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Retraction

Retracted: Analysis of the Structure of Aerobics Complete Sets of Movements Based on Genetic Algorithm

Security and Communication Networks

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] H. Yang, F. Miao, and X. Deng, "Analysis of the Structure of Aerobics Complete Sets of Movements Based on Genetic Algorithm," *Security and Communication Networks*, vol. 2022, Article ID 9063568, 9 pages, 2022.

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Research Article

Analysis of the Structure of Aerobics Complete Sets of Movements Based on Genetic Algorithm

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As an independent sport, aerobics is a popular and highly popular sport that integrates group gymnastics, dance, music, fitness, and entertainment. With the continuous development of global fitness fever and happy sports in recent years, the classification of aerobics has become more and more extensive. The development of fitness aerobics and competitive aerobics conforms to the trend of the times. In the course of aerobics teaching, action structure analysis is essential, and the performance of decomposing action image recognition has a direct impact on the effect of aerobics teaching. Therefore, it is important to study an effective aerobics complete set of action structure analysis method. In order to solve the problem that the traditional method is easily affected by the movement rate, lighting conditions, occlusion, complex background, etc., resulting in poor robustness of the recognition results, this paper takes the complete set of aerobics movements as the initial population and then designs the adaptation of the aerobics movements. The degree function is used to realize the structural analysis of aerobics complete sets of movements through the genetic algorithm. First, the video sequence is divided into several segments by using the time energy pyramid, and the human body target for aerobics exercise is extracted by the background subtraction method, and the decomposition actions of aerobics are obtained. By calculating the fitness of different actions, the fitness of the complete set of actions is obtained and then realize the analysis of aerobics complete sets of movements. The structural analysis of aerobics complete sets of movements can not only improve the choreography efficiency of complete sets of movements, but also promote the improvement of the training level of aerobics athletes, and help coaches make relative adjustments and changes in teaching on the basis of the original training of athletes.

1. Introduction

Aerobics originated in the United States. It was first created by the American Dr. Nice Cooper in the 1960s to create a set of exercise systems with cardiopulmonary function training as the main purpose. Since then, it has been promoted to people in all fields of society [1]. Aerobics is highly sought after by aerobics enthusiasts and gradually matures. This is mainly because aerobics has physical fitness, regardless of the age level, suitable for old and young, rich and novel, with a wide range of mass and rich in a distinct sense of rhythm and rhythm characteristics. With the improvement of the project, according to different purposes and tasks and according to the needs of different groups, aerobics can be divided into three categories: fitness aerobics, competitive aerobics, and performance aerobics [2].

Among them, competitive aerobics is the most representative kind of aerobics, competitive aerobics is highly performative and has strong viewing and fitness value. According to the theory of item groups, it belongs to the skill-led category of difficult and beautiful performances. It is one of the competitive sports, and its main purpose is to “compete and win”. Competitive aerobics is a sport that can perform continuous, complex, and high-intensity complete sets of movements under the accompaniment of music. It is a combination of continuous movements to show athletes “health, strength and beauty”. Competitive aerobics originated from Traditional fitness aerobics is developed from a series of strict requirements on body flexibility, muscle strength, and endurance, as well as a perfect combination of complex arm movements and seven basic steps under the feet [3]. They completed beautiful, changeable, and smooth sets of movements on a specified 5-square-meter field within a specified time of 1.5 to 2 minutes. A large number of freehand movements were also added to the set of movements at that time. And dance moves and simple technical movement elements have appeared [4].

The necessary condition for competitive aerobics to obtain excellent sports performance is the innovative arrangement of complete sets of movements, and a set of novel complete sets of movements will directly attract the attention of the audience and the referees. Arrange a complete set of competitive aerobics routines, the content must include calisthenic movements, difficult movements, transition and connection movements, lifting and cooperating movements; the content process of the arrangement should reflect a complete set of dynamic and smooth, especially transition and connection movements. The variety of choices and the complex innovation of the movements; the content of the complete set of movements should be taken into account in the balanced and effective use of various areas of the vertical space and the plane space, that is, the ground, standing, vacated and the entire horizontal area, and the time sequence of the complete set of movements. Reasonable adjustments should also be made according to the orchestration requirements [5]. Action choreography has the highest score in the final value judgment of the entire set [6]. Therefore, it is particularly important to analyze the structure of aerobics complete sets of movements, which can not only improve the choreography efficiency of complete sets of movements, but also promote the training level of aerobics athletes, and help coaches make relative teaching based on the original training of athletes. Adjustments and changes. Based on this, this paper takes the complete set of aerobics as the initial population and then designs the fitness function of the aerobics action.

2. State of the Art

Without rules, no circle can be formed. Rules play a decisive role in the development of grading projects. The promulgation of the new cycle of competitive aerobics rules will inevitably promote the development of this project. Only after in-depth research on the rules of competitive aerobics by members has the project developed rapidly in China. According to the rules formulated by aerobics, the action structure of competitive aerobics decomposition is conducive to our understanding of aerobics.

Competitive aerobics complete sets of movements include calisthenic movements, difficult movements, transition/connection movements, formation/position, lift movements, and dynamic coordination [7]. It mainly includes the technical content of the system as shown in Figure 1.

The choreography of the complete set of competitive aerobics movements is gradually becoming more artistic. The high-level artistic expression of competitive aerobics is the perfect combination of technical beauty and innovative beauty of the complete sets of movements. This development trend is becoming more and more obvious. Difficulty, novelty, and oddity in the choreography of complete sets of actions are the keys to winning. Therefore, the choreography of complete sets of actions is not only the process of arranging simple single actions, but also the organic combination of actions in modeling and music and changing the combination of previous actions. The model, combined with the laws of human body structure, perfectly appears in another innovative form [8]. To create a basic combination of ingenious, increase the effect of the action, make the action strong and powerful, and make the referee impressed and unforgettable after watching it. This is the creative process of tactical adjustment and placement of the main content of the complete set of actions through artistic means. Transition and connection movements are the necessary movements to connect the basic steps, calisthenic movements, difficult movements, lifts, and shapes of aerobics in a set, as well as to achieve space conversion, and are one of the leading factors to make the set seamless and smooth [9]. Transition and connection actions can increase the sense of space in the complete set and act as a bridge and link in the set in terms of adjusting and adjusting and mobilizing physical strength and assisting difficult movements and one of the main criteria for artistry.

Creation technology is an important constituent element of the technical system of competitive aerobics. To improve the creation technique, we must first broaden our creation ideas ideologically. Xianxiong conducted a detailed analysis of the transition and connection movements of the top eight men's singles athletes in the World Championships, analyzed the proportion of transition and connection movements in the complete set of movements, and found that 80% of the men's singles players' transition and connection movements accounted for nearly one-third of the total proportion of the complete set [10]. Xia conducted a tentative study on the creation and editing of competitive aerobics assisted by computer three-dimensional animation technology. Zhang Hong introduced the art term "mutation composition" into the field of aerobics creation, raised the unconscious mutation creation phenomenon in actual creation to the height of theory, and carried out theoretical positioning [11]. Huijun introduced the idea of connection into the creation of competitive aerobics, providing more information and a broader selection space for the creation and creation of jazz dance, Latin dance, and hip-hop in competitive aerobics. Yu pointed out that the use of the visual expression to design aerobics choreography can cause visual impact and infection and can achieve a good choreography effect. Finally, Chunying proposed to explore and analyze the conditions for aerobics complete sets of movements to be protected by copyright law, and thus arouse the creators of aerobics to establish the awareness of intellectual property protection and guide the project to develop better [12]. Through the research of the above scholars, we can find that if athletes want to achieve excellent results in competitive aerobics, they must innovate in the movement structure and have innovative consciousness in the process of aerobics choreography.

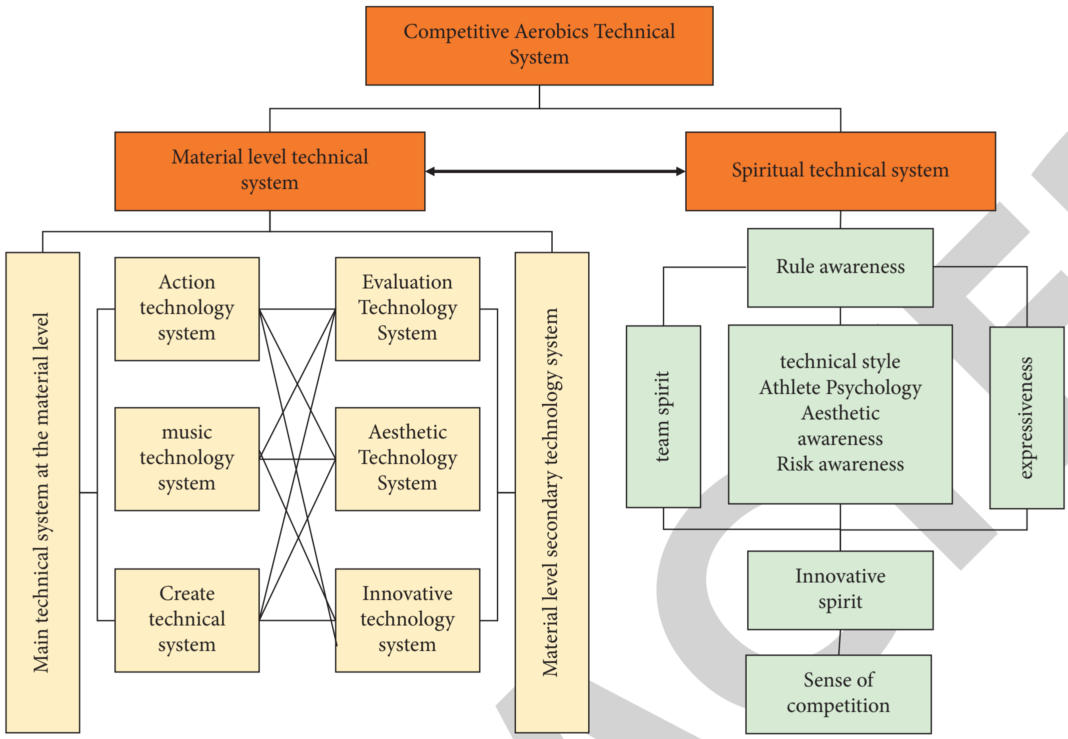

Figure 1: Competitive aerobics technical system and its relationship.

In most cases, the number of transition and connection movements used in a set is affected by difficult movements. On the other hand, the new rules advocate the use of multidimensional space movements, highlighting the ornamental nature of the set, so that the whole set of movements is not only a single movement surface, a single movement The axes and actions are concentrated in a complete set of spatial levels. The combination of transitions and connecting actions should be used to demonstrate the spatial three-dimensionality of the routine. Generally speaking, a single transition action needs 2–6 shots to complete, and the transition and action take up the shot. In the past routines, most of the knots appeared in a single form [13]. In the development cycle of transition and connection movements, the difficulty of movements gradually increases, the structure becomes more complex and novel, and appears in the routine in the form of combination or superposition, and the action rhythm also increases without reducing the frequency of individual movements.The emergence of this combination of transition and connection movements, on the one hand, increases the viewing value of the movements and the number of movement space transitions, on the other hand, it also requires more time and physical fitness, and requires higher overall quality of the athletes themselves."

3. Methodology

3.1. Competitive Aerobics Movement Technical System and Scoring Rules. Through understanding the technical system of competitive aerobics action, it is conducive to our technical decomposition of competitive aerobics, so as to promote the training level of aerobics athletes. The movement technique system of competitive aerobics is the core part of the main technical system of the material level of competitive aerobics, and it is also the most important element of the main technical system of the material level of competitive aerobics [14]. According to the division of complete sets of competitive aerobics and the technical characteristics of competitive aerobics in the competition rules of FIG2 009.2012, the technical system of competitive aerobics movements is divided into basic technology, difficulty technology, connection technology (transition connection technology), coordination technology, modeling technology, and control technology are studied in six aspects (see Figure 2).

3.1.1. Basic Technology. Basic technique is the most basic and essential element that constitutes the movement technique system of competitive aerobics. Bouncing technology, posture technology, and exercise technology reflect the essential characteristics of competitive aerobics technology, are the basis of competitive aerobics technology, are the symbol of competitive aerobics that distinguishes it from other sports, and are the thing of competitive aerobics. The performance of the fundamental features we call the basic technique [15].

3.1.2. Difficulty Technology. Difficulty technique is an important component of the action technique system of competitive aerobics. Without difficulty, there is no competition. There are 359 difficult movements listed in the rules of competitive aerobics. According to whether

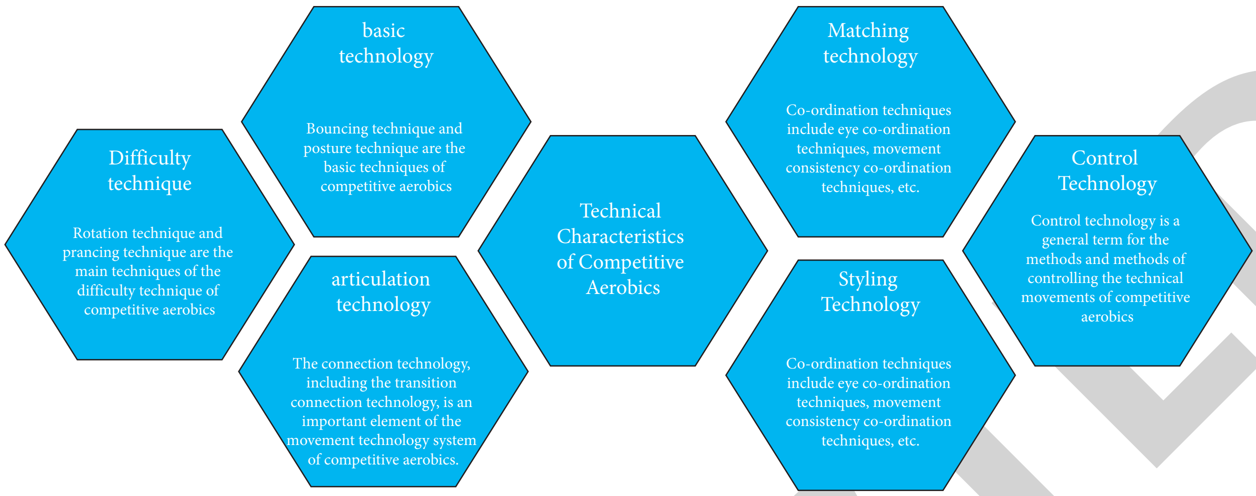

Figure 2: Competitive aerobics movement technique system and its relationship.

there is flying in the difficult movements, the difficult movements can be divided into aerial difficult movements and nonaerial difficult movements. The classification is based on the contact between the foot and the ground (impact), i.e., the presence of aerials (using the ground as a frame of reference), and by analogy, the following classification table is derived, and the difficulty and the amount of impact can be judged as large, medium, or small according to the impact of the movement on the ground. Difficulty movements can be divided into swivel movements and non-swivel movements (see Table 1). It can be seen that the swivel technique and the prancing technique are the main techniques of the difficulty technique of competitive aerobics. The jumping technology includes take-off technology, aerial technology, and landing technology.

3.1.3. Connection Technology. The connection technology includes transition connection technology, which is an important component of the competitive aerobics movement technology system, an important component of the subsystem, and organically connects the competitive aerobics movements and the movements or the elements within the movement technology system to ensure the competitive aerobics.

3.1.4. Matching Technology. Coordination technique is an important "member" in the action technique system of competitive aerobics, and it is the main technical element of the collective project of competitive aerobics. Co-ordination technique refers to the general term for the methods in which individuals and groups cooperate with each other to complete movements, form formation patterns, complete lifts, and create shapes. The coordination techniques include eye coordination technology, movement consistency coordination technology, dynamic coordination technology and lift coordination technology, body position, and formation change coordination technology.

Table 1: Classification and quantity of difficult movements.

Action category	Subdivision category	Quantity
Flying class	Swivel class	163
	Non-swivel	49
Nonflying class	Swivel class	81
	Non-swivel	66

3.1.5. Control Technology. The control technology is not only a constituent element in the technical system of competitive aerobics movements, but also the main line running through the technical system of competitive aerobics movements, a complete unity.

Scoring rules are the legal basis for competitive events, and competitive aerobics scoring rules guide the development direction of competitive aerobics. Therefore, to discuss the special characteristics of competitive aerobics, it is necessary to understand the requirements of the scoring rules. "2013–2016 Cycle International Gymnastics Federation Aerobics Scoring Rules" is provided by the International Gymnastics Federation (FIG) Executive Committee and has been officially implemented since January 1, 2013. The requirements of the new rules for competitive aerobics are shown in Table 2.

3.2. Human Gesture Recognition Method. In the structural analysis of aerobics complete sets of movements, the first and foremost is to predict the movement trajectory and movement trend of the athlete's movements according to the information such as the position and shape of the body parts, and judge whether there are errors or irregular movements in the aerobics movements [16]. Therefore, it requires that the number of keyframe sets should be as few as possible, and the local topological structure of human actions should be expressed more accurately. Embedding the spatiotemporal features of human body parts in the flexible hybrid articulated human body model can effectively improve the robustness of the human body and action recognition, and use human body pose parameters and action features to

Table 2: Major adjustments in the new cycle scoring rules.

Content	Require
Fucking	There are clear requirements for the number and route of operation units
Transition link action	Clarified the concept and specific types of violation actions
Skill action	Clarified the concept, type, quantity and connection of skill movements

determine the keyframes of motion video [17]. The so-called "robustnessm" refers to the control system in a certain (structure, size) parameter perturbation, to maintain some other performance characteristics. That is, the robustness of the system is the key to the system survival in abnormal and dangerous situations. For example, whether the computer software in the input error, disk failure, network overload, or intentional attack, can not crash, is the robustness of the software.

According to the definition of the flexible hybrid articulated human body model, the problem pose p a cost minimization problem, and its cost function $C(I, p)$ is:

$$C(I,p) \propto \sum_{u\in V} \varphi(I,p^u) + \sum_{(u,v)\in E} \psi_{u,v}(p^u - p^v). \tag{1}$$

When the FMP model is calculated by using the optical flow difference between before and after

$$\theta(p_t, p_{t+1}, I_t, I_{t+1}) = \sum_{u\in V} \left\| p^u_{t+1} - p^u_t - f(p^u_t) \right\|_2^2. \tag{2}$$

Assuming that the frame image set of a section of motion video is I, and the estimated pose parameter sequence is P, then the cost of obtaining P from I by using the model is:

$$C(I,p) + \sum_{t=1}^{T-1} C(I,p) + \lambda\theta(p_t, p_{t+1}, I_t, I_{t+1}). \tag{3}$$

When using FMP pose viewed. First, without considering the spatiotemporal continuity constraints of human poses, a set of K human poses is generated from a single frame image. Due to motion blur and self-occlusion, some human body parts in Kb, such as the elbows (le, re), wrists (lw, rw), knees (lk, rk) identified by the eight white dots in Figure 3, and ankle joints (la, ra). (called nondeterministic parts), it is difficult to estimate accurately [18]. With the help of the local temporal continuity of human body parts (represented by four dashed edges in Figure 3 to improve the accuracy of human body pose estimation, (3) is modified as:

$$C(I,p) + \sum_{t=1}^{T-1} C(I,p) + \overline{\lambda_1} \sum_{u\in V} \left\| p^u_{t+1} - p^u_t - f(p^u_t) \right\|_2^2. \tag{4}$$

When the K attitude parameters of each frame image are obtained, the optimal is determined by minimizing formula (3), namely:

$$\min_{p_t\in P_{t,\forall t}} C(I,p) + \sum_{t=1}^{T-1} C(I,p) + \lambda\theta(p_t, p_{t+1}, I_t, I_{t+1}). \tag{5}$$

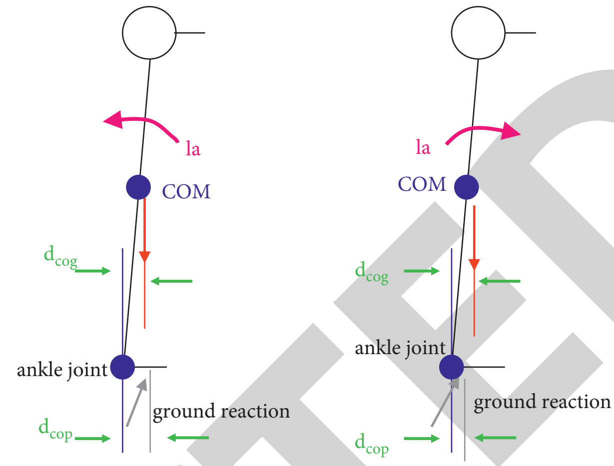

Figure 3: Commonly used human body models.

3.3. Analysis of Aerobics Movement Based on Genetic Algorithm

3.3.1. Traditional Genetic Algorithm. Genetic Algorithm, referred to as GA, is a computational model that combines biological evolution and genetics. It can simulate the process of natural biological evolution through mathematical methods, the process of problem-solving, and the selection and crossover of chromosomal genes in the process of biological evolution mutation, etc. [19].

The algorithm steps of the traditional genetic algorithm (GA) are as follows:

Step 1: Initialization: first set a counter $i = 0$ $(i \leq t)$, used for statistics of evolutionary algebra, set the most large evolutionary algebra t $(t > 0)$, followed by the initialization of the population P(0), the population contains M $(M > 0)$.

Step 2: Individual evaluation: calculate the fitness of each individual included in the population $P(i)$, and count the calculation results.

Step 3: Selection operation: perform selection operation on the individuals of the population. Sorting is performed according to the individual fitness of step (2), and then select the optimized individuals that meet the conditions to perform direct genetic operations or generate offspring individuals through pairing and crossover to complete the genetic operations.

Step 4: Crossover operation: perform crossover operation on the individuals of the population. This is the core step of the genetic algorithm. The crossover operator is controlled by the crossover probability to complete the crossover operation on the population, thereby generating a new population.

Step 5: Mutation operation: perform mutation operation on the individuals of the population. Complete the changes to the gene values of individuals in the population after crossover. When a population $P(i)$ has undergone selection, crossover, and mutation operations, a new generation of population $P(i+1)$ will be obtained.

Step 6: Judgment of termination condition: if $i \leq t$, it means that the population has not reached the maximum evolutionary algebra, then $i = i + 1$ to perform step 2; if $i = t$, it means that the population has reached the maximum evolutionary algebra. The optimal solution is output, and the optimal solution is the individual with the maximum fitness, and finally the algorithm is terminated.

The specific flow chart of the traditional is shown in Figure 4.

3.3.2. Improved Genetic Algorithm. The fitness of a single action can be set according to the technical system of competitive aerobics movements and the scoring rules, and punishment items can be set according to the deduction item.

The selection operator used [20] by the traditional genetic algorithm has a large error in the actual selection process [21]. In response to this problem, this study uses the sorting method to improve it and redefines the probability P of the i-th individual being selected after sorting as follows:

$$b = \frac{q_0}{1 - (1 - q_0)\alpha}, \quad P = b(1 - q_0)\beta - 1. \tag{6}$$

In the formula, α is the number of the population; q_0 is the probability that the optimal individual is selected; b is the normalized value of q_0; β is the position of the i-th individual in the entire population after sorting.

The diversity of calisthenics movements mainly depends on the crossover probability, and the global optimization ability of the genetic algorithm is also directly affected by the crossover probability. Whether the genetic algorithm can avoid the local extreme value is mainly determined by the mutation probability, which are the core factors of the genetic algorithm.

In the calculation of individual similarity, the method of information entropy is used to obtain the specific calculation formula of population information entropy as follows:

$$H(M) = -\frac{1}{N}\sum_{i=1}^{N}\sum_{j=1}^{S} P_{ij}\log P_{ij}. \tag{7}$$

Among them, M is the number of individuals, N is the number of individual genes, and S is the number of alleles that can be selected. Therefore, the specific calculation formula of similarity A between individual P and individual Q is as follows:

$$A_{PQ} = \frac{1}{1 + H(2)}. \tag{8}$$

In the traditional genetic algorithm, the value of the crossover probability P_j is a constant, generally set as $0.3 \leq P_j \leq 0.8$. If the selected value of the crossover probability is too large, the global search ability of the genetic algorithm will become stronger, but at the same time, the original high adaptability of the chromosome will be destroyed. On the contrary, if the selected crossover probability value is too small, the global search ability and convergence speed of the genetic algorithm will decrease. Therefore, in the evolution process of the genetic algorithm, it is necessary to continuously adjust the crossover probability according to the current individual fitness and the number of evolution iterations. The improved crossover probability is

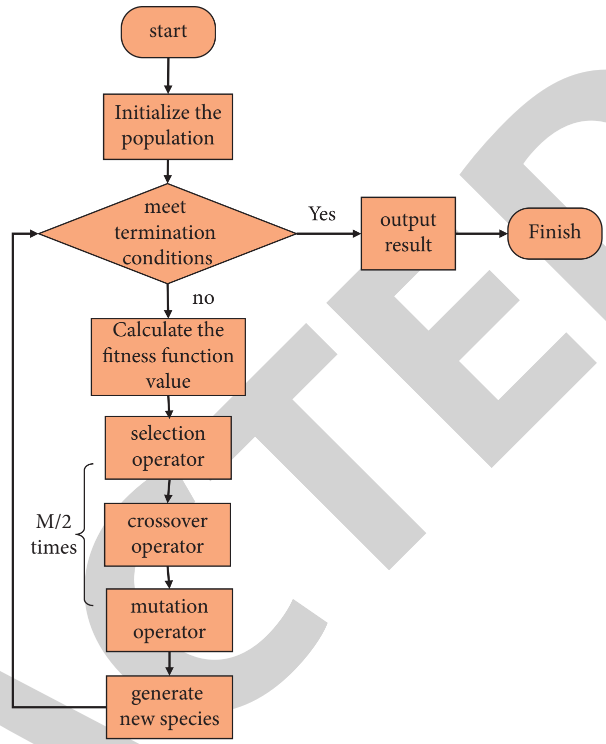

Figure 4: Flowchart of genetic algorithm.

$$P_j = \begin{cases} P_{j\max}, & F_{\max} < F_{\text{mean}}, \\ P_{j\max} - \dfrac{n}{n_{\max}}\left(P_{j\max} - P_{jmim}\right), & F_{\max} \geq F_{\text{mean}}. \end{cases} \tag{9}$$

Similarly, the improved mutation probability can be expressed as:

$$P_b = \begin{cases} P_{b\min}, & F < F_{\text{mean}}, \\ P_{b\min} - \dfrac{n}{n_{\max}}\left(P_{b\min} - P_{b\min}\right), & F \geq F_{\text{mean}}. \end{cases} \tag{10}$$

Among them, F is the fitness value of the parent chromosome in the population.

4. Result Analysis and Discussion

4.1. Effectiveness of Human Action Recognition in Aerobics. Test the body part embedded in the spatiotemporal feature of the non-deterministic part. For comparison experiments, the results are shown in Figure 5.

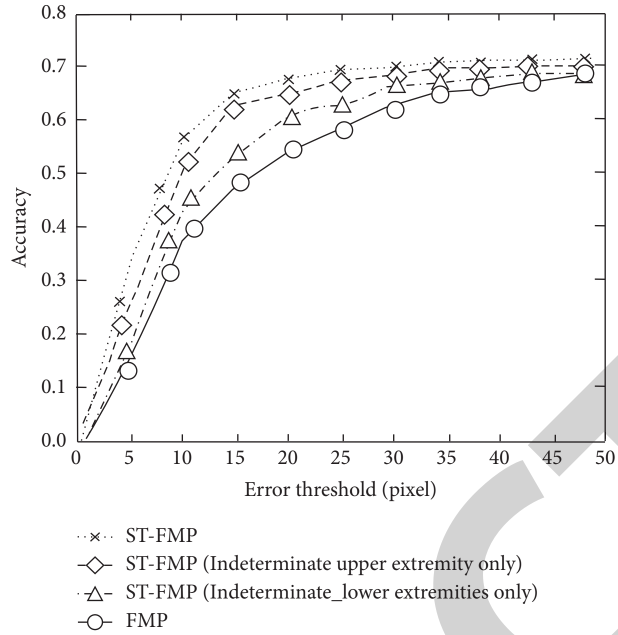

Figure 5: Elbow recognition results of aerobics movements.

When using the ST-FMP to estimate the human body pose in the motion video, the accuracy of the non-deterministic parts within a certain pixel error range is significantly improved. Table 3 shows the results.

In order to further verify the recognition accuracy of the method in this paper, the leave-one-out cross-validation method is used for testing during the experiment, that is, some accurate actions of individuals are selected as test data in each round of experiments, and the remaining actions are used as training data. The leave-one cross-validation method is to divide a large data set into *k* small data sets, with k-1 as training set, the remaining one as test set, then select the next as test set, the remaining k-1 as training set, and so on. Identify the confusion matrix. The identification results are shown in Table 4. Analysis of Table 4 shows that the method in this paper is used to identify the decomposition movements of aerobics. Only the two decomposition movements of the chest cross and the step have certain recognition errors, resulting in confusion, and the recognition results of the other movements are relatively accurate.

4.2. Analysis of Aerobics Movement Structure Based on Improved Genetic Algorithm. On the basis of the aforementioned experiments, we use a single action of aerobics to form a set of actions and use different sets of actions as groups. The parameter information that needs to be set is shown in Table 5.

In the experiment, aerobics decomposition action database and single aerobics decomposition action database are selected as research databases, which are turn, there are 10 aerobics movements in the videos, which are realized by 12 aerobics athletes in turn. The dataset was shot in the actual environment, contains lighting information, and is partially occluded. Database B contains 15 types of movements of 1 aerobics.

Table 3: Performance comparison of different key frame extraction algorithms.

Algorithm	Accuracy	Recall
ST-FMP algorithm	0.99	0.94
KFE algorithm	0.86	0.78
Motion block algorithm	0.76	0.82

The two designed aerobics databases are used as the basis for the structural analysis of the designed set of movements and based on the algorithm designed in the previous section, the body posture recognition of aerobics is realized. According to the movements in database B, a set of aerobics movements is formed, and then database A and the newly formed set of movements are used as the initial population of the function is designed using the evaluation criteria of aerobics, and the complete set of movements is iterated to generate the set of movements with the best evaluation quality. The method of this paper, the dictionary learning method and the hierarchical time memory method are used to analyze the decomposition actions of the choreographed aerobics complete sets of movements, and the analysis and judgment accuracy of the three methods in different scenarios are compared (see Table 6).

It can be seen from the results that among the three methods, the average recognition accuracy of the method studied in this paper is 91.1%, which is higher than the other two methods. Especially in the indoor environment, the accuracy of the method can reach 95.23%. In other scenarios, the accuracy of the method studied in this paper is relatively the highest, which further verifies the accuracy of the method. The structural analysis of aerobics complete set of movements is helpful to the coaches to help athletes optimize the combination of movements, improve the efficiency of aerobics choreography, and is conducive to the improvement of athletes' level.

Table 4: Recognition confusion matrix of several typical actions.

	Stretch up	Stretch down	Chest cross	Clasped fist	Step	Swing legs	Step
Stretch up	100	0	0	0	0	0	0
Stretch down	0	100	0	0	0	0	0
Chest cross	0	0	96.3	3.7	0	0	0
Clasped fist	0	0	1.8	98.2	0	0	0
Step	0	0	0	0	100	0	0
Swing legs	0	0	0	0	0	100	0
Step	0	0	0	0	0	0	100

Table 5: Experimental parameter information table.

Name	Population	Crossover probability	Mutation probability	Weight ratio	Number of iterations
Symbol	Size	P_e	P_m	T_i	Number
Default setting	50	0.7	0.01	4 : 3 : 2 : 1	500

Table 6: Comparison of recognition accuracy of three methods.

Method	Poor lighting conditions (%)	Indoor scene (%)	Outdoor scene (%)	Average value (%)
The method of this paper	91.15	95.23	86.92	91.1
Dictionary learning	85.31	88.25	79.35	84.30
Hierarchical time memory	86.11	91.36	82.19	86.55

5. Conclusion

In recent years, the practice of competitive aerobics in our country has developed rapidly, while the theoretical development is relatively lagging behind, especially the lack of research on the technical system of competitive aerobics affects the further development of the practice of competitive aerobics. It is necessary to systematically study the technical system of competitive aerobics in theory, identify and sort out its internal elements and their interrelationships, improve a comprehensive understanding of the technical system of competitive aerobics, and promote the development of aerobics discipline. The technical system of competitive aerobics is a complex system composed of the technical system at the material level and the technical system at the spiritual level and their interrelationships. The evaluation of aerobics is highly subjective. Based on this background, this paper proposes a complete set of action structure analysis algorithm for aerobics based on genetic algorithm. First, the video sequence is divided into several segments by using the time energy pyramid, and the background subtraction method is used. The human body target for aerobics exercise is extracted, and the decomposition action of aerobics is obtained. By calculating the fitness of different actions, the fitness of the complete set of actions is obtained, and then the analysis of the aerobics complete set of actions is realized. The experimental results show that the method proposed in this paper can realize the structural analysis of aerobics complete sets of movements, not only can improve the choreography efficiency of complete sets of movements, but also promote the improvement of the training level of aerobics athletes, and help coaches in the original training foundation of athletes. It has strong guiding and reference significance to make relative adjustments and changes in teaching.

Data Availability

The labeled data set used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

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