Research Article

Digitalization of Cross-Country Skiing Training Based on Multisensor Combination

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The status and role of science and technology in the field of modern competitive sports have become increasingly prominent. The construction of a scientific training command system is of great significance for improving the scientific level of the training process and deepening the digital cognition of ski training. This paper is based on the multisensor combination to conduct a digital research on cross-country skiing training, aiming to conduct in-depth research on the realization of human motion capture and the theory of motion inertial sensing. To build a scientific, formal, and malleable ski training program, the requirements for data acquisition, recording, and analysis are quite strict. For this, it is necessary to use scientific and reasonable tools combined with multiple algorithms to process information and data. During the experiment, accelerometers, gyroscopes, and magnetometers are selected as sensors to receive motion information, and recognition algorithms for identifying weightlessness, hybrid filtering algorithm, displacement estimation algorithm, and kinematic principles are adapted to process multisensor data using information integration technology. A human body motion model was established based on kinematic principles, and a cross-country skiing motion measurement program was designed. The experimental results show that, according to the combination of multisensing and video platform, the athlete's posture prediction is adjusted, and the action on the track is more consistent, which can accelerate the athlete's skiing speed and the size of the inclination angle to a large extent. It can affect the direction of the athlete's borrowing force and the adjustment of gravity during the exercise. The tilt angle is expanded from 135° to 170°, and it can maintain good continuity during the exercise.

1. Introduction

Cross-country skiing is a weak item of winter sports in my country [1]. Injuries of skiers during training and various strains caused by long-term training are often reported. In sports competitions at home and abroad, the competition system is tightly arranged, which puts forward very strict requirements on the physical and psychological qualities of skiers. In this high-intensity environment, the probability of sports injuries will greatly increase, and sports injuries occur increasingly frequently. Injuries have played an important role in the psychology of skiers and will directly affect their training and sports competitions. The level of competition directly affects the final result of the competition. In the existing research literature on cross-country skiing training, there is a large amount of content that shows that the current prospects for the development of skiing training are not good. From the perspective of the main body, athletes are not taken seriously, and there is little investment in skiing. In the traditional rural ski training process, the equipment is outdated, the concept is confusing, the science is weak, and the emerging technologies are not fully utilized [2].

Motion posture measurement is the key technology to realize the motion capture function [3]. With the development of sensor technology and the in-depth study of machine learning algorithms, the status and role of science and technology in today's competitive sports field have become essential. Sports recognition can play a role. The quality of training and the development of a scientific training plan are of great significance for improving the technical

level of the training process and a deep understanding of skiing rules [4]. The collected motion data can be well protected by the motion detection of sensors and probe sensors, especially the image research aspect of human behavior identification. The biggest challenge faced in this process is the recognition of body movements. The application of a certain technology involves personal privacy, so relevant technologies need to be used to process these data. The application of this technology can greatly promote human research and development in the fields of medical research, deaf education, safety monitoring, sports evaluation, sports film and television production, etc. [5].

Both at home and abroad attach great importance to the digital research on cross-country skiing training, and certain results have been achieved. Schelkun showed in his research that lighter equipment, cleaner trails, and increasingly popular ski skating technology introduce a new element to cross-country skiing: speed. Although the overall injury rate is still low, the number of traumatic injuries among cross-country skiers appears to be increasing. However, most skin injuries are still caused by overuse, which can be easily prevented by proper conditioning [6]. The purpose of the Gonzalez-Millan et al. study is to evaluate different physiological variables before and after the 5 km (women) and 10 km (men) cross-country skiing competitions to determine the underlying mechanism of fatigue. 14 elite skiers participated in the official cross-country skiing competition in classical style (9 men and 5 women). During the race, the instantaneous ski speed is measured by a 15 Hz GPS device. Before and after the game, venous blood samples were collected to assess changes in blood lactate, serum electrolyte, and myoglobin concentrations. It also measured changes in blood oxygen saturation before and after the game and forced vital capacity during spirometry, jumping height, and grip strength during reverse jump [7]. Today's elite athletes use professional and scientific training methods, and it is undeniable that science is playing an increasingly important role in sports. Svensson believes that the scientific process begins with endurance sports, including cross-country skiing. This article analyzes how Swedish physiologists and cross-country skiers interact in the scientific aspect of training methods, focusing on the exercise techniques used. Examples of such technologies include scientific tests, training logs, training camps, and training manuals. The materials in the archives, interviews, and early research will be studied using theories of biological power and kinetic. The conclusion of the article is that although exercise technology cannot ensure the rapid rationalization of training methods, over time, these techniques have become the standard features of cross-country skiing training and exercise [8]. Channel state information (CSI) can provide the phase and amplitude of multichannel subcarriers to better describe the signal propagation characteristics. Based on this, Zhou et al. proposed to combine the back propagation neural network (BPNN) and adaptive genetic algorithm (AGA) with CSI tensor decomposition for indoor Wi-Fi fingerprint positioning. Specifically, the tensor decomposition algorithm based on the parallel factor (PARAFAC) analysis model is combined with the alternating least squares (ALS) iterative

algorithm to reduce environmental interference [9]. Zhou et al. also reported on the initial development of a water ski simulator for indoor training. Compared with the existing training system, the proposed simulator can reproduce a more realistic and immersive simulation experience by providing proprioception and visual feedback to practicing skiers. In addition, it allows practical testing of any required skiing action, because skiing is produced by a six-degree-of-freedom pneumatic hexapod device, and its movement can be programmed arbitrarily in space [10]. Their research has a certain positive significance and promotion effect on the development of cross-country skiing. From the analysis of the combination of physiology and psychology, they study the current problems of cross-country skiing training and find countermeasures to explore the improvement mechanism. However, in their research, it is only limited to finding problems and applying existing conditions to solve them, which is far from enough. Today, with the development of science and technology, advanced technology should be used for scientific and digital research.

This experiment makes full use of multisensor combination technology to observe the functions of multisource data collection, storage, processing, video surveillance, target tracking and data playback, motion detection, etc. Motion recognition technology is the focus and problem of research in the field of human-computer interaction. The data obtained by the multisensing technology is classified into data nodes. For example, the athlete's movement position, the coordination of actions, the choice between the whole process of action transformation, etc., can all be regarded as data nodes. These all belong to the category of physical motion information. Flexibility and accumulation of physical movement information in this program are a prerequisite for the completion of functional identification. This can provide data support and work support for scientific training and combine the specific needs of coaches and athletes to improve the shallow training plan in the traditional national ski training process. This paper adopts a weight recognition algorithm, hybrid processing algorithm, motion simulation algorithm, kinematic process, etc., uses information synthesis technology to process multidimensional data, further improves the scientific level of process training, and solves the limitations of traditional training procedures. This methodology is developed, a standardized model of ski music is used, and multisensor integration functions such as position information, video processing, and data analysis are used to determine the athlete's strength tracking and a set of scientific, comprehensive, and practical cross-country skiing training teaching plans.

2. Calculation of Ski Training Posture Method

2.1. Cross-Country Skiing.
The construction of smart sports not only guides the development of future sports but also corresponds to the requirements of the development of the times [9]. With the discovery and progress of emerging technologies such as artificial intelligence and epic reality, the combination of new sports and new technologies will be realized in reality. The innovative concept of "artificial

intelligence+sports" was used to determine the deep integration of the sports industry and emerging technologies, kinematic data was collected through a portable GPS receiving module, and the required positioning method was selected according to standard conditions [10]. In the part of the intelligent monitoring program, we studied the problem of tracking the target skier. The problem of the surveillance camera while skiing here refers to the automatic tracking of the skier through the camera. On the premise that the control system can control the position of the dome camera, the position of the skier can be predicted [11]. The precondition of the image monitoring process of this system is transformed into a virtuous circulatory system formed by cameras, which are organized by intelligent monitoring programs, and the adaptability conditions are adjusted flexibly according to the change of the skier's position. The intelligent snow training system is full of monitoring command center, field, receiving video data and transmission system, world system, etc. This article mainly focuses on the digital research of cross-country skiing training for the visual inspection system.

2.2. Measurement of Skiing Posture. The development of cross-country skiing is inseparable from the participation of people. The factors affecting cross-country skiing are more in the training of athletes. Therefore, all factors surrounding athletes should be considered. Compared with the high-level athletes in the world, there is still a big gap between Chinese cross-country skiers and the world's high-level athletes. It is reflected not only in the performance of the competition but also in the gap in understanding the law of the project; the gap in training concepts, training methods and methods, and the scientific special training; the gap in monitoring methods; the gap in the psychological ability of the game; and the gap in the professional knowledge reserve of the coaches, all of which hinder the development of China's cross-country skiing project, so China's cross-country skiing project must work hard in these aspects to make a breakthrough. Practical problems [12] were solved. Recently, many sites have paid increasing attention to the application of 3D motion tracking and motion detection equipment [13]. A visual inspection system is used to convert the image records of athletes' postures taken at different sites into digital information, and specific data processing is used to distinguish sports postures, including prone, supine, side-lying, and other postures. The core of human motion detection technology lies in many three-dimensional measurements of human body position, rotation angle, position displacement, etc., through motion capture technology to accurately collect the athlete's limb movement data and analyze it frame by frame in the later stage to analyze the standard degree of athlete's posture and movement. Field motion can fully solve many problems in system testing of human body position, rotation angle, position displacement, and many other three-dimensional measurements. The application of this technology will help this research to obtain data more easily. The field motion tracking system can track the motion trajectory of the object in three-dimensional space and can also identify the motion

position and relative position of the object, to realize the detection and recognition of the moving world [14].

By analyzing the motion relationship between the camera and the target athlete, a mathematical model of the athlete tracking camera is obtained [15]. To give full play to the role of the time series model constructed in this experiment, the first thing is to solve the problem of position transformation, so this transformation is simplified to point transformation. Based on the time series model, the skier's motion state equation model and observation equation model are established. The motion capture technology collects any two movements a, b of the athletes and converts them into picture records. If this movement is converted into a point on a two-dimensional plane, the displacement can be expressed as

$$\begin{bmatrix} a_1 \\ b_1 \end{bmatrix} = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix} + \begin{bmatrix} l_a \\ l_b \end{bmatrix}. \tag{1}$$

Among them, α represents the angle of transformation between the two actions and l_a, l_b represents the distance of displacement. The scale and figure of the image are unchanged after the rigid body transformation [16]. According to the projection conversion algorithm, each pixel of the image is projected and converted (conversion between two three-dimensional coordinate systems) and then output to the corresponding position of the new image (the actual algorithm should first calculate the size of the output raster, and then calculate the pixel points in the output grid and the pixel points in the source image corresponding to the coordinate conversion formula, and perform sampling output). Under the irradiation of light, athletes will leave shadows on the ground during the exercise, which is the so-called projection. The transformation between shadows can be expressed by the projection transformation formula as

$$\begin{cases} a_1 = \dfrac{a_{01} + a_{12} + a_{23}}{a_{32} + a_{22} + a_{11}}, b_0, \\ b_1 = \dfrac{b_{11} + b_{12} + b_{13}}{b_{31} + b_{21} + b_{11}}, a_0. \end{cases} \tag{2}$$

When the sensor or the application of Shebei processes the pictures of these pictures, the cross-correlation method is first used [17], because every part of the body is in relative motion during the movement, that is, a similar degree of correlation function:

$$Q(m, n) = \frac{\sum_a \sum_b T_{(a,b)} K(a-m, b-n)}{\sum_a \sum_b k^2(a-m, b-n)}. \tag{3}$$

$(a - m, b - n)$ is the state of relative motion. When $am = b - n$, formula (3) is used to express the motion at rest. The matching degree between the generated image and the physical action is [18]

$$V(t, k) = \sum_a \sum_b (t(a, b) - \beta_t)(k(a-m, b-n) - \beta_t), \tag{4}$$

$$G(m, n) = \frac{1}{I \cdot J} \sum_{m=1} \sum_{n=1} S(m + s - 1, n + t - 1) - N(s, t).$$

$$(5)$$

The similarity of the two images has a linear relationship with the size of the correlation coefficient [19]. The angle of light exposure and the difference in time will affect the size of the shadow on the ground. Among them, m, n is the athlete's body shape and the shadow on the ground. Clearly, the smaller the absolute value of $V(t, k)$, the higher the matching degree between the generated image and the actual image [20].

Suppose that the images recorded in two different motion processes are E and F, respectively, and E is obtained after F is rotated and translated. The translation amount of a fixed point on the horizontal plane and the longitudinal direction is (C_e, C_f), and the rotation angle is λ. Then,

$$F = e(a \cos \lambda + b \sin \lambda - f_a, -a \sin \lambda + b \cos \lambda - f_b). \quad (6)$$

The relationship between E and F is

$$F_2(\partial, \beta) = e^{(m,n)} \cdot F_1(\beta \cos \partial + \eta \sin \partial, -\beta \sin \partial + \eta \cos \partial). \quad (7)$$

The time-domain information in the time-domain feature function uses time as a variable to depict the waveform of the signal. Its application will bring about the corresponding increase in the root mean square value, absolute mean value, and root square amplitude. The changes in these data are very significant, based on reference. Human motion recognition like signal features was recorded. And data were sampled for human motion. The time-domain feature functions commonly used for human body recognition include sample variance and standard deviation [21]:

$$\delta^2 = \frac{1}{x} \sum_{i=1}^{x} (\delta_i - \phi)^2, \quad (8)$$

$$\delta = \sqrt{\frac{1}{x} \sum_{i=1}^{x} (a_i - \phi)^2 \cdot (x_1, \phi_1)}. \quad (9)$$

Through standard deviation and sample variance, we can discover the characteristics of frequency and periodic information in multisensor signals.

2.3. Multisensor Data Fusion. In recent years, some new methods based on statistical analysis, artificial intelligence, and information processing have appeared, which have played an important role in the development of information integration technology [22]. The application of multisensor information integration technology is extremely wide, and it has been developed rapidly in various fields. In this process, with the deepening of research, information integration technology has become more mature [23]. The function of the sensor is similar to human vision, hearing, smell, touch, etc., used to perceive and capture target parameters in the environment. By comprehensively producing the combined information obtained by multiple parallel sensors or multi-sensor sensors, the fusion information obtained under this condition is more comprehensive, accurate, and true. Data fusion theory urgently needs a unified system standard to be standardized. Only when the interrelated fusion fields can be connected can the further development of this field be guided.

Suppose that multiple sensors simultaneously record and monitor the cross-country skier's movement, so that R_1 and R_n represent the data obtained by the first sensor and the nth sensor. If R_1 and R_n both satisfy the characteristics of Gaussian distribution [24], to express the degree of difference between the two, the formula is expressed as

$$z_i(R, R_1) = \frac{1}{\sqrt{2\varepsilon v_1}} \exp\left(-\frac{1}{3}\left(\frac{R - R_1}{v_1}\right)^2\right), \quad (10)$$

$$z_n(R, R_n) = \frac{1}{\sqrt{2\varepsilon v_n}} \exp\left(-\frac{n}{2}\left(\frac{R - R_n^2}{v_n}\right)\right). \quad (11)$$

In the above formula, $z_i(R, R_1), z_n(R, R_n)$ represents the probability density of the image of the first sensor and the nth sensor [25]. The smaller the result obtained by the calculation formula, that is, the lower the probability density, the greater the measurement result of the first sensor and the nth sensor; recently, the degree of difference between the two is smaller. For the error between the two, the error function can be used to calculate

$$E_{\text{in}} = \text{erf}\left(\frac{1}{\sqrt{2v_{\text{in}}}}\right) \pm \sum_{i \in n} 1 + m_{1/i}. \quad (12)$$

The upper limit of the ideal error is determined by the upper limit of multisensor data fusion [26], that is,

$$p(r, r_i) = \frac{p(1, n)}{\max}(p_{1,i}, p_{n-i}) \sum_n i_{1-r}, \quad (13)$$

$$p(r) = \frac{n}{1 - i} \sum_{n=0}^{i} n_r(R_1) n_i(R_n). \quad (14)$$

The size of $p(r, r_i)$ in the formula represents the range supported by the nth sensor for the first sensor during the image processing of this sensor. The larger the value, the greater the correlation between the two; the higher the upper limit of the ideal error, smaller, the more accurate the measured data processing [27].

3. Multisensor Digital Materials and Experimental Methods

3.1. Object. The subjects of the experiment are 15 Changchun City Speed Skating Team athletes. Through multisensor to explore the stability of the athlete's overall body control, the flexibility of each joint, and whether there are any problems with the athlete's overall proprioceptive
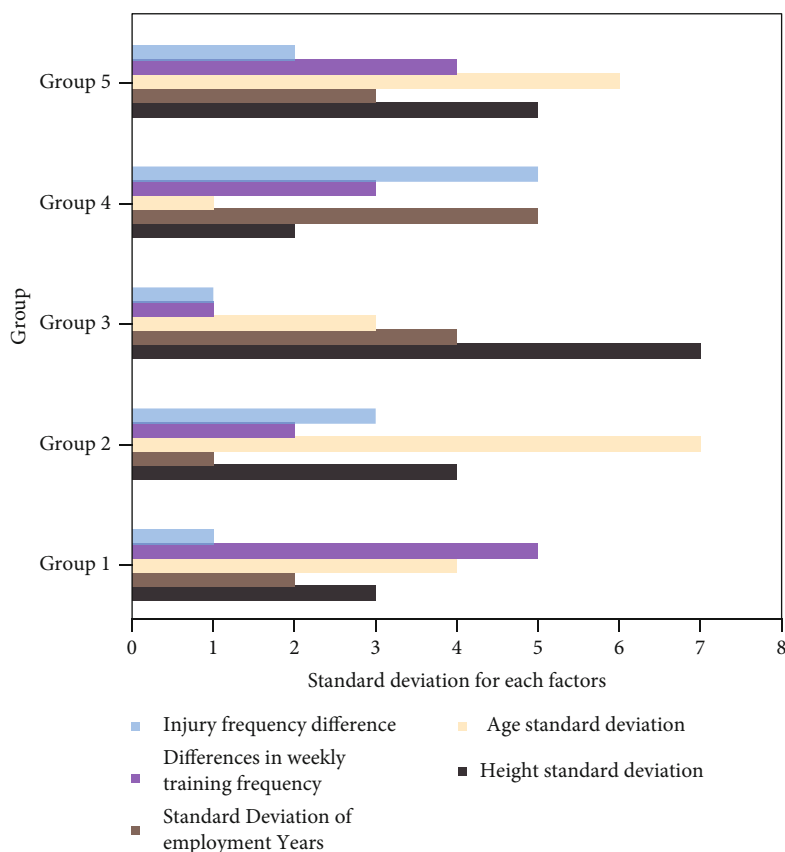
FIGURE 1: The basic situation of 15 skiers.

sensing, the problems found in the experimental test are recorded and analyzed. Corresponding corrective plans are developed to improve athletes' ability to prevent injuries, and practical guidance and a solid data basis were provided for athletes' future training norms and appropriate health training.

3.2. Process

(1) The training load monitoring methods for cross-country skiing in this experiment mainly include laboratory monitoring and sports field monitoring methods. From the perspective of environmental construction, release the monitoring command center, collect the video data of the scene and the transmission system, the world system, analyze the composition and structure of the smart ski training system, and design the data warehouse

(2) Collecting human body data during exercise through multiple sensors can provide a database for studying the characteristics of human movement, the progress of exercise levels, and the analysis of sports techniques

Based on the camera projection model, the sensor characteristics are analyzed, the error and accuracy of the sensor are measured through experiments, and the image registration model under the condition of introducing the camera rotation angle information is derived by using the transformation relationship of the camera movement. The biased measurement of the local sensor is used to estimate the value of the observation deviation, and it has a qualified value that is approximately equal to a certain value. The prediction of the difference of this value can be more advantageous to refine the problem of coupling between the two in the estimation method. The experimental results provide no guarantee. To improve the practicability of the model, an accurate matching scheme for the measurement error of the rotation angle is proposed. The size of the angle error is set to limit the size of the search function in a certain range, to avoid the global search and improve the matching operation speed. Improve nonprofessional training items, improve the traditional national ski training process, combine the actual needs of coaches and cross-country skiers, and make full use of digital technologies such as multisensor combination and athlete posture tracking to realize the collection and processing of athlete-related training data during the experiment, video viewing, target tracking, and data retrieval services, providing data support and operational support for scientific training. First of all, we have made statistics on the basic conditions of these 15 cross-country skiers, recorded in Figure 1, and attached the corresponding heart rate tables to the corresponding training items of these 15 cross-country skiers under normal circumstances (Table 1).

We classified the 15 athletes according to their age difference, height difference, and working time difference.

TABLE 1: In general, the heart rate table corresponds to different training items.

Training purpose	Training intensity (AT)	Main training methods	Heart rate during exercise
Adjusted training	60-80	Uniform speed skating	120-140
Improve glycolipid coordination function	90-95	Incremental sliding	150-170
Anaerobic threshold training	95-105	Intermittent slip	160-180
VO$_2$max training	105-110	Uniform speed skating	>180
Lactic acid tolerance training	>110	Uniform speed skating	>180

TABLE 2: Statistics of data acquisition items.

Serial number	Sports event	Technical index requirements
1	Target tracking	1500 track full coverage
2	Track the number of athletes at the same time	3 people
3	Track athlete speed	>5 m/s
4	Position and speed measurement frequency	1 Hz or more
5	Position measurement accuracy	Plus or minus 1 meter
6	Speed measurement accuracy	Plus or minus 1 meter per second
7	Working environment	-40°, gale

In addition, we analyzed the injury frequency of each group member and the weekly training frequency standard, to keep the athletes near the center of the video screen and the camera; the rotation process is smooth; the speed is smooth, and there is no frustration. It is necessary to set the rotation speed of the dome camera to match the sliding speed of the athlete; that is, the angular velocity of the athlete relative to the dome camera is roughly equal to the rotation speed of the dome camera, which is convenient and targeted, to conduct comparative research on the records of athletes' cross-country skiing events, such as using classification analysis at different ski speeds and different wind directions.

By general analysis and storage of picture data, comparative analysis with historical data, acquisition of athletes' specific snow field information, and analysis of the relative movement of the camera and the target athlete, the mathematical model of the athlete's tracking camera is obtained. This process requires high planning efficiency and fast response speed. Therefore, the test items related to the experiment in this article are recorded in Table 2, and the hardware facilities required during the experiment are recorded in Table 3.

The test items required for this experiment include target tracking, the number of synchronously tracked skiers, the speed of the athletes during exercise, the frequency of position and speed testing, the accuracy of position measurement, the accuracy of speed measurement, and the environment of the on-site test at that time. To ensure the accuracy of the data and save the workload, the experiment decided to test 15 athletes in groups during the test. The groups are based on the basic situation of the athletes and their usual training. The standard basis for grouping factors is the level and skiing level.

In the first step of the experiment, we first have a basic understanding of the screen sensing and data recording structure flow (Figure 2).

Fifteen cross-country skiers performed the first round of testing. After analyzing the data on a multisensor and video integrated platform, we recorded the test results in Figure 3.

According to the data in Figure 3, during the exercise test of cross-country skiers, the third group with the largest height standard deviation has the highest speed measurement accuracy after data analysis on the multisensor and video integrated platform, but the position measurement accuracy is the opposite. All test groups are the lowest; the second group with the largest age standard deviation has the lowest speed measurement accuracy. And the frequency of position and speed testing is second; the third group of skiers with the lowest target tracking has the highest speed measurement accuracy. The highest position accuracy rate is 4.8, the highest speed accuracy rate is 4.7, and the highest target tracking accuracy rate is 2.3.

In addition, wind direction, wind force, temperature, and other factors may affect the training effect and cause slight changes in ski performance. By analyzing weather factors, it can help coaches develop a reasonable training plan and explain slight fluctuations in athlete performance. In this experiment, 15 skiers were divided into 5 groups for group testing, and there are three people in each round of speed skating competition at the same time, assuming that the five groups are numbered (1, 2, 3, 4, and 5), and the weather factors at different marked points and the athletes' various aspects of the process are recorded in Figure 4.

The weather conditions of the different groups participating in the test vary with the test time. The data in Figure 4 show that the wind is the lowest when the temperature is the highest during the test, and the cross-country skier's skiing speed reaches the highest point when the temperature is the lowest during the test. In addition, the athlete's movement range and physiological function will also change with the change of difficulty.

TABLE 3: System hardware equipment-related information table for recording screens and data.

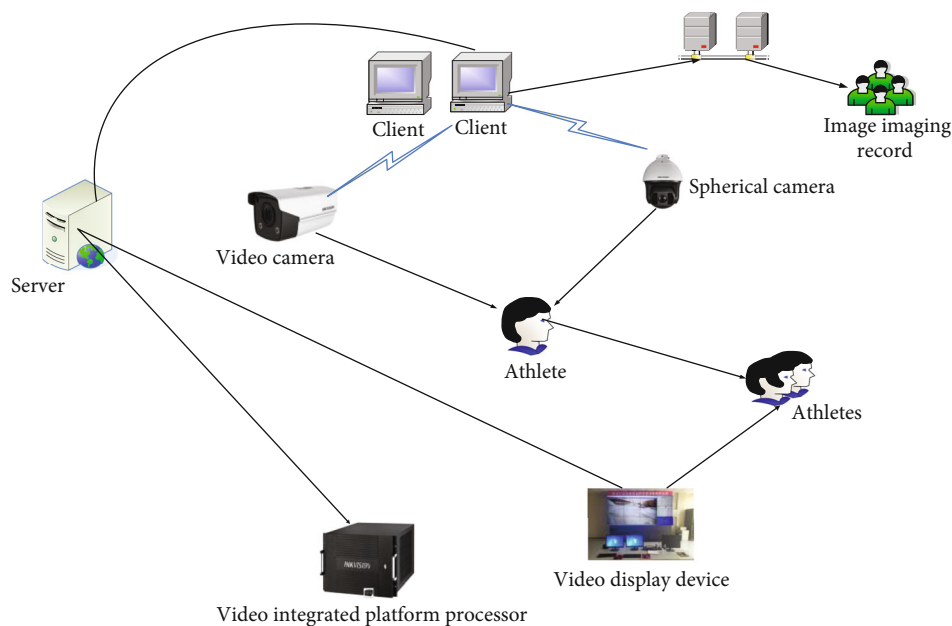| Appellation	Amounts	Features
Panoramic camera	10	Flexible adjustment
Spherical camera	5	Fixed viewing angle video monitoring
LCD screen	1	Screen high-definition display
Video integrated platform	2	Multifunctional integration
GPS positioning system	5	Precise positioning

FIGURE 2: Screen sensing and data recording structure flow chart.
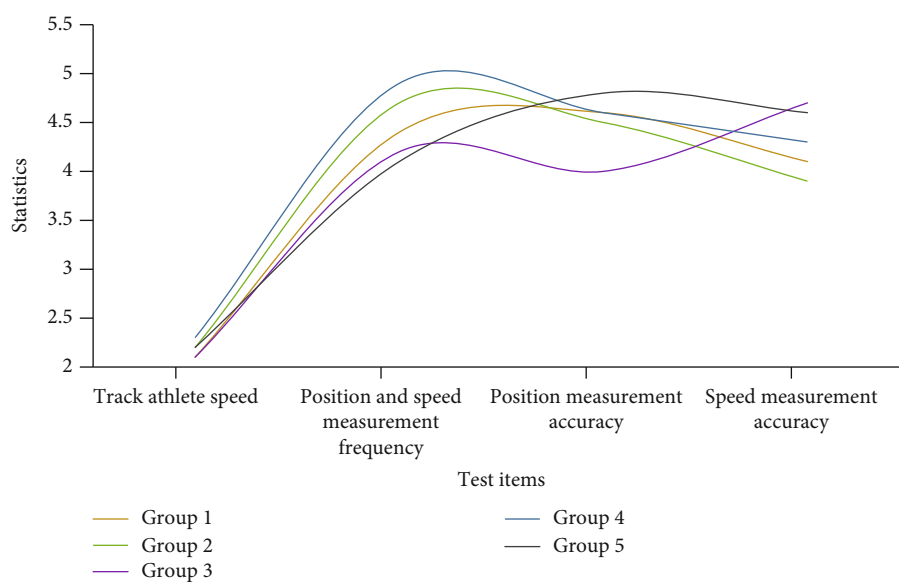

FIGURE 3: 15 cross-country athletes first-round test-related data statistics.

Stronger than the wind, the athlete's exercise process is more difficult. To this end, we adjusted and improved the hard conditions that can be changed by these tests and conducted separate tests for indoor and outdoor. The basic conditions of indoor and outdoor test sites are recorded in Table 4.
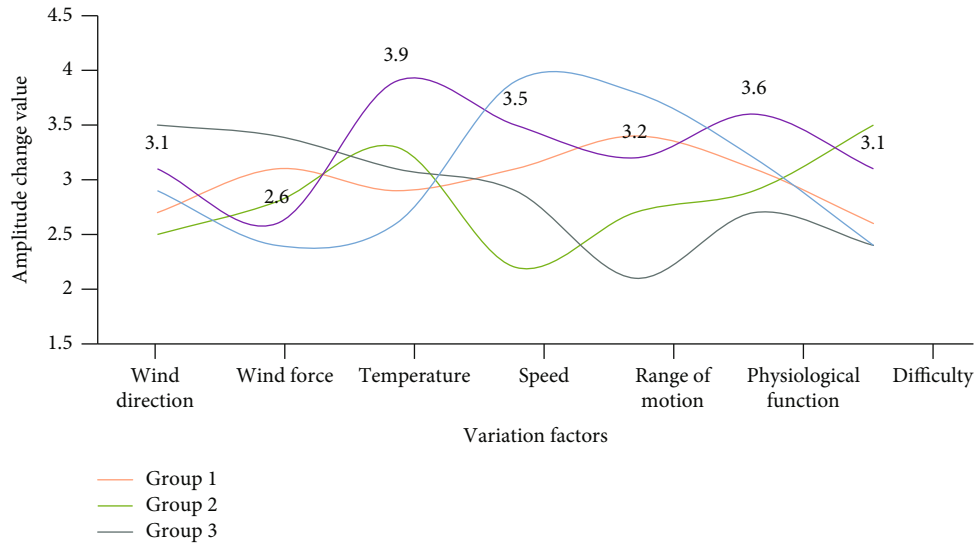
FIGURE 4: Weather conditions and physical condition data at different marked points.

TABLE 4: Basic configuration of indoor and outdoor test sites.

	Indoor	Outdoor
Temperature	Constant temperature -20°	Minus 40°
Wind conditions	Closed environment without wind	Gale
Piste conditions	Small amplitude change	Diverse situations
Number of sensor devices	5	10
Target tracking	Segmented tracking	Ski track tracking

Compared with the outdoor situation, the indoor situation tends to be more stable in any aspect. During the test, the picture recording and data recording and analysis are simpler than the outdoor test. Due to the relative reduction of the influence factors of the change, and the temperature and control of wind are controllable indoors, the use of sensor equipment is relatively reduced.

After making adjustments, we conducted a new round of indoor tests for these 5 groups of athletes, mainly for data analysis of the speed, position and speed test frequency, position measurement accuracy rate, and speed measurement accuracy rate of the athletes during exercise. The data is recorded in Figure 5.

According to the data in the table, the accuracy of position measurement and speed test have been improved. Under this circumstance, it is helpful for coaches to make improvements in subsequent training, such as athletes' movement norms, sports postures, and avoidance. With injury inertia, reduced adverse reactions, etc., through calculations combined with relevant data, the cross-country skier's action, continuity, body inclination angle, direction of borrowing force, gravity point, self-regulation ability, etc., were predicted and tested, and the changes before and after the data are recorded in Table 5 and Figure 6.

From Table 5, it can be found that the cross-country athletes adjust the athlete's posture prediction based on the combination of multisensing and video platforms, and their movements on the ski trail are more consistent, which can accelerate the athlete's skiing speed to a large extent. The size of the tilt angle can affect the direction of the athlete's borrowing force and the adjustment of gravity during the exercise. On the whole, the gravity point of the living body is difficult to grasp during the operation, but the data analysis is carried out through a combination of multiple sensors. A feasibility data basis is presented.

In addition, a comprehensive comparative analysis of 15 cross-country athletes before and after the improvement, such as action specifications, sports posture, and the degree of injury, is comprehensively compared and analyzed as shown in Figure 6 (the standard is marked as 5).

Through the method of video feedback, it can widely mobilize students' skills, enhance the sense of picture and expressiveness, cultivate the establishment of normative practice and the foundation of practical technical skills, and improve the quality of learning, and loop playback of videos can dig out the behavioral image to carry out the cerebral cortex.

4. Discussion

Attitude measurement technology originally served the fields of aerospace, industrial control, and military industry. Today, science and technology are changing rapidly and developing rapidly, and it has become a leading force in
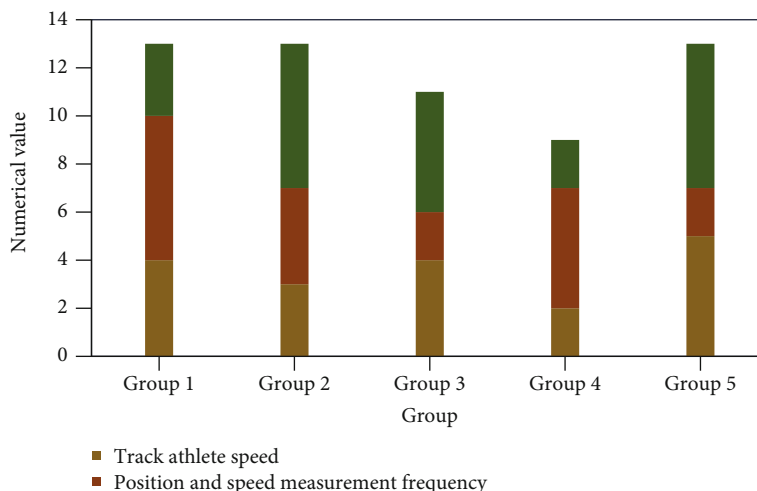
FIGURE 5: Statistics related to training of indoor cross-country athletes.

TABLE 5: Comparison of various factors before and after adjustment of cross-country skiers.

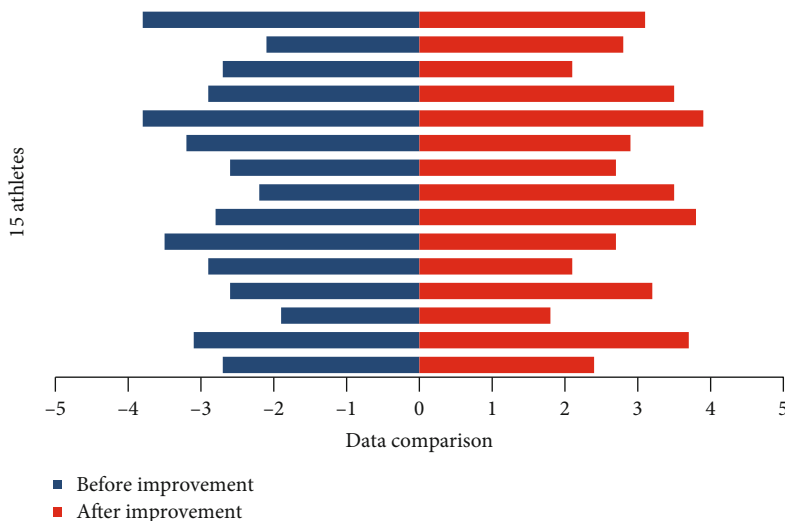| Factors	Before the change	After the change
Action continuity	Poor and easy to lose balance	Strong continuity
Body tilt angle	Maximum 135˚	Up to 170˚
Leverage direction	Single	Multidirection
Gravity point	Fixed and high	Low and adjustable
Self-regulation	Lack of capacity	Easy to grasp

FIGURE 6: Comparison of data before and after improvement.

promoting the continuous rise of the global economy. At the same time, attitude measurement technology has also been greatly updated, is more integrated into daily work and human life, and is widely used in many new electronic products. A posture measurement system integrates many advantages such as miniaturization, low cost, low power consumption, high reliability, and high integration. Image compression and data processing technology are an important part of multisensor data integration. It can overcome the size range, geometric shape, and depth of field describing the spatial resolution of a single image and greatly improve the quality of the captured image. In the spatial registration problem, most methods only consider the estimation problem under the condition of one or two system errors. The system error is still incomplete, and it is subject to mutual coupling and high nonlinearity. In the problem that multiple systematic errors exist at the same time, the method of estimating the systematic error is usually only suitable for the

estimation under certain conditions, and the estimation effect is not ideal for the problem of large deviation. By separating the estimation of the observation standard deviation and the platform's positioning and positioning deviation, only the biased measurement of the local sensor is used to estimate the value of the observation deviation, so that the estimation result of the observation deviation will not be affected by the platform's positioning and positioning deviation, eliminating the previous estimation problem of coupling the two in the method combined with experimental data; using technology to improve equipment, the selection of genetic materials, new sports equipment, new equipment facilities, skates, etc., will of course have the greatest impact on improving athletes' performance.

5. Conclusion

The use of sensor data to identify the human body will continue to flourish with the development of sensor technology: as the energy consumption of the sensor decreases, the volume becomes smaller, the sensitivity increases, and the accuracy improves; as more algorithms are proposed and introduced, I believe this subject direction can have more research and applications on various human actions, various human behaviors, and even more people-to-human interaction occasions. Use multiple sets of sensors to record data of wind direction, wind force, temperature, and other factors at all times, combined with athletes processed by related technologies. The resolution of the sliding speed is the response speed of the image extracted at different setting shooting points in the image. The cross-country speed skating group test is used as a screening method for the weak links of the speed skating team athletes. The precision and performance analysis of the precision positioning technology in landslide monitoring and the use of practical application scenarios for in-depth discussion and analysis can facilitate the discovery of athletes' movements. Existing performance problems can be screened and identified as action patterns that need to be paid attention to. Effectively, objectively, and comprehensively detect the functional problems of the athlete's body, understand the specific situation of the athlete, update the study in time, regularly promote the progress of the athlete, and prevent the occurrence of the athlete's injury. The selection is made in combination with the athlete's actual situation, physiological characteristics, and project characteristics, and the training content is adjusted in time under the principle of corrective training. Through in-depth research on theory and practice; the use of sports training, sports physiology, sports biochemistry, and other scientific and technological means; and research methods conducted on the training process of cross-country skiing events in my country, a monitoring mode for cross-country skiing training is established; that is, the effect of sports training is the maximum guarantee, athletes will not have excessive fatigue, a guarantee for my country's cross-country skiing events is provided, excellent results in international competitions are created, and the status and long-term development of my country's cross-country skiing in the international winter sports field are ensured.

Data Availability

The data underlying the results presented in the study are available within the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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