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Retraction

Retracted: Research on Design and Application of National Fitness System

Journal of Mathematics

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

Wiley and Hindawi regrets 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 own 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.

References

[1] S. Wang, "Research on Design and Application of National Fitness System," *Journal of Mathematics*, vol. 2021, Article ID 5178550, 10 pages, 2021.

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Research Article

Research on Design and Application of National Fitness System

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In order to improve the physical quality of the national people, a national fitness system is designed and applied to practice. Design the overall architecture of the national fitness system, including the perception layer, network layer, and application layer. The perception layer mainly uses Internet of Things gateway, central machine, wireless perception node, and fitness data dashboard to obtain fitness data. The network layer mainly uses WiFi, 4G, Ethernet, and other public networks to transmit fitness data, fitness guidance data, and equipment operation and maintenance data. The application layer provides data storage, device management, user management, and client services. On this basis, through the collection of users' fitness data rating data, the data are transformed into fitness data rating matrix, and the matrix is analyzed and calculated to realize the intelligent recommendation of fitness data and complete the design of national fitness data recommendation algorithm. The test results show that the system can meet the requirements of normal use, good compatibility, and user score is high and has high practical application value.

1. Introduction

With the rapid development of Internet technology, big data technology, machine learning, and other emerging technologies, the era of "Internet +" and big data has come. The penetration of Internet technology and big data technology into various traditional industries in the society subverts the original market operation mode and industrial pattern, and all traditional industries begin to upgrade and transform to adapt to the new market demand, so does the sports industry [1, 2].

With the improvement of people's living standards, people pay more attention to health, so the national fitness craze rises. National fitness refers to the strengthening of strength and flexibility, endurance, coordination, and control of all parts of the body by all people, regardless of age [3]. Bodybuilding offers people a way of life that improves their quality of life. Regular exercise can prevent various diseases, such as heart disease, stroke, hypertension, arterial embolism, obesity, cholelithiasis, diabetes, and osteoporosis, eliminate tension and pressure, relax the body and mind, improve sleep, make people happy, enhance self-confidence and self-esteem, and make people easier to communicate with others [4]. Regular exercise can not only improve the basic activities of the body but also delight the body and mind, regulate emotions, relieve psychological pressure, and enhance people's physical and mental health. The fitness movement advocates the fashionable fitness concept, the purpose of fitness is no longer a simple physical fitness; its ultimate purpose is "heart." When a person is in a happy mood, the state of mind will be peaceful; the body can get a full range of relaxation. It is easy to complete every day's work efficiently and successfully when the body relaxes, feels happy, and improves its physical quality [5]. Therefore, fitness is an upward way of life, which will bring high-quality life enjoyment and spiritual experience to modern people [6]. Therefore, this paper designs a national fitness system and applies it to the practice to verify the practical application effect of the system.

The contents of this paper follow the following pattern; Section 2 discusses the national fitness system design which is composed of system architecture and fitness material recommendation algorithm design. In Section 3, the application effect of national fitness system is analyzed through carrying out the compatibility and pressure tests. Finally, the results of the study are summarized in Section 4, conclusion.

2. National Fitness System Design

In this section, the design for national fitness system is explained. To this end, we first describe the complete architecture of the system. The system has three layers, that is, perception layer, network layer, and application layer. Secondly, the fitness material recommendation algorithm design is deliberated which is based upon decomposition of matrices.

2.1. Overall System Architecture. The perception layer of the system obtains the data information of each fitness exercise, and the specific equipment includes Internet of Things gateway, central machine, wireless perception node (fitness client), and fitness equipment dashboard (data transmission unit). The network layer of the system is used to transmit fitness data, fitness guidance data, and equipment operation and maintenance data, mainly using WiFi, 4G, Ethernet, and other public networks [7]. The main functions of the system application layer include storage and maintenance of fitness data, fitness equipment management and control, user rights management, and extended interface service. Extended interface service mainly provides application interfaces and data query services for the expansion requirements of third-party application systems. Through further analysis of system requirements, the overall structure diagram of the national fitness system is designed as shown in Figure 1.

Among them, because the network layer uses the public network, the network layer is not discussed too much, so focus on the analysis and design of the perception layer and the application layer.

2.1.1. Perception Layer. The perceptive layer device is used to collect the operating parameters of the equipment and the physical parameters of fitness and send the data to the central machine, which integrates and calculates the data and uploads it to the remote server. The perception layer of the fitness system of the Internet of Things plays the role of the fitness information collector and is compatible with various types of fitness equipment of the Internet of Things through the central machine and gateway of the perception layer, so as to achieve all-weather LAN access and system access of various fitness equipment [8]. In the perception layer, there are two types of perception devices: data transmission units for their own dashboards and fitness terminals suitable for wireless sensors. A national fitness system based on the Internet of Things is designed and implemented by designing and implementing the central machine to support data transmission unit and fitness terminal [9]. In the deployment of perception-layer equipment, appropriate fitness equipment should be selected according to the application situation of fitness, so as to design the corresponding data transmission unit or wireless sensor and fitness terminal, and connect it to the center. The central machine has functions such as data acquisition and processing, network communication [10], authority management, and man-machine interface, and its functional block diagram is shown in Figure 2.

The essence of the central computer is a microcomputer system, which is specially used for fitness information management. When designing the system hardware, it is necessary to choose the appropriate processor chip according to the application background [11]. From the point of view of hardware functions, the central machine has such basic functions as data collection, data display, data storage, data network transmission and local download, QR code decoding, NFC label reading and writing, Mifare card reading and writing, and human-computer interaction, so the schematic diagram of the hardware structure of the central machine is shown in Figure 3.

The software system of central computer consists of serial port driver, NFC driver, and application software. FTDI company provides API for serial port program, and NFC also has corresponding API. Therefore, serial port driver and NFC driver only need to be familiar with program flow [12] and make API call. This paper mainly designs application software of central computer to realize functions such as data collection, identity verification, and network communication. The overall software structure of the central computer is shown in Figure 4.

The sports and fitness data acquisition module is used to collect all kinds of sports and fitness parameter information, including the identity information of the fitness users, physiological parameter information, and equipment operation parameters. In order to support a variety of fitness, the module needs to design different submodules for different data transmission units and fitness terminals [13]. The equipment management module is mainly used for the statistics of fitness equipment warehousing, warehousing, running status and equipment activation, deactivation, opening, closing, and exercise prescription implementation. The sports and fitness data storage and query module is mainly used for local storage and remote server storage of fitness data, as well as extracting historical data from remote server or local files, and realizing visualization. The authentication module is mainly used for NFC Tag and QR code information collection [14] and then connects to the remote server through Ethernet for authentication. The human-computer interaction module is mainly used for data query, data graphical display, equipment management, personnel management, and parameter configuration.

The application software flow of central computer is as follows:

(1) Administrator authentication, enter the interface;

(2) initialize the NFC interface and UART interface to open a thread to receive identity information;

(3) initialize communication program, start SOCKET server, wait for device connection, and open thread for data collection [15];

(4) initialize human-computer interaction configuration, obtain information of each fitness equipment, and monitor data upload instructions; and

(5) wait for thread data.

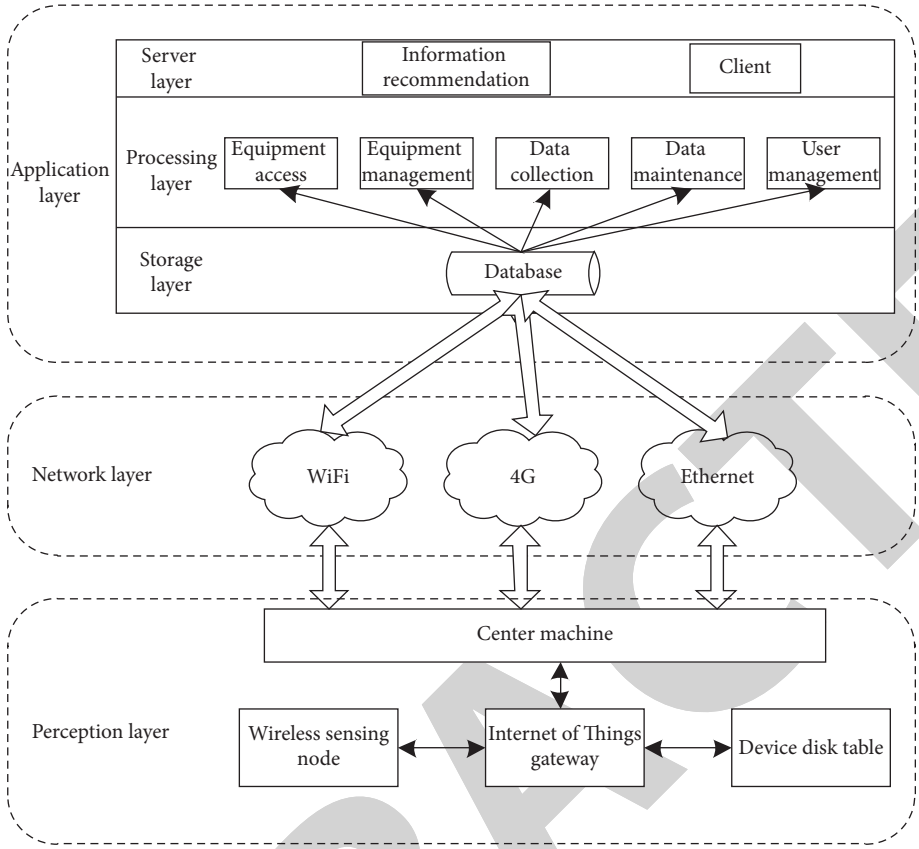

Figure 1: System structure diagram.

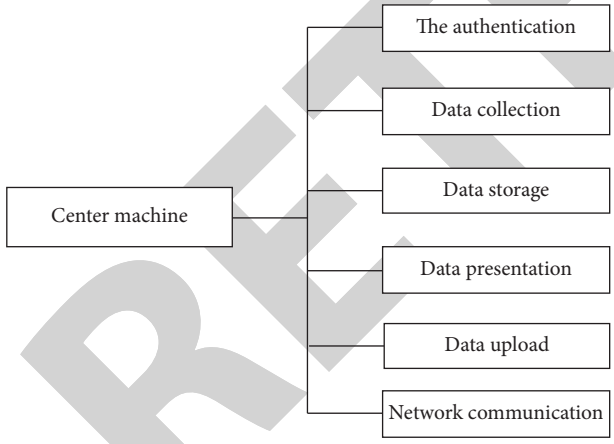

Figure 2: Functional block diagram of central computer.

2.1.2. Application Layer. The application layer of the system consists of storage layer, processing layer, and service layer.

The storage layer is responsible for data storage, including device information, user information, fitness data, and so on. The user information table contains user names, passwords, gender, age, permissions, profile pictures, and other information for user information storage, adding data during user registration. The user information is shown in Table 1.

In user movement record form records are added after a user exercises, including user name, height, time, abscissa value, ordinate value, and heat consumption, and are used to draw movement curves. The user movement record is shown in Table 2.

The heat consumption meter includes fields username, date, and heat consumed. The heat consumption meter is shown in Table 3.

In fitness equipment list users record equipment name, number, and other information, as shown in Table 4.

The system processing layer is responsible for data maintenance, including user management, equipment management, and fitness data calculation and update.

Authentication: According to the system design requirements, the system authentication in this paper is implemented in the form of Mifare card and QR code hardware decoding. The flow chart of authentication is shown in Figure 5.

The QR code hardware decoder is connected to the central machine through serial port, and the NFC card reader is connected to the central machine through USB. The main difference of the whole process is reflected in the module initialization. The initialization of QR code module is mainly through serial port connection. The basic process is as follows:

(1) Enumerates connected serial port devices;

(2) access to communicate with peripherals;

(3) configure parameters such as baud rate for the serial port; and

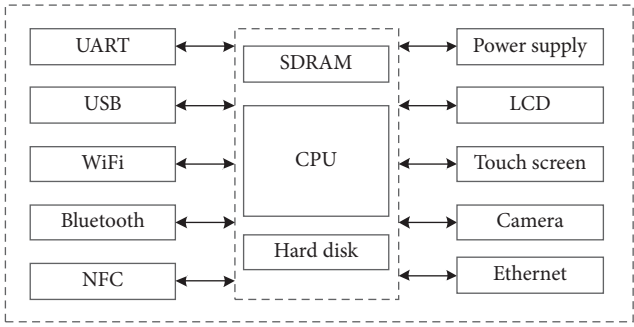

Figure 3: Hardware structure of central machine.

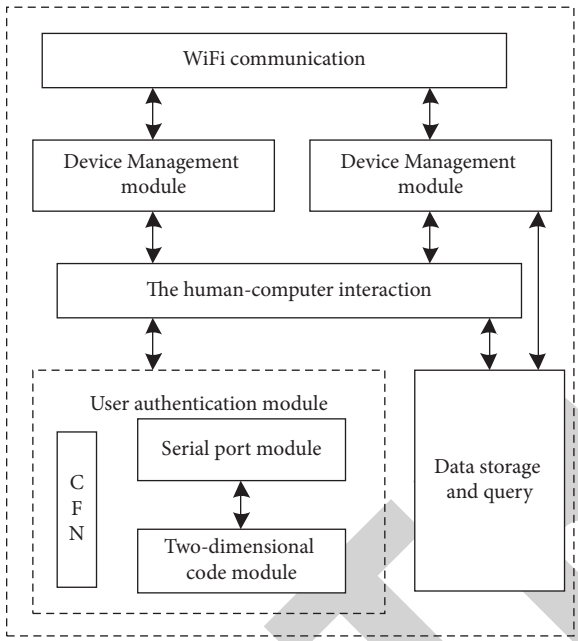

Figure 4: Overall structure of central computer software.

(4) communicate with peripherals to obtain identity information.

In the user authentication program, open up a thread for serial communication, each scans a QR code, through the regular expression to extract the user name and password, and then communicate with the remote server, request authentication, and return the results; the authentication passes the jump to the relevant page, otherwise prompted to reauthentication.

User management: The device management module is designed for device managers. Therefore, users must be authenticated before entering the device management module. The main function is to realize the maintenance and visualization of fitness equipment table, including the addition, deletion, activation, deactivation of equipment, editing and viewing of equipment information, and the maintenance and management of equipment information, such as daily maintenance, remote warranty, and so on. As the data and logic of this module are intricate, the specific design and programming implementation are not described.

Human-computer interaction: The man-machine interaction module provides various man-machine interfaces. Fitness coaches and other managers can manage equipment, personnel, and data through the central machine. At the same time, the central machine provides a friendly interface for ordinary fitness users to query data, exercise prescriptions, and other fitness information.

Data collection and update: Whenever the central computer receives data, it first writes the data into the database, and then searches the fitness equipment table according to the IP address of the current socket connection, and then adds or statistics the use record of the equipment according to the data type [16, 17]. The data acquisition and update flow chart is shown in Figure 6.

The client in the service layer is the direct medium of the interaction between the system and the user. We adopt the intelligent client technology and deploy the function modules of the client through the network. The main interface includes the main interface, registration interface, login interface, and heat consumption query interface. When the system starts, the login page is displayed. There is a registration button on the login page. After you click the button, the registration page is displayed. It should be said that interface design is more important because it is the first impression the software leaves on the user. This paper adheres to the design principles of graphical user interface, which is intuitive and transparent to users. Users can see the corresponding functions on the interface at a glance after contacting the software and can easily use this system without much training. Use a uniform composition layout, with a uniform tone, contrast, color levels, and image style. The design of the interface follows the principle of conciseness and clarity. No unnecessary menus, buttons, and other components are set. As long as it can realize various functions of calling software, it is convenient for users to use. The flow of using the client interface is shown in Figure 7.

2.2. Fitness Material Recommendation Algorithm Design Based on Matrix Decomposition. The matrix decomposition model is a collaborative filtering method, which takes advantage of users' preference data for goods and converts these data into a two-dimensional matrix with users as rows and goods as columns. This paper collects the rating data of users' fitness data, converts the data into the rating matrix of fitness data, analyzes and calculates the matrix, and realizes the intelligent recommendation of fitness data.

Assuming that the actual "user-item" scoring matrix is S and dimension is $u * e$, it is decomposed into $u * k$-dimension user factor matrix A and $e * k$-dimension item factor matrix B; then the loss function is shown in formula (1).

$$C = \sum_{i=1}^{u} \sum_{j=1}^{e} \left(S_{i,j} - A_i \cdot B_j^T\right)^2, \tag{1}$$

wherein i and j represent the i-th row and j-th column of the scoring matrix and $S_{i,j}$ cannot be the missing value. By minimizing the loss function, the predicted matrix is as close as possible to the original scoring matrix. However, when the

Table 1: User information table.

Field names	Data type	Length
User name	Char	10
Password	Varchar	50
Salt	Varchar	50
Gender	Char	10
Age	Char	10
Permissions	Char	10
Head portrait	Char	10

Table 2: User movement record table.

Field names	Data type	Length
User name	Char	10
Highly	Int	4
Time	Decimal	9
Abscissa values	Int	4
Ordinate values	Int	4
Consumption quantity of heat	Decimal	9
ID	Int	4
Heart rate	Nchar	10
Distance travelled	Nchar	10

Table 3: Heat consumption meter.

Field names	Data type	Length
User name	Char	10
Date of	Decimal	9
Consumption quantity of heat	Decimal	9

Table 4: Fitness equipment list.

Field names	Data type	Length
Key	VARCHAR	10
Devname	VARCHAR	2
Devid	VARCHAR	9
Devtype	VARCHAR	5
Devvision	VARCHAR	4
Sportstype	VARCHAR	10
Duration	VARCHAR	12
Devip	VARCHAR	6
Devbrand	VARCHAR	4
Fixdate	VARCHAR	10
Bitmap	VARCHAR	2
State	VARCHAR	6

matrix is sparse, over-fitting may occur. The method of over-fitting is to use regularization, which is to add the binary norm of user factor matrix and data factor matrix to the loss function. The loss function after introducing regularization is shown in formula (2) below.

$$C = \sum_{i=1}^{u}\sum_{j=1}^{e}\left(S_{i,j} - A_i \cdot B_j^T\right)^2 + \lambda\left(\left\|A_i\right\|^2 + \left\|B_j\right\|^2\right). \tag{2}$$

The user factor matrix A and data factor matrix B can be obtained by optimizing the loss function to the minimum value, so that their product approximates the original score matrix. Since both user factor matrix and data factor matrix

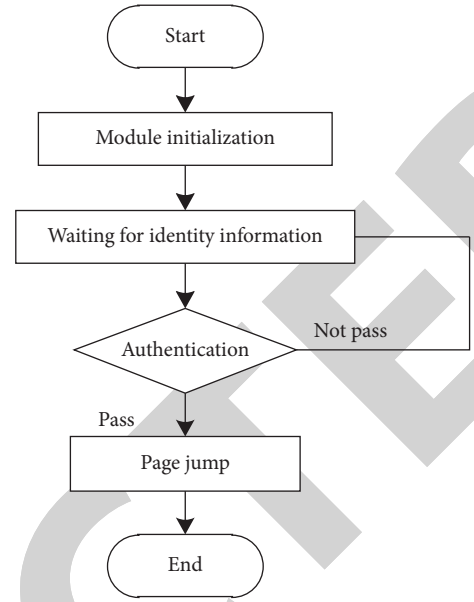

Figure 5: Authentication process.

are changing here, it is difficult to calculate, so the cross least square method is adopted to fix one of the two factor matrices to update the other and keep iterating until the model converges or reaches the set number of iterations. The steps are as follows:

(1) Generate a user factor matrix $A^{(0)}$ randomly.

(2) Fix $A^{(0)}$ and obtain the optimal $B^{(0)}$ by taking partial derivative of data factor matrix B. The partial derivative of loss function C is taken with respect to B_j, as shown in formula (3).

$$\begin{aligned}
\frac{\partial C}{\partial B_j} &= \frac{\partial}{\partial B_j}\left(\sum_{i=1}^{u}\left(S_{i,j} - A_i \cdot B_j^T\right)^2 + \lambda\left(\left\|A_i\right\|^2 + \left\|B_j\right\|^2\right)\right),\\
&= \sum_{i=1}^{u}\left[2\left(S_{i,j} - A_i^{(0)} \cdot B_j^T\right) \cdot \frac{\partial\left(-A_i^{(0)} \cdot B_j^T\right)}{\partial B_j} + 2\lambda B_j\right]\\
&= \sum_{i=1}^{u}\left[2\left(S_{i,j} - A_i^{(0)} \cdot B_j^T\right) \cdot \left(-A_i^{(0)}\right) + 2\lambda B_j\right]\\
&= \sum_{i=1}^{u}\left[2S_{i,j} \cdot \left(-A_i^{(0)}\right) + 2B_j \cdot A_i^{(0)} + 2\lambda B_j\right]\\
&= 2\sum_{i=1}^{u}\left[B_j\left(\left(A_i^{(0)}\right)^T \cdot A_i^{(0)} + \lambda - S_{i,j} \cdot A_i^{(0)}\right)\right].
\end{aligned} \tag{3}$$

1 The above partial derivative formula uses the vector derivative rule and the exchange law of matrix multiplication. The vector derivative rule and matrix penalty exchange law are shown in formula (4) and formula (5), respectively.

2 Vector derivative rule:

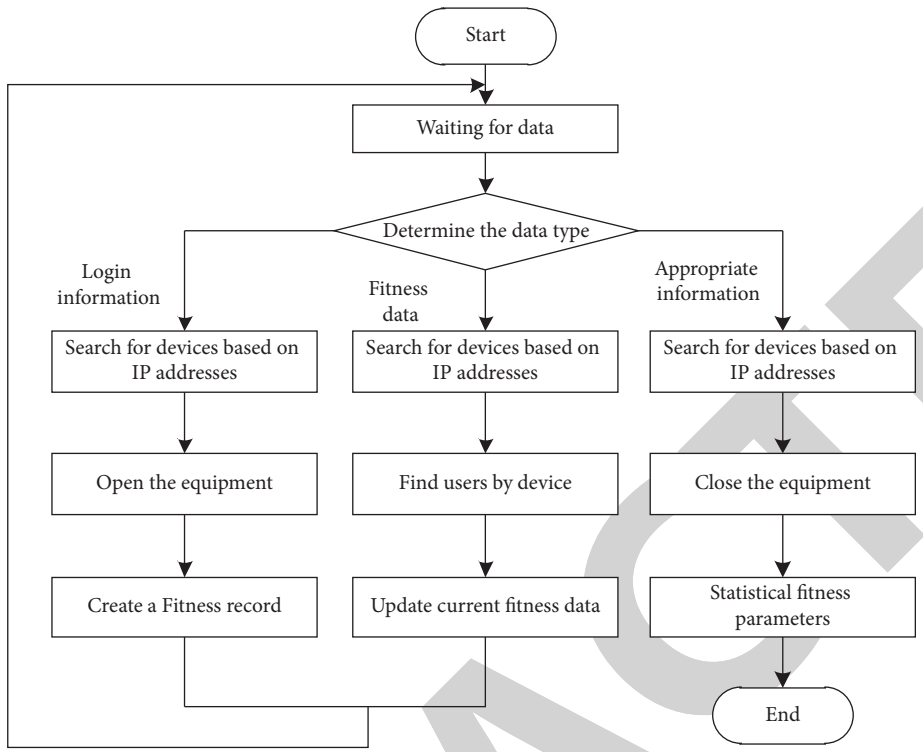

Figure 6: Data collection and update process.

$$\frac{\partial\left(-A_i^{(0)} \cdot B_j^T\right)}{\partial B_j} = -A_i^{(0)}. \tag{4}$$

3 Commutative law of matrix multiplication:

$$2B_j \cdot \left(A_i^{(0)}\right)^T \cdot A_i^{(0)} = B_j\left(\left(A_i^{(0)}\right)^T \cdot A_i^{(0)}\right). \tag{5}$$

(3) Let the partial derivative of loss function C with respect to B_j be 0, and it can be obtained:

$$\sum_{i=1}^{u}\left[B_j\left(\left(A_i^{(0)}\right)^T \cdot A_i^{(0)} + \lambda\right) - S_{i,j} \cdot A_i^{(0)}\right] = 0. \tag{6}$$

There are

$$\sum_{i=1}^{u} B_j\left(\left(A_i^{(0)}\right)^T \cdot A_i^{(0)} + \lambda\right) = \sum_{i=1}^{u} S_{i,j} \cdot A_i^{(0)}. \tag{7}$$

That is,

$$B_j\left(A^T A + \lambda E\right) = A^T S_j^T. \tag{8}$$

If $M_1 = (A^T A + \lambda E), M_2 = A^T S_j^T$, then

$$B_j = \frac{M_2}{M_1}. \tag{9}$$

The data factor matrix B can be obtained by calculating $B_1, B_2, \ldots, B_e$ in turn.

(4) Fixed data factor matrix B and solved user factor matrix A.

$$\begin{aligned}
\frac{\partial C}{\partial A_i} &= \frac{\partial}{\partial A_i}\left(\sum_{j=1}^{e}\left(S_{i,j} - A_i \cdot B_j^T\right)^2 + \lambda\left(\|A_i\|^2 + \|B_j\|^2\right)\right), \\
&= \sum_{j=1}^{e}\left[2\left(S_{i,j} - A_i \cdot B_j^T\right) \cdot \frac{\partial\left(-A_i \cdot B_j^T\right)}{\partial B_j} + 2\lambda A_i\right] \\
&= \sum_{j=1}^{e}\left[2\left(S_{i,j} - A_i \cdot B_j^T\right) \cdot \left(-B_j\right) + 2\lambda A_i\right] \\
&= \sum_{i=1}^{u}\left[2S_{i,j} \cdot \left(-B_j\right) + 2A_i \cdot B_j^T \cdot B_j + 2\lambda A_i\right] \\
&= 2\sum_{j=1}^{e}\left[A_i\left(B_j^T \cdot B_j + \lambda\right) - S_{i,j} \cdot B_j\right].
\end{aligned} \tag{10}$$

Let formula (10) be 0 and get

$$2\sum_{j=1}^{e}\left[A_i\left(B_j^T \cdot B_j + \lambda\right) - S_{i,j} \cdot B_j\right] = 0. \tag{11}$$

There are

$$\sum_{j=1}^{e} A_i\left(B_j^T \cdot B_j + \lambda\right) = \sum_{j=1}^{e} S_{i,j} \cdot B_j. \tag{12}$$

That is,

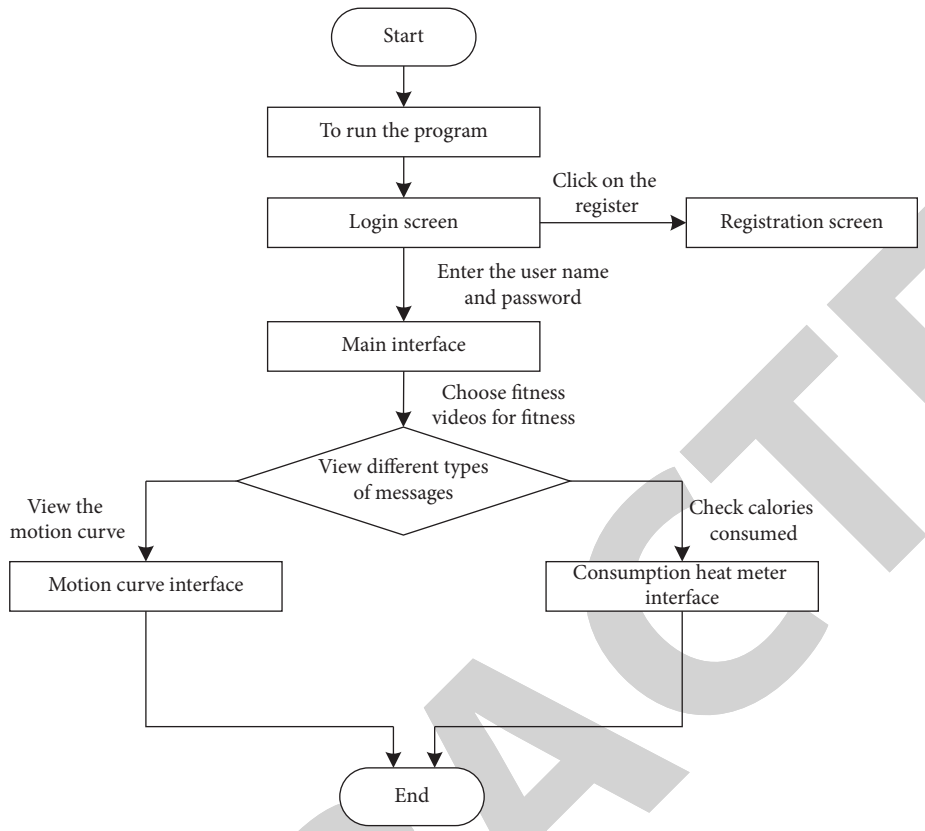

Figure 7: Client usage flow.

$$A_i\left(B^TB+\lambda E\right)=B^TS_i^T. \tag{13}$$

If $M_1=(B^TB+\lambda E), M_2=B^TS_i^T$, then

$$A_i=\frac{M_2}{M_1}. \tag{14}$$

The data factor matrix A can be obtained by calculating $A_1, A_2, \ldots, A_u$ in turn.

(5) The steps (3) and (4) are cyclically executed successively until the loss function C converges or the number of cycles reaches the set value. Then the optimal user factor matrix A and data factor matrix B are obtained.

(6) Build a recommendation model to realize the recommendation of fitness materials. The specific description of the model is as follows:

$$G=\frac{\sum_{(i,j)\in R}\left(S_{i,j}-J_{i,j}\right)^2}{A+B}. \tag{15}$$

In the above formula, 1 represents the scoring approximation matrix.

3. Analysis of the Application Effect of National Fitness System

3.1. Establishment of Development and Operation Environment. According to the analysis and description of the national fitness system design above, the Wamp (Windows + Apache + My SQL + PHP) framework is adopted in the development environment based on Windows, and the concept of continuous integration is integrated to facilitate the maintenance and expansion of the system in the later stage. After the development of this system is basically completed, it will be deployed on the WEB application server of a key laboratory of a university, and stage tests will begin.

1 Development environment: in this paper, the national fitness system is developed using Wamp architecture, the language is object-oriented PHP5.5.12, and the development editor is Net Beans8.1; Net Beans is open source software development integration environment, is an open framework, extensible development platform, and can be used for Java, C/C++, PHP, and other language development. In terms of database management, the graphical management tool phpMyAdmin is used, version 4.1.14.

2 Operating environment:

1 web server: Apache 2.4.9;
2 database: My SQL 5.6.17; and
3 operating system: Windows XP/7/Vista/8/10.

3.2. Application Test

3.2.1. Pressure Test. In this paper, the system tested the high concurrency test and big data test of the system through the pressure test tool ab of the Apache server. By simulating the access of users, the system continuously submitted requests

to verify the bearing capacity of the system. Apache server pressure test tool ab is a relatively popular professional system test tool and has been widely praised in the industry.

The specific test steps are as follows:

(1) Open the Apache server installation directory. An executable program ab.exe is displayed in the bin directory.

(2) On the CLI of Windows, go to the directory where the ab.exe program resides and run the ab.exe program.

(3) Start the ab stress test and input the command line to access the script 5000 times, 200 concurrent (simulate 200 users access at the same time).

The pressure test results are shown in Table 5.

According to the test results of the system, when the number of online visitors increases, the average response time of the system, the throughput per minute of the system, and the offset given by the system increase correspondingly. For the system in this paper, considering the actual situation after the system goes online, the system can still meet the requirements of normal use in extreme cases.

3.2.2. Compatibility Tests. The stability of a system running flawlessly and perfectly on different platforms is known as the compatibility of the system. In this subsection, the compatibility test system under different operating systems will be carried out mainly through the test system. It will be evaluated that whether the browsers display effect is good or bad. Moreover, the tests will be run in different operating systems and browsers.

The compatibility test tool used by the system in this paper is Browser-shots, a popular online test. Browser-shots is an excellent tool on the market to detect the compatibility of websites or systems. It tests the compatibility of websites or systems by rendering web pages in different browsers under different operating systems and then obtaining screenshots. And its service is completely free.

The specific steps of using Browser-shots to test the compatibility of the system in this paper are as follows.

Start by going to Browser-shots' official website, https://browsershots.org/ and selecting a variety of browsers for the different operating systems you want to test. There are four operating systems, Linux, Windows, Mac OS, and Free BSD, as well as various browser versions. Detailed test parameters are available at the bottom. Then enter the URL of the web page to be tested and finally select the platform and browser version. Click Submit to start making effect screenshots. The final test screen will be shown in screenshots and show the compatibility test results for different operating systems and browsers. The results are shown in Table 6.

Table 5: Pressure test results.

The number of threads	20	50	100
Number of samples	200	500	1000
Average response time (ms)	112	409	2876
Offset	65	447	3215
Throughput per minute	356 M	906 M	905 M

Table 6: Compatibility test results.

Browser compatibility testing	IE7	Test pass
	IE8	Test pass
	IE9	Test pass
	IE10	Test pass
	Chrome	Test pass
	Firefox	Test pass
	Google Chrome	Test pass
Server compatibility test	Windows server 2019	Test pass
	Windows 7	Test pass
	Windows 8	Test pass
	Windows 10	Test pass
	Linux	Test pass

As can be seen from the above table, the system in this paper can run stably in different operating systems and browsers, so the compatibility test of the system in this paper shows that the system has good compatibility.

3.3. Application Effect. After 10 months of experiment, the evaluation results of the system in this paper were obtained. The full score was 100, and the lowest score was 0. The user evaluation results are shown in Table 7.

By analyzing the data in Table 7, it can be seen that with the increase of the experiment time, the score of the testers for the fitness system designed in this paper increases, and the user score reaches the maximum value at the 12th month, indicating that the testers are very satisfied with the system designed in this paper, thus proving that the system has a good application effect.

On the basis of the above, a questionnaire survey was conducted among 1000 subjects at the end of the experiment. The results are shown in Table 8.

By analyzing the data in Table 7, it can be seen that with the increase of the experiment time, the score of the testers for the fitness system designed in this paper increases, and the user score reaches the maximum value at the 10th month, indicating that the testers are very satisfied with the system designed in this paper, thus proving that the system has a good application effect.

On the basis of the above, a questionnaire survey was conducted among 1000 subjects at the end of the experiment. The results are shown in Table 8.

By analyzing the data in Table 8, it can be seen that most testers are satisfied with the fitness effect, novelty, lasting attraction, entertainment, and recommendation

Table 7: User evaluation results.

Experimental time	Evaluation results
1 month	85.35
2 months	87.47
3 months	89.52
4 months	92.63
5 months	94.31
6 months	95.74
7 months	96.18
8 months	96.57
9 months	97.34
10 months	97.64

Table 8: Questionnaire survey results.

Project	Satisfaction		Dissatisfaction	
	Number of people	Proportion (%)	Number of people	Proportion (%)
Effect of fitness	9725	97.25	275	27.5
Novelty	9816	98.16	184	18.4
Lasting appeal	9732	97.32	268	26.8
Entertaining	9274	92.74	726	7.6
Recommend effect	9536	95.36	464	46.4

effect of the system. In particular, the novelty of the system has been highly praised by most testers. At the same time, the tester also gave many good suggestions, such as increasing the playability of the system and the fineness of the interface, so as to improve the application effect of the system.

4. Conclusion

The development and implementation of the national fitness program is a systematic project and an open, dynamic, and self-organizing system. To maintain the stability of the national fitness system, it must be an open system. It needs to constantly exchange material, energy, and information with the external environment; that is, it needs to constantly attract all sectors of society to participate and invest, introduce excellent sports instructors, and absorb advanced management experience and technology. With the improvement of scientific and technological level and quality of life, people also put forward higher requirements for the professionalism of fitness and pay more and more attention to the information construction of fitness industry. At the same time, the development of massive data management technology and micro service architecture provides an opportunity for the technical transformation of fitness system. Therefore, this paper designs a new national fitness system and proves that the system has good application effect through practical application, which can be further popularized in practice. However, there are still the following aspects to be improved.

(1) Due to the tight time, the business consideration of the system is not perfect. This paper only realizes the basic business functions, but there are other functions, such as online fitness course management, coach recommendation, and so on.

(2) With the continuous popularity of mobile devices, we will study how to expand the fitness system business to the mobile terminal in the future and provide corresponding data interfaces for Android, IOS, and other mobile terminals.

Data Availability

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

Conflicts of Interest

The author declares that he has no conflict of interest.

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References

[1] A. G. Khan, S. Banik, M. A. Uddin, and S. Moudud-Ul-Huq, "Unlocking the relationship between talent management practices and performance sustainability in the sports industry," *International Journal of Asian Business and Information Management*, vol. 12, no. 3, pp. 366–380, 2021.

[2] J.-H. Yu, H.-H. Lin, J.-M. Huang, C.-H. Wu, and K.-C. Tseng, "Under industry 4.0, the current status of development and trend sports industry combining with cloud technology," *Mathematical Problems in Engineering*, vol. 2020, no. 11, pp. 1–16, 2020.

[3] D. Min, "Perceived service quality, image, trust and word-of-mouth recommendation among participants of National Fitness Awards in South Korea," *Korean Journal of Sport Management*, vol. 26, no. 1, pp. 31–48, 2021.

[4] Q. Z. He, "Mechanism design of bodybuilding and entertainment rehabilitation equipment based on the spatial fixed

Axis gear structure and chain drive," *Journal of Mechanical Engineering and Technology*, vol. 9, no. 5, pp. 384–391, 2020.
[5] Q. Lan, C. Liu, and S. Ling, "Research on measurement of symbiosis degree between national fitness and the sports industry from the perspective of collaborative development," *International Journal of Environmental Research and Public Health*, vol. 16, no. 12, pp. 2191–2208, 2019.
[6] D. Kyslenko, O. Shynkaruk, and O. Kryshevych, "Enhancing physical fitness of future national security personnel of Ukraine using team sports," *Journal of Physical Education and Sport*, vol. 20, no. 11, pp. 1–10, 2020.
[7] M. Zhang and X. Li, "Drone-enabled internet-of-things relay for environmental monitoring in remote areas without public networks," *IEEE Internet of Things Journal*, vol. 7, no. 8, pp. 7648–7662, 2020.
[8] S. Ortiz and M. Green, "Trends and patterns of mobile learning: a study of mobile learning management system Access," *The Turkish Online Journal of Distance Education*, vol. 20, no. 1, pp. 161–176, 2019.
[9] T. Li, "Community application of wearable sports fitness equipment in the embedded system environment of the Internet of Things," *Journal of Ambient Intelligence and Humanized Computing*, vol. 98, no. 3, pp. 1–10, 2021.
[10] M. Kaveh and M. R. Mosavi, "A lightweight mutual authentication for smart grid neighborhood area network communications based on physically unclonable function," *IEEE Systems Journal*, vol. 14, no. 3, pp. 4535–4544, 2020.
[11] M. S. Lodhi, T. Sheorey, and G. Dutta, "Mitigation of fluid flow and thermal non-uniformity of nanofluids in microfluidic systems applied to processor chip: a comparative analysis of mass versus thermal mitigation," *Microsystem Technologies*, vol. 23, no. 1, pp. 1–17, 2021.
[12] S. Liu, M. Liu, T. Tang, and C. Yue, "Moxa multi serial ports card driver development based on RTX system," *Journal of Projectiles, Rockets, Missiles and Guidance*, vol. 39, no. 3, pp. 5–8, 2019.
[13] M. Avkiran, V. Gül, S. Şahin, and İ. Tanağardigil, "Kesintisiz güç kaynağı için uzaktan i?zlemeyi sağlayan veri paylaşım modül tasarımı ve regresyon modelleri ile akü ömrü tahmini," *European Journal of Science and Technology*, vol. 23, no. 6, pp. 279–283, 2020.
[14] Q. Ling, "Research on equipment defect management system based on QR code," *IOP Conference Series: Materials Science and Engineering*, vol. 67, no. 2, pp. 052058–052068, 2019.
[15] X. Luo, R. Hu, and N. Hassan, "Denoising data acquisition algorithm for array pixelated CdZnTe nuclear detector," *Open Physics*, vol. 17, no. 1, pp. 144–152, 2019.
[16] M. J. Christensen and T. Richter, "Journal of Instrumentation Achieving reliable UDP transmission at 10 Gb/s using BSD socket for data acquisition systems 2020 JINST 15 T09005," *Journal of Instrumentation*, vol. 15, no. 9, pp. 1–11, 2020.
[17] Y. X. Gan and X. G. Chen, "Simulation of trusted client identity authentication in power security control process," *Computer Simulation*, vol. 38, no. 8, pp. 181–184, 2021.