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Retraction

Retracted: Wireless Sensor Network Technology-Based Design and Realization of Intelligent Tennis Sports System

Wireless Communications and Mobile Computing

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Wireless Communications and Mobile Computing has retracted the article titled "Wireless Sensor Network Technology-Based Design and Realization of Intelligent Tennis Sports System" [1] due to concerns that the peer review process has been compromised.

Following an investigation conducted by the Hindawi Research Integrity team [2], significant concerns were identified with the peer reviewers assigned to this article; the investigation has concluded that the peer review process was compromised. We therefore can no longer trust the peer review process and the article is being retracted with the agreement of the Chief Editor.

The authors do not agree to the retraction.

References

[1] Y. Zhou and H. Shen, "Wireless Sensor Network Technology-Based Design and Realization of Intelligent Tennis Sports System," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 3260000, 13 pages, 2022.

[2] L. Ferguson, "Advancing Research Integrity Collaboratively and with Vigour," 2022, https://www.hindawi.com/post/advancing-research-integrity-collaboratively-and-vigour/.

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Research Article

Wireless Sensor Network Technology-Based Design and Realization of Intelligent Tennis Sports System

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With the progress of the times and the development of science and technology, the scientific and technological elements infiltrated in various sports fields are increasingly enriched, which greatly improves the skills and technical and tactical levels of sports participants and sports equipment users and the development of sports items. With the increasing importance of education, people have begun to pay attention to physical education. Tennis has also received much attention in recent years. However, there are many problems in traditional tennis, such as untimely detection and irregular movements, so this paper is aimed at studying how to design an intelligent system for tennis based on wireless sensor network technology. With the development of sports, athletes have higher and higher requirements for themselves. However, traditional training has been unable to find their own mistakes in time, and the intelligent tennis system can not only analyze the data information of tennis in the air but also provide users with various sports analysis data to help players find specific problems and achieve the purpose of comprehensively improving tennis skills. This paper presents the development of wireless sensor networks and tennis and introduces the concepts of wireless sensor networks and tennis. From the data of the experiment in the text, we can see that the growth rate of tennis courses offered in colleges and universities increased from about 4% to about 24% in 2019, an increase of 20%. In 2020, the growth rate of tennis courses in colleges and universities increased from about 21% to about 33%, an increase of 12%. It can be seen that in recent years, tennis has been valued by major universities and loved by students. Therefore, it is necessary to take necessary measures for the development of tennis, and it is very meaningful to realize the intelligent system of tennis based on wireless sensor network.

1. Introduction

Physical education is the key to education. If the data mining brought by the era of big data is applied to sports, the development of sports can be enriched and expanded. This has a great impact on improving students' physical quality, improving students' enthusiasm for participating in sports, enhancing physical strength, and cultivating students' lifelong sports awareness. It can effectively improve the effect of physical education and effectively promote the depth and breadth of knowledge competition between teaching and learners.

In recent years, college tennis classes have become popular in college sports courses, and registrations are very popular every semester. However, the tennis tactics that students can learn and master in tennis lessons often fail to achieve the expected goals, which are caused by many reasons. In the era of big data, the technological innovation brought by big data should be combined to solve the bottleneck constraints faced by the development of tennis in colleges and universities in the traditional sense, and the wireless sensor network is one of the current solutions.

The innovations of this paper are as follows: (1) the theoretical knowledge of wireless sensor network and tennis is introduced, and the application of wireless sensor network technology in the design of intelligent tennis system is analyzed by using various algorithms of wireless sensors. (2) The benefits of tennis and its importance are investigated and analyzed, and the important influence of wireless sensor network technology in the design of intelligent tennis systems is summarized.

2. Related Work

With the development of wireless sensor, its application range is more and more extensive. Khan et al. found that wireless sensor networks (WSNs) are a key component of the emerging Internet of Things (IoT). They are ubiquitous and used in several application areas. However, as WSN nodes become more powerful, it becomes increasingly important to study how multiple applications can share the same WSN infrastructure. They introduce the basics of WSN virtualization and inspire its relevance through carefully selected scenarios. Although they are aware of the importance of wireless sensor networks, there is no concrete example to verify its importance [1]. Erdelj et al.'s work is to identify the role of wireless sensor networks (WSNs) and drones in natural disaster management. They found that the WSN system is mainly used for classification according to disaster management stage. They review relevant research activities and explore unresolved issues. The main goal of their work is to provide technological outcomes that help improve people's jobs and to push the state-of-the-art technology a step forward in disaster management systems. They did not explain why wireless sensor networks can be used in disaster management systems [2]. Sheng et al. found that supporting emerging sensor applications is becoming increasingly important due to the need to better utilize computing and communication resources and make them energy efficient. Therefore, mobile wireless sensor networks (MWSNs) will be a new interface to support future applications. They proposed a new method to minimize the energy consumption of processing applications in MWSN while meeting certain requirements. They proposed energy-saving collaborative strategies to maintain a balance between energy consumption. Although they proposed a strategy to solve the problem, there was no experiment to prove the feasibility of the strategy [3]. Anbarci et al. found that tennis poses many risks to athletes. They wanted to know whether winning or losing during the game affected the motivation of athletes. To solve this problem, they provide a theoretical framework, divide players into men's and women's teams, and collect their athletic data, and the final results show that players who are behind in scoring serve harder than those who are leading. Although their experiments were coherent, the lack of experimental data made the authenticity of the conclusions unreliable [4]. Shim believes that cryptographic primitives are fundamental building blocks for designing security protocols to achieve confidentiality, authentication, and integrity. It is no exaggeration to say that the selection of appropriate cryptographic primitives and their integration into security protocols determines the most critical part of the efficiency and energy consumption of wireless sensor networks (WSNs). There are many surveys on WSN security issues; however, these surveys do not focus on public key cryptographic primitives in WSNs. During the survey, he developed a deeper understanding of the public key cryptographic primitives in WSN and discussed their main directions and some open research questions that could be further investigated. But he did not introduce their main directions and further research problems in detail [5]. Shen et al. find the research field of wireless sensor networks (WSNs) very attractive, and the application areas of WSNs are object tracking and remote monitoring of the environment. However, data can be easily corrupted by a large number of attacks. Their main concern is whether the data integrity can be protected, and their scheme can not only maintain the integrity of the data but also reduce the storage cost of the wireless sensor network. But they did not clearly state what their plan was, making their conclusion very vague [6]. Nurellari et al. consider the distributed decision fusion problem in wireless sensor networks (WSNs). The task of WSN is to detect intruders transmitting unknown signals, and existing distributed-based fusion rule algorithms can only ensure an equal combination of local data. In the case of bandwidth-constrained WSNs, they perform poorly and fail to converge across sensor nodes. Therefore, they proposed a two-step distributed fusion rule algorithm. Although they proposed a two-step distributed fusion rule algorithm, they did not describe these two steps in detail [7]. Wu et al. found that the Internet of Things can enable everything in a global network to access each other, and wireless sensor networks (WSNs) are one of the most important applications of this concept and are widely used in almost all fields. They proposed an improved wireless sensor network authentication scheme, but it also has some weaknesses, including no session key and lack of mutual authentication. To avoid these weaknesses, they proposed a new authentication scheme that also works with WSNs. But they did not explain why this scheme is also applicable to WSN [8].

3. The Concept of Wireless Sensor Network and the Development of Tennis

A wireless sensor network is a distributed sensor network with sensors at the periphery that can sense and inspect the outside world. Sensors in WSN communicate wirelessly, so network settings are flexible, device locations can be changed at any time, and wired or wireless connections to the Internet are possible. With the continuous progress of modern science and technology, information technology plays an important role in improving the level of sports, especially as an auxiliary training method [9]. The use of information technology and other scientific and technological means to improve the training efficiency of athletes is also an important part of physical education.

The development of college tennis is closely related to the environment of social sports development. The development of tennis promotes the improvement of the physical fitness of the whole people. Therefore, tennis should adapt to the development of the times and actively respond to new opportunities and challenges in the era of big data [7]. Tennis is shown in Figure 1.

As shown in Figure 1, physical training is a complex systematic project, involving a variety of disciplines and

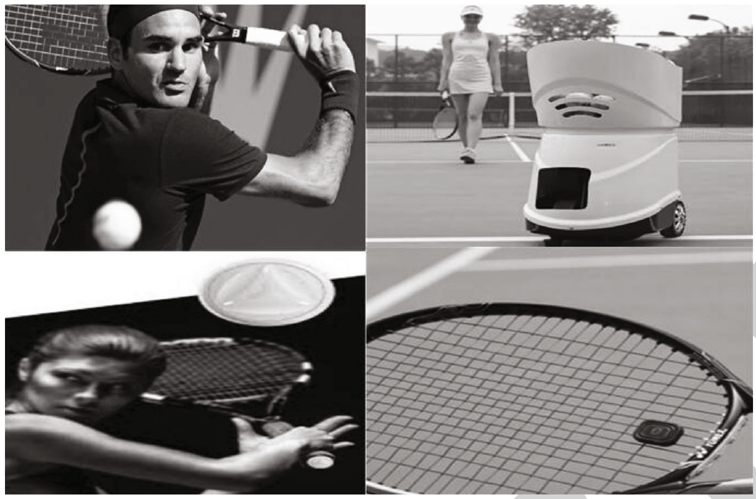


Figure 1: Tennis in colleges and universities.

systems, and there are many factors that affect the performance of athletes, including skills, physical fitness, mental ability, and tactical levels. In the traditional sports training process, the coaches use their eyes to observe the technical movements of the athletes, judge the rationality with experience, and put forward suggestions for improvement. Big data is of great significance for people to grasp the laws, achieve scientific development, and make scientific decisions. But big data increases the risk of privacy breaches. First, the centralized storage of a large amount of data increases the risk of its leakage; second, the ownership and use rights of some sensitive data are not clearly defined.

Wireless sensor networks have the characteristics of low cost, small size, and self-organization. It is especially suitable for various harsh environments and special environments that humans cannot reach, and it is expected to have a very wide range of applications [10]. The sensor network realizes three functions of data collection, processing, and transmission. Together with communication technology and computer technology, it constitutes the three pillars of information technology. Wireless sensor network is a self-organized network composed of microsensor nodes arranged in the monitoring area and has various functions such as information collection and data processing. A schematic diagram of a typical structure of a sensor network is shown in Figure 2.

As shown in Figure 2, by randomly dispersing or manually configuring multiple sensor nodes in the monitoring area, the detection object where the observer is located is monitored in real time, and the information collected by the processing system is used to embed the nodes. Data collected by nodes within the cluster is aggregated to the cluster head node. After the data of the cluster head node is merged, it is routed to the base station in the form of communication, and finally, the base station transmits the data to the user terminal by wireless or wired, so as to realize the real-time monitoring of the remote target by the user [11]. The schematic diagram of wireless sensor network detection in motion is shown in Figure 3.

As shown in Figure 3, the exercise system monitors the athletes' exercise behavior and physiological parameters such as speed, ECG, and blood pressure through wireless communication. Integrating various types of sensors on an athlete's body or on the sports field can collect relevant movement parameters and physiological parameters. These parameters are sent to the base station through the radio frequency module, and the base station realizes data collection and processing through internal management software [12].

4. Design of an Intelligent Tennis Motion System Based on Wireless Sensors

The athlete data collected by the wireless sensor network will ultimately be transmitted to the data management center, and the data will be analyzed, processed, and stored through the sports database management system run by it, and the results will be provided to the coaches and decision makers for research and use. In addition, coaches can control the front-end wireless sensor network through the system, set athletes training tasks, etc. [13].

In order to facilitate tennis players to grasp their own sports situation in real time, in the training process, the system is designed to collect sports data through the sensor at the bottom of the tennis racket handle. The collected data is sent to the smartphone terminal in real time, and the mobile terminal analyzes the data through the application software to record and display the analyzed exercise results [14]. The motion detection on the smartphone side is shown in Figure 4.

As shown in Figure 4, the tennis training system belongs to an intelligent sports equipment. Through the motion sensing module fixed at the bottom of the tennis racket handle, real-time motion data is collected and transmitted to the mobile APP of the tennis training system through the wireless transmission function of the sensing module. A sensor is a detection device that can sense the measured information and can transform the sensed information into electrical signals or other required forms of information output according to certain rules, so as to meet the requirements of

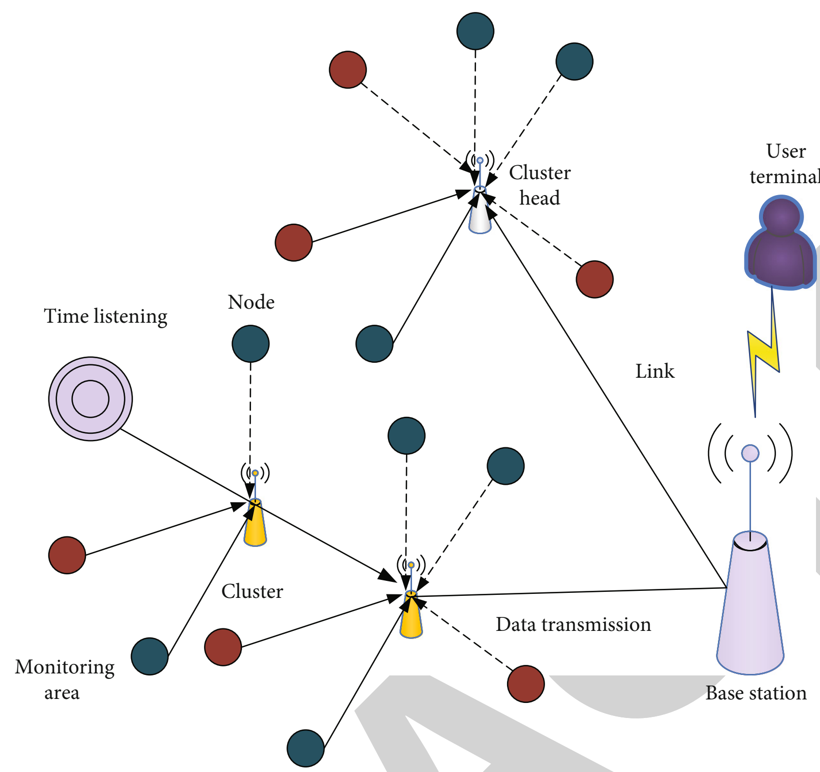


Figure 2: Schematic diagram of typical structure of sensor network.

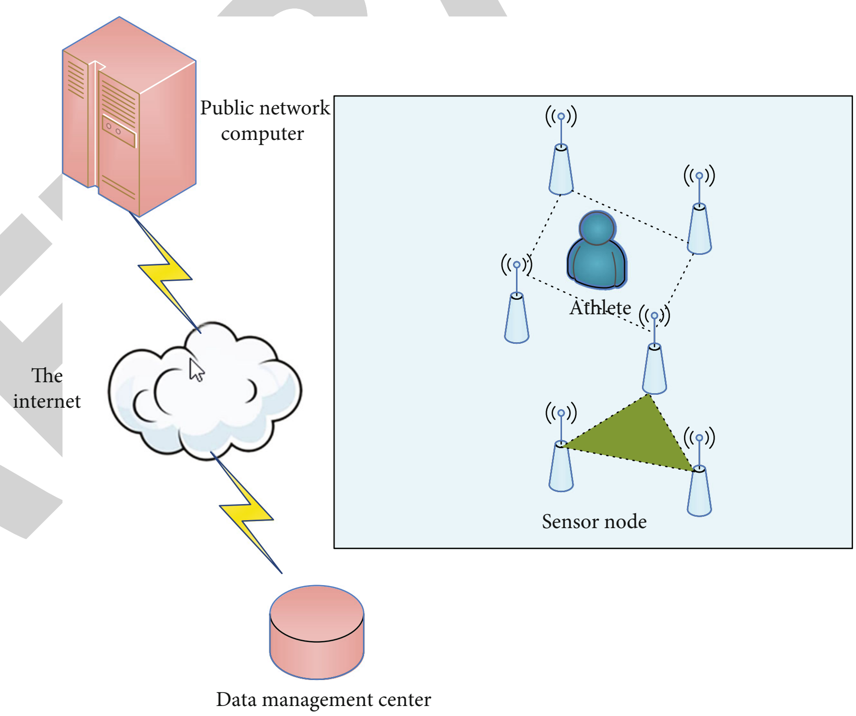


Figure 3: Schematic diagram of wireless sensor network detection in motion.

information transmission, processing, storage and display, and recording and control requirements.

The tennis training system is mainly composed of a sensor module and a mobile phone APP. Among them, the sensor module mainly includes a six-axis sensor, which can work with the microprocessor and power supply module for low-power wireless communication with smartphones [15]. The mobile phone APP collects sports signals in real time, analyzes, and displays the sports results, and the tennis sports training system is shown in Figure 5.

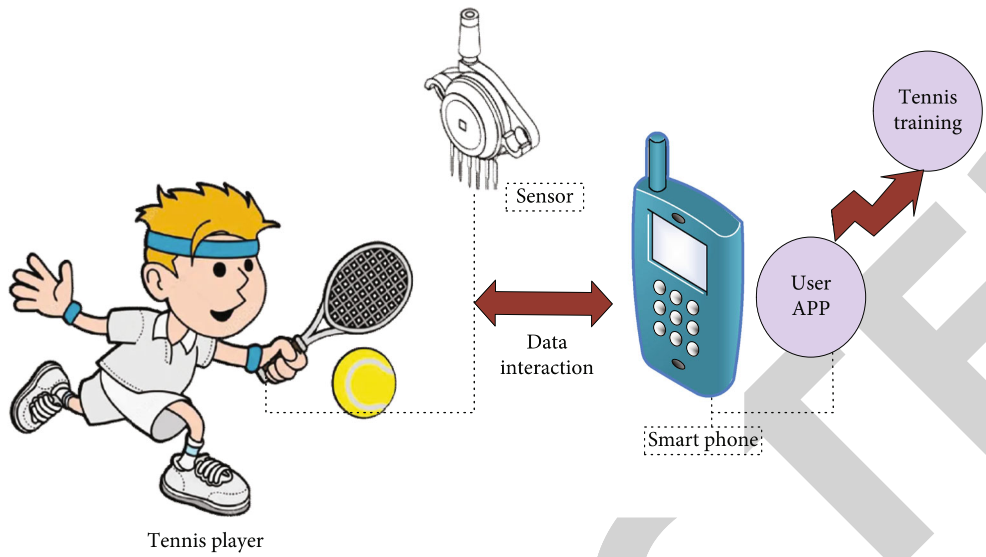


FIGURE 4: Motion detection on the smartphone side.

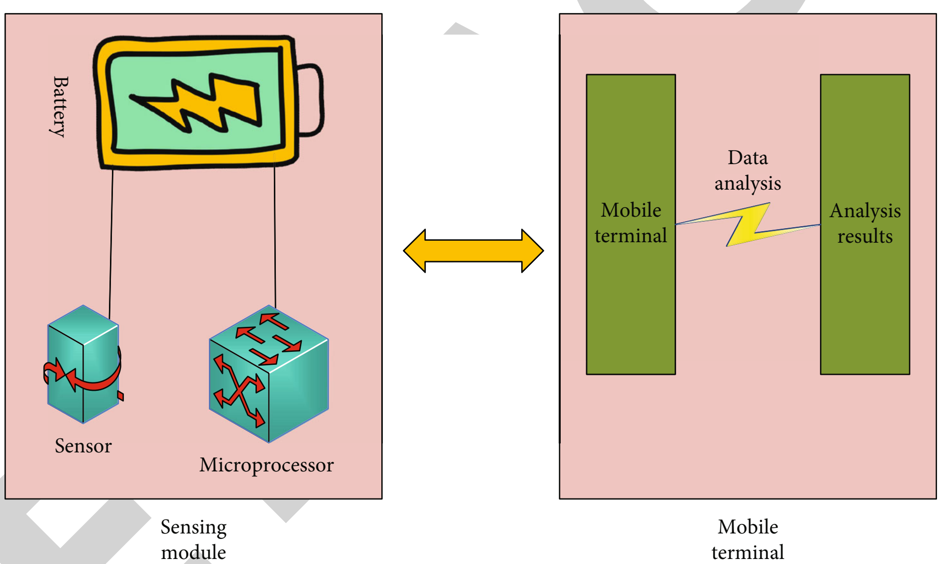


FIGURE 5: Tennis sports training system.

As shown in Figure 5, the smartphone APP can analyze and calculate in real time the technical action categories, times, and percentages of tennis players in tennis and the maximum racket speed. And these contents are displayed through the mobile phone APP software interface [16]. In order to enable tennis players to obtain real-time exercise information in the training process, the system is designed to meet the requirements of the smartphone terminal to receive real-time exercise data, analyze the exercise situation, and display the exercise results.

Generally speaking, when the circuit is in the low-frequency working mode, all the effects in the circuit will be analyzed and considered together. A circuit is replaced by a resistor for circuit analysis; then, this resistor can be called a centralized element [17]. High-frequency circuits are basically composed of passive components, active devices, and passive networks. Components used in high-frequency circuits have different frequency characteristics than components used in low-frequency circuits. The characteristics of centralized components are as follows: when the current passes, the input current and the output current are compared, and neither the amplitude nor the phase changes. However, when the circuit is in the high-frequency working mode, it is not possible to simply replace the circuit line with a resistor, because the amplitude and phase of both the input current and the output current at both ends of the line have changed. Transmission line effects of high-frequency properties cause currents to vary in magnitude and phase, as shown in Figure 6.

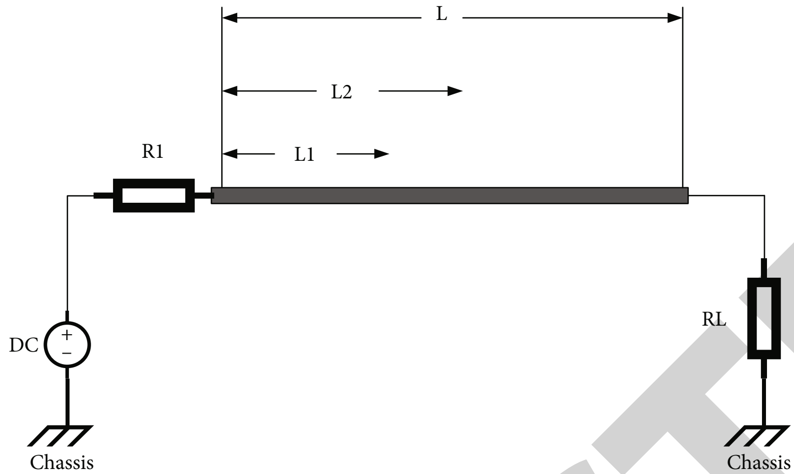


FIGURE 6: High-frequency signal transmission circuit diagram.

As shown in Figure 6, in the case of high frequency, there are corresponding magnetic fields and electric fields around the lines through which the high-frequency currents pass. The magnetic field can store magnetic energy, and the electric field can store electrical energy, making the circuit exhibit inductive and capacitive properties. At this time, the circuit can no longer be equivalent to a simple resistor, but a series-parallel circuit with an added inductor and capacitor, as shown in Figure 7.

As shown in Figure 7, in a high-frequency circuit, the longer the length of the transmission line, the more complex the corresponding equivalent circuit, and the more obvious the influence of the transmission line. In this case, the line can be considered short and the loss of circuit and energy will be ignored.

5. Wireless Sensor Network Algorithm

5.1. Wireless Sensor Network Node Clock Model

5.1.1. Basic Algorithm of Wireless Sensor. Adjacent nodes in wireless sensor networks can identify similarities in data, with a large amount of redundant supplementary information [18]. In the random area S with the distribution density $P(a, b)$, the data redundancy between the wireless sensor network nodes is shown as follows:

$$\eta = \xi S e^{P}. \tag{1}$$

If these highly redundant raw data are directly transmitted through Se^P, it will inevitably cause a huge waste of node energy.

The beamforming algorithm is a representative weighted average method widely used in wireless sensor networks [19]. The beamforming algorithm filters and combines the signals collected by multiple sensors, as shown as follows:

$$b = \sum_{i=1}^{n} \sum_{i=1}^{l} w_i(l) S_i(n-1), \tag{2}$$

where $S_i(n)$ represents the signal collected by the ith sensor and $w_i(l)$ represents the weight filter of the ith sensor.

Several beamforming algorithms, including the minimum mean square error method and the maximum energy beamforming algorithm, aim to develop filters with superior performance. All these algorithms need to choose a compromise point between the energy consumption of the node and the overall performance [20–22].

5.1.2. Local Clock. Defining the difference between the frequency $f(t)$ of the counter and the value 1 as the clock drift is shown as follows:

$$\rho(t) = f(t) - 1. \tag{3}$$

In practical applications, sensor nodes are usually located at relatively general environmental parameters, so the maximum possible clock drift value $\rho_{\max}$ of the node can be reasonably estimated as follows:

$$|\rho(t)| \le \rho_{\max}. \tag{4}$$

The local clock reading $C_i(t)$ can be expressed as follows:

$$C_i(t) = \frac{1}{f_0} \int_{t_0}^{t} f(t)dt + C_i(t_0), \tag{5}$$

where t_0 represents the physical moment when timing starts and $C_i(t_0)$ represents the clock reading of the node at time t_0.

Due to the manufacturing error of the crystal oscillator, usually f_0 and $f(t)$ are not equal. Therefore, the local clock of the node can also be expressed as follows:

$$C_i(t) = x_i(t - t_0) + b_i, \tag{6}$$

where $b_i = C_i(t_0)$ is the clock reading at the initial moment

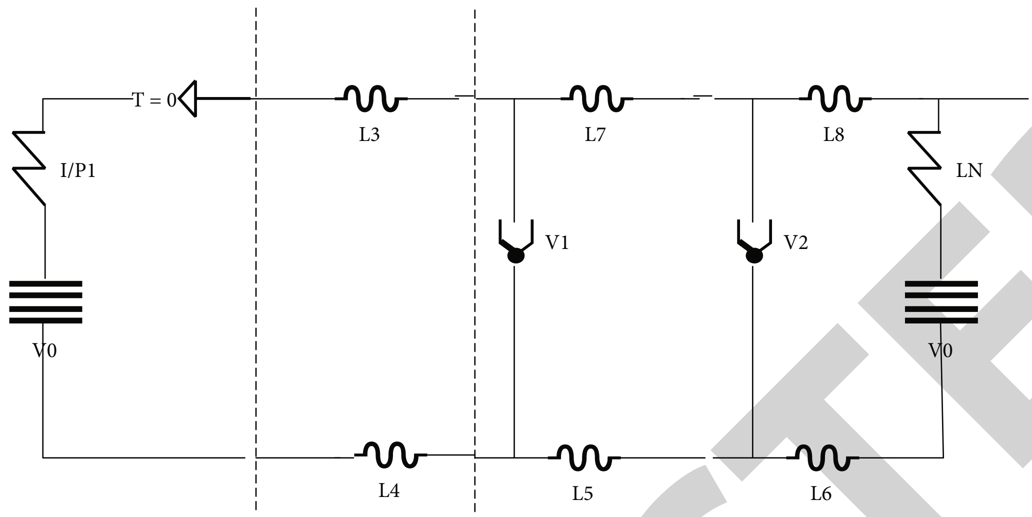


Figure 7: High-frequency series-parallel circuit.

of timing, as in the following equation:

$$t = \frac{1}{a_i} C_i(t) + \left(t_0 - \frac{b_i}{a_i} \right), \quad (7)$$

where a_i and b_i are set as the corresponding coefficients to adjust the logical clock to the physical time base.

From Equation (7), the relationship between the local clocks of any node i and j can be expressed as follows:

$$C_j(t) = a_{ij} C_i(t) + b_{ij}. \quad (8)$$

The above two methods are to estimate the frequency correction coefficient and the initial phase correction coefficient, respectively, which improves the synchronization accuracy. For low-precision applications, this can be modified simply based on the current difference between the node's local clock and the physical clock, or based on the difference between the two nodes' local clocks.

5.2. Optimal Deployment Based on Sensor Nodes. The optimal deployment based on sensor nodes is mainly divided into two methods: single-node signal processing and multinode information fusion. However, single-node signal processing cannot give full play to the inherent advantages of sensor networks and gradually fade out of the research hotspot [23–25]. Multinode information fusion refers to the fusion of effective information obtained by some or even all nodes in the sensor network and finally exerts the multinode advantage of the sensor network. Multinode information fusion can be divided into two categories: information-driven methods and data filtering techniques. The wireless sensor detection efficiency of single-node signal processing and the wireless sensor detection efficiency of multinode information fusion are shown in Figure 8.

As shown in Figure 8, the premise of the information-driven sensor queue to achieve cooperation is to assume that the target has a sparse spatial distribution. Based on this assumption, the cooperative tracking problem can be approximated as a continuous Bayesian estimation problem. The basic idea is to mine sensor information that can optimize the next task through certain rules.

Assuming that Z_1 is the current position of sensor j, and the observation value of the fth sensor is Z_f, the current confidence state of the tracked target can be expressed as follows:

$$P = \left(A \middle| Z_1, \cdots, Z_{f-1}, Z_f \right). \quad (9)$$

The problem of selecting a sensor j is equivalent to the problem of finding the optimal solution of the objective function. The objective function of the optimization problem of information acquisition and consumption can be expressed as follows:

$$M\left[P\left(A \middle| Z_1, \cdots, Z_{f-1}, Z_f \right) \right] = \alpha \cdot \beta\left(P \middle| Z_1, \cdots, Z_{f-1}, Z_f \right) + (1-\alpha)\beta, \quad (10)$$

where β is the amount of effective information, β_c is the loss caused by sensor communication or other, and α is the correlation factor between the obtained effective information and energy loss.

Assuming that the sensor L is the head node, the cost function of communication depends on the distance between the sensors. The distance between the sensors, as a rough measure of the energy consumption of sending data between the sensors, is a relay station for the user. So, the objective function can be expressed as follows:

$$M\left(a_f\right) = -\alpha\left(a_f - a_t\right)^{\mathrm{T}} \sum \left(\left(a_f - a_t\right)^{\mathrm{T}} \right)^2 - (1-\alpha), \quad (11)$$

where a_f and a_t, respectively, represent the position of the moving target and the position of the corresponding sensor passing by in the past and present. In addition, when the route is updated dynamically, the update of the incremental information generates the update of the objective function

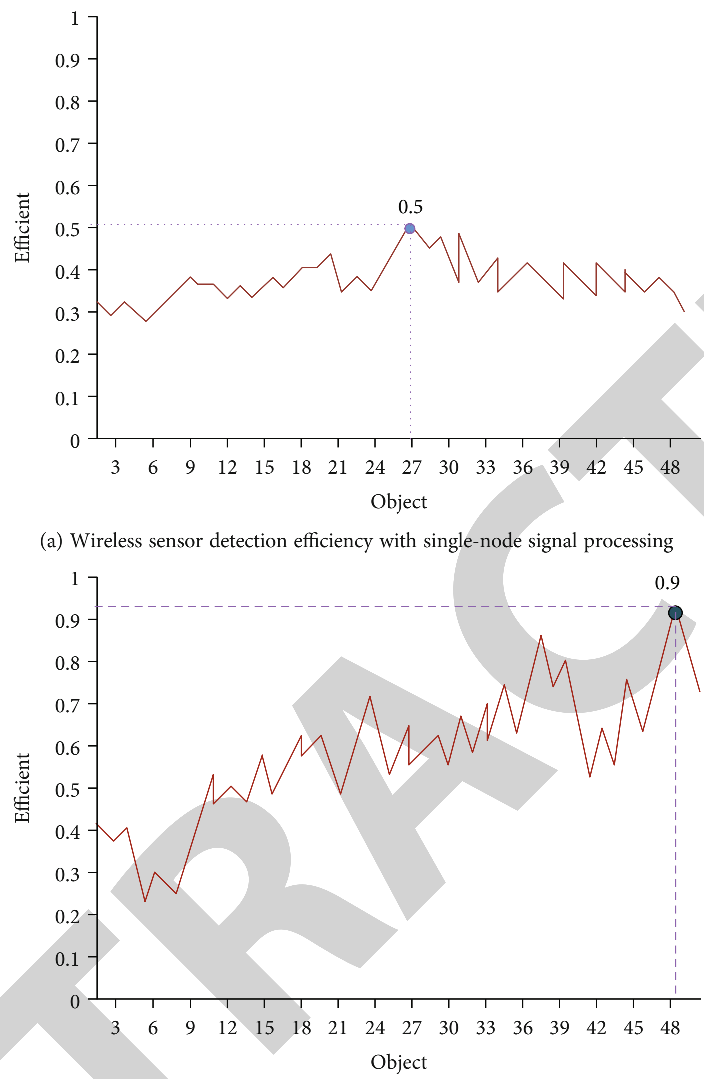


Figure 8: Wireless sensor detection efficiency for single-node signal processing and wireless sensor detection efficiency for multinode information fusion.

value according to the updated values $(a_f - a_t)^{\mathrm{T}}$ and $\sum((a_f - a_t)^{\mathrm{T}})^2$ of the routing path of each node. The updated values a_t and $\sum((a_f - a_t)^{\mathrm{T}})^2$ are passed to the next node and all routing happens locally.

If the node detects a moving target, it will calculate the measurement time difference and the time spent in the previous step, and use the extended Kalman filter to fuse the target estimated value that has been obtained; then, the normal speed model of the target can be expressed as follows:

$$A(+1) = F_k A(k) + G_k u(k), \tag{12}$$

where $A(k)$ is the state of the target at step at time and $A(k)$ and $u(k)$ are the coordinates at step k, respectively.

Assuming that $u(k)$ is white Gaussian noise, the observation model at step k can be expressed as follows:

$$z_{s(k)}(k) = h_k(A(k), s(k)) + v_s(k), \tag{13}$$

where $s(k)$ is the observation range of the sensor in the kth step with a measurement value of $z_{s(k)}(k)$, and $v_s(k)$ is the Gaussian white noise. The predicted value can be expressed as follows:

$$z(k+1|k) = h_{k+1}(A(k+1|k), s(k+1)), \tag{14}$$

where $A(k+1|k)$ is the predicted state of the target at step $k+1$. When the state of the moving object becomes predictable, the idle sensor nodes can sleep temporarily to save energy.

Each node can perceive its neighbor nodes in the same plane. When a moving target appears, the Euclidean distance can be used to calculate the distance between the target and the node. Assuming that the coordinate of the moving target is (a_n, b_n), and each node has a coordinate (a_i, b_i), then the distance between the target and the node can be obtained as follows:

$$D = \sqrt{(b_n - b_i)^2 + (a_n - a_i)^2}. \tag{15}$$

To predict the trajectory of a moving target, firstly, a prediction mechanism needs to be established to monitor the movement of the target, and at the same time, as few nodes as possible can participate in cooperative tracking at the same time, so as to reduce the system energy consumption of WSN. In this scheme, when the node detects that the moving object is in the current geometric plane, it can predict the next position of the moving object.

Assuming that the moving target is detected by the node, the position of the target is represented as (a_n, b_n), then the next position of the target can be represented as (a_{n+1}, b_{n+1}), and the moving speed and direction of the moving target are as follows:

$$v = \frac{\sqrt{(b_n - b_{n-1})^2 + (a_n - a_{n-1})^2}}{T}, \tag{16}$$

$$d = \tan^{-1}\left|\frac{a_n - a_{n-1}}{b_n - b_{n-1}}\right|. \tag{17}$$

By obtaining the moving speed and direction of movement of the moving target, the next step coordinate (a_{n+1}, b_{n+1}) of the target can be predicted, which is as follows:

$$a_{n+1} = \frac{vT}{\sqrt{\arctan^2 d + 1}} + a_n. \tag{18}$$

The moving target moves along the dotted path, and the corresponding adjacent nodes are awakened to participate in the cooperative tracking by calculating the coordinates of the next step. This method realizes simple and effective prediction of moving target trajectory.

Let $S(C_k)$ represent the average distance within a cluster, let $S(C_j)$ represent the average distance between classes, and let DB represent the number of objects in the ith class, then there is as follows:

$$DB = \frac{1}{C}\sum_{k=1}^{C} \max\left\{\frac{S(C_k) + S(C_j)}{d(C_k, C_j)}\right\}, \tag{19}$$

where C is the number of classes and k is the total number of objects. For the target detection effect, the smaller the DB index, the better the target detection effect.

In addition to the target detection effect, there are also target detection accuracy issues that need to be considered. For example, the CA indicator is an indicator to measure the target detection accuracy. The CA index refers to the ratio of the number of correctly classified objects to the total number of objects. The CA indicator is as follows:

$$CA = \sum_{i=1}^{c} \frac{A_j \cap C_i}{\sum_{j=1}^{c} C_j}, \tag{20}$$

where A_j is the number of objects belonging to the ith class in the clustering result and C represents the number of classes. The larger the value of CA, the higher the accuracy of the target detection.

Moving object detection refers to the separation of moving objects from the background through surface and background separation techniques to obtain relatively clear and complete moving object areas. Moving object detection is one of the most important research directions in the field of visual computing.

6. Experiment and Analysis of Traditional Tennis and Tennis Based on Intelligent System

6.1. Experimentation and Analysis of the Benefits of Tennis. Tennis has a history of more than 100 years since it was introduced to China, from the sports and entertainment projects of the school to the establishment of tennis associations, participation in international tennis events, and then to achieve excellent results in international events. Tennis is also growing in popularity and popularity in China.

The opening of tennis courses in colleges and universities is the trend of the development of colleges and universities, and it is also the will of students. Tennis itself is a combination of aerobic and anaerobic, suitable for all ages. It meets the needs of modern people in pursuit of health, happiness, and high quality of life. This article compares the growth rates of tennis courses in 2019 and 2020, as shown in Figure 9.

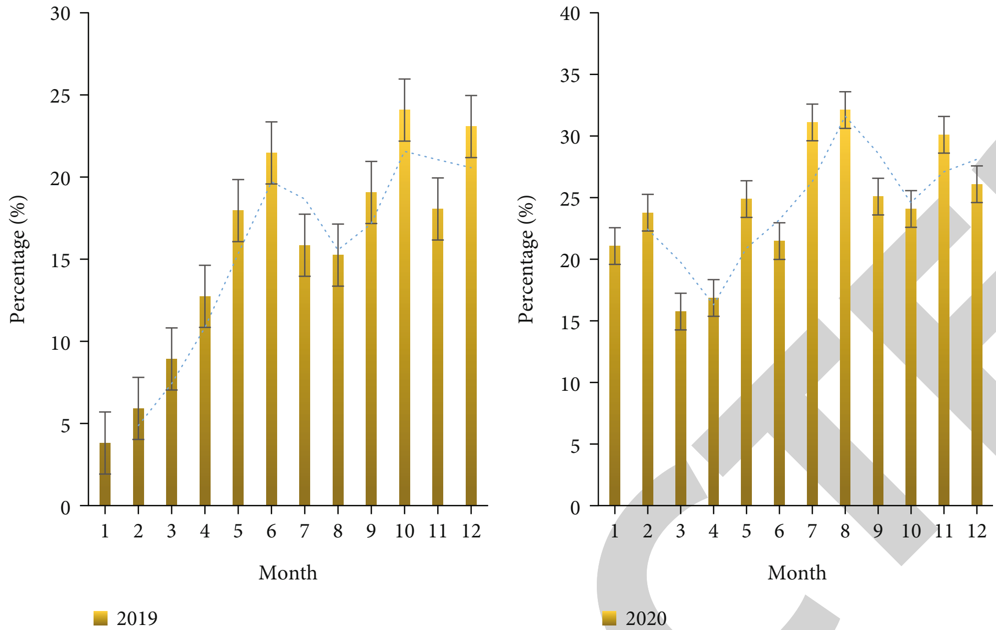
As shown in Figure 9, with the deepening of China's reform and opening up and the development of the market economy, people's awareness and consumption levels have improved, and tennis has become popular in China. Over time, tennis also began to develop in China's college sports.

The development time of tennis in colleges and universities is relatively short, and due to various reasons such as funds, teachers, teaching facilities, and venues, the development of tennis is still in its infancy. This paper investigates and analyzes the basic situation of tennis development in 50 colleges and universities, as shown in Table 1.

As shown in Table 1, the number of colleges with tennis courts in the 50 colleges is 21, accounting for 42%, and the number of colleges offering tennis courses is 15, accounting for 30%. There are 10 universities that have held tennis competitions, accounting for 20%, and only 4 universities that have dedicated tennis varsity teams, accounting for 8%. It can be seen that although tennis is getting more and more popular, professional tennis training is not yet mature.

In this paper, 100 tennis-loving students are surveyed about the benefits of tennis, as shown in Table 2.

As shown in Table 2, 100 tennis players believed that tennis improved their physical fitness, promoted their



(a) Growth rate of tennis courses offered in 2019

(b) Growth rate of tennis courses offered in 2020

Figure 9: Growth rate of tennis courses offered in 2019 and 2020.

Table 1: Basic situation of tennis development in 50 colleges and universities.

Investigate subject	Frequency	Percentage (%)
Colleges with tennis courts	21	42%
Colleges that offer tennis courses	15	30%
Colleges that have hosted tennis tournaments	10	20%
Colleges with varsity tennis teams	4	8%

Table 2: 100 tennis-loving students consider the benefits of tennis.

Benefit	Number of people	Percentage	Effective percentage
Strengthens the body	37	37%	37%
Promotes interpersonal communication	22	22%	22%
Character becomes more cheerful	18	18%	18%
Learned tennis culture	13	13%	13%
Aids sleep	10	10%	10%

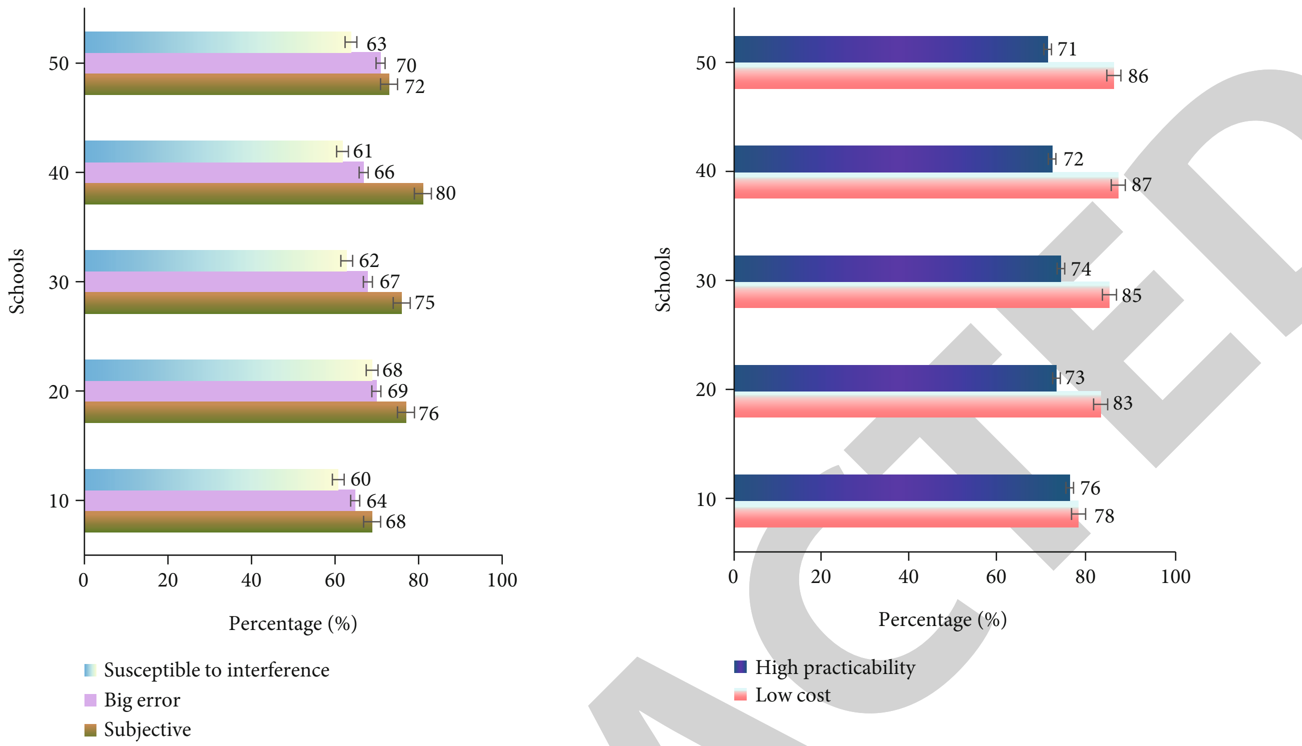
interpersonal communication, made their characters more cheerful, learned tennis culture, and even helped their sleep.

6.2. Experiment and Analysis of Intelligent Tennis Motion System Based on Wireless Sensor Network. This paper analyzes the characteristics of traditional sports training methods and intelligent tennis system based on wireless sensor network, as shown in Figure 10.

As shown in Figure 10, the rapid development of information technology has brought an unprecedented impact on modern competitive sports. The use of information technology to help athletes in scientific training has become an important symbol of modern competitive sports. Traditional physical training methods have disadvantages such as strong subjectivity, large errors, and easy interference. The intelligent tennis system based on wireless sensor network has the advantages of low cost and high practicability.

In this paper, 5 tennis coaches who have used the intelligent tennis exercise system have made statistics on the scores of the intelligent tennis exercise system based on the wireless sensor network and the traditional tennis exercise training, as shown in Tables 3 and 4.

As shown in Tables 3 and 4, this paper compares the traditional tennis exercise training and the intelligent tennis



(a) Characteristics of traditional physical training methods (b) Characteristics of intelligent tennis motion system based on wireless sensor network

Figure 10: The traditional sports training method and the characteristics of the intelligent tennis system based on the wireless sensor network.

Table 3: Work efficiency of traditional tennis training.

Object of investigation	Timeliness	Validity	Real-time monitoring	Resolution
1	5.6	6.1	3.4	4.2
2	5.2	4.8	3.2	4.1
3	5.1	4.7	4.5	4.7
4	4.9	4.2	4.0	4.6
5	4.5	3.8	3.6	4.3

Table 4: The working efficiency of the intelligent tennis system based on the wireless sensor network.

Object of investigation	Timeliness	Validity	Real-time monitoring	Resolution
1	8.9	7.3	7.8	6.4
2	8.5	6.9	7.7	6.6
3	8.3	7.2	8.3	6.9
4	7.9	7.1	8.6	6.2
5	7.0	6.5	8.3	6.1

exercise system based on the wireless sensor network. This is mainly compared from the timeliness, effectiveness, monitoring, and resolution of training. Finally, it is found that the intelligent tennis system based on wireless sensor network can not only improve the timeliness and effectiveness of training but also monitor the sports behavior of athletes in real time and distinguish whether the athletes' movements are standardized.

7. Discussion

This paper studies the relevant theories of smart tennis. The design method of the intelligent tennis system is analyzed, and the advantages of the intelligent tennis system based on the wireless sensor network are analyzed through experiments.

This paper also adopts the node clock model based on wireless sensor network technology. It can be known from the article that in tennis, the detection of time is also very important, and the node clock model can well identify and record the time of the player's movement. Therefore, the method of the node clock model is used for motion detection.

8. Conclusions

With the rapid development of China's economy, the country has paid more and more attention to the sports industry. Sports can not only promote the development of a country's economy but also represent the spiritual outlook of a country. With the rise of tennis in recent years, people's research on tennis is also increasing. In the context of the era of big data, intelligent motion systems have also begun to attract people's attention. Therefore, this paper mainly discusses the design of the intelligent tennis system based on the wire sensor network technology. This paper revolves around the importance of wireless sensor networks and tennis and compares traditional tennis with intelligent system-based tennis. Based on wireless sensor network, this paper proposes to optimize the deployment of sensor nodes, so that the designed intelligent system can run better. In the experiment, this paper mainly analyzes the development of tennis and the shortcomings of traditional tennis. It is found that the development of tennis is getting faster and faster, and the traditional tennis can no longer meet people's needs. The efficiency of traditional tennis training is far lower than that of tennis training based on intelligent systems. Finally, the advantages of tennis based on the intelligent system are summarized, and it is found that it is not only low-cost but also can detect the behavior of players in tennis in real time, correct their wrong movements in time, and accurately record their exercise duration and so on. It can be seen from the full text that the intelligent tennis system based on wireless sensor network technology can help tennis lovers and athletes to exercise better.

Data Availability

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Conflicts of Interest

The authors state that this article has no conflict of interest.

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