng, "Optimization of college physical education curriculum system based on sports literacy theory," *Leisure*, vol. 21, no. 2, p. 155+158, 2019.
[16] B. A. Sibley and S. M. Bergman, "Relationships among goal contents, exercise motivations, physical activity, and aerobic fitness in university physical education courses," *Perceptual & Motor Skills*, vol. 122, no. 2, pp. 678–700, 2016.
[17] Z. Liu and Y. Wu, "Design of a university aerobics teaching network information platform (ATNIP)," *World Trans. on Engng. and Technol. Educ*, vol. 13, no. 1, pp. 34–37, 2015.