

Retraction

Retracted: Physical Education Attendance Based on Wireless and Passive RFID Technology

Journal of Sensors

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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.

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] J. Lin and S. Wen, "Physical Education Attendance Based on Wireless and Passive RFID Technology," *Journal of Sensors*, vol. 2022, Article ID 8485428, 12 pages, 2022.

Research Article

Physical Education Attendance Based on Wireless and Passive RFID Technology

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Attendance information is an important data resource for physical education management in colleges and universities. Based on wireless and passive RFID technology theory, this paper designs a UHF passive RFID radio frequency identification physical education attendance model. The device includes three parts: carrier leakage canceller, radio frequency transceiver, and digital baseband signal processing. In the model hierarchy, the client sends a Web request to the server, and the request information is organized by the RFID document, including information such as the range, scale, and display attributes of the requested map. The Web server modifies the predefined map definition file by parsing the information. In the simulation process, the frequency domain model and baseband complex envelope time domain system of the RF front-end of the reader based on carrier leakage cancellation were built in ADS software and Matlab/Simulink, respectively. The reader front-end and digital baseband signal processing are comprehensively simulated, and the result verifies the function of the whole system. After testing and debugging, it has been proven that the median synchronization number of the signal is 12, the point synchronization number is 29, the input IDB compression point measured by a single tone is 9.6 dB smaller than that of IIP3, and the input IDB compression point measured by two tones is smaller than 14.4 dB, which can promote the informatization process of physical education management in colleges and universities.

1. Introduction

For a long time, attendance management has relied on manual operations. For the attendance information of various types of students in physical education courses, the workload of managers has increased [1], and a lot of manpower and material resources have been wasted [2] and have caused more irregularities in attendance management. According to the needs of the actual system application, the researchers used advanced modeling tools and development models: UML and RUP (Rational Unified Process) to complete the demand analysis and system design of the physical education teaching attendance system [3–5] and realize the intelligent management of physical education hours and student attendance records [6].

With the gradual development of the information society and the improvement of national quality, the information literacy of students is generally enhanced, which provides a strong guarantee for the laboratory to use the attendance management system reasonably [7]. From the analysis of some attendance management systems now, we can divide the attendance management systems from the management functions into two types: the first is the access control physical education system. The access control physical education management system mainly solves the important department entrances and exits to achieve effective physical education management measures [8], integrating computer automatic identification technology and modern physical education measures as a whole. It can automatically identify the identity of the visitor and record the time of entry and

exit but generally does not have a comprehensive attendance analysis function [9]. The second is a comprehensive attendance management system. Mainly, it is used to manage school attendance records and other related situations. The education and self-education of students cannot be carried out in a timely manner [10–12], so that the phenomenon that students cannot be punished appears at a level; this results in managers, teachers, and students not being able to understand the attendance status in time, resulting in ineffective monitoring; in this way, it is very easy for many teachers to lose enthusiasm for attendance management. The vast majority of schools are still in the state of manual work in attendance management, and it is difficult to adapt to the requirements of student attendance management under the current new situation [13].

The physical education attendance system of wireless and passive RFID technology is composed of hardware and software. The hardware part includes a radio frequency module that can identify the frequency of the tag. This module mainly uses RFID technology to distribute the cards containing the basic information of the students and the RFID chip to the one-to-one supervision and management of students; the software part consists of background services and computer terminal management software responsible for data communication with the central database. The signal emitted by the active electronic tag only passes through the obstacle once, so the active electronic tag is mainly used in applications with obstacles, and the distance is longer. When the card is swiped, the basic information data of the students contained in the RFID chip is read and transmitted to the central database in real time. The popular development tool, Microsoft Visual Studio 2008, adopts three-tier architecture and B/S mode and fully utilizes distributed processing technology to ensure that the system's functions such as adding, deleting, modifying, and querying are easy to expand and maintain and are robust. The clients of the B/S architecture process and query information through the browser, which solves the outdated way of installing the client on each host, realizes the zero-installation operation of the terminal client, and fully realizes the sharing and exchange of information and then provides the best support for system expansion.

2. Related Work

Compared with traditional barcode technology, RFID has obvious advantages. It can realize the process of data processing without manual intervention, and unlike the one-time use of barcodes, RFID tags are readable and writable, repeatedly used, and resistant to high temperature, oil stains, and pollution. It is precisely because of these remarkable characteristics of RFID that it has a very broad application prospect. RFID technology has been widely used in many fields such as logistics supply and management, product tracking, asset management, medical care, physical education, and defense [14].

The BizTalk RFID framework can eliminate many technical barriers of customization, and Nagwani et al. [15] provide a unified method for discovering and managing RFID devices and communicating with each other on the Micro-

soft Windows platform. The BizTalk RFID infrastructure includes all the necessary modules and components required by developers to build RFID application software and is plug-and-play and easy to implement. In this way, all useful information for tracking and controlling products can be recorded in detail by using RFID technology. Li et al. [16] designed and implemented the BizTalk RFID infrastructure to make it more convenient and easy for all users to apply RFID technology and to integrate this technology into various business applications and workflows. Of course, making RFID devices fully compatible with the Microsoft Windows platform is a prerequisite for this. The solution of Izang et al. [17] is to integrate all types of RFID devices (including current RFID devices, next-generation RFID devices, sensors, and EPC (Electronic Product Code) readers) by adding a software adaptation layer to the RFID device. Integration on the Microsoft Windows platform becomes a “plug-and-play” model.

The basic principle of DOA positioning technology is as follows: the direction with the strongest received signal power or the opposite direction with the weakest received signal power is the direction of signal transmission; the position of the target can be determined by knowing the directions of two signal transmissions. Wang [18] uses RSSI positioning technology which requires fewer base stations; the system is easy to build, convenient for networking, and suitable for indoor positioning in offices, floors, etc.; however, the received signal strength is easily affected by the surrounding environment, weather, and other signal interference. The positioning accuracy is low, and the design of each node locator is complex, which requires high cost and energy consumption [19]. UWB technology uses the time difference between transmitting and receiving pulses for distance measurement and positioning. It has the advantages of high positioning accuracy and good robustness and is not susceptible to interference. However, the system requires a large bandwidth (greater than 500 MHz) and a precise synchronous clock; the calibration is more difficult [20–22]. The application of UWB mainly lies in short-distance high-speed data communication, that is, the wireless transmission of a large amount of multimedia data without delay; the rate is from 100 Mb/s to 500 Mb/s; it also has certain advantages and application prospects in the field of indoor attendance [23], so many researchers are working on this [24].

3. Construction of Physical Education Attendance Model Based on Wireless and Passive RFID Technology

3.1. Passive RFID Hierarchical Construction. In the construction of passive RFID layers, the electronic tag is activated by receiving a special radio frequency signal launched by the reader through the transmitting antenna, so that the energy obtained by the induced current will store the encoded information in the chip which is sent out through the built-in radio frequency antenna or actively sends a certain frequency signal; the receiving antenna of the reader receives

the reflected microwave synthesis signal, which is decoded by the antenna conditioner. After that, the valid information is sent to the central information system for related data processing. MCU has a dedicated on-chip SPI interface, and the MCU can operate and configure the registers of the radio frequency transceiver through the SPI interface to control the working mode of the radio frequency transceiver and then control data transmission and reception.

$$\sqrt{L(w, x, y) + \text{lamda}(x, y)} = \frac{1 - \min \phi(w, x, y)}{wpi * w(x, y)}, \quad (1)$$

$$\sum \frac{1}{2} p' p(x, y) - \sum [\text{lamda}(x^t x + y) - 1] = x - y. \quad (2)$$

The state vector can be either the position and velocity vectors of the MS in all directions or the position coordinates of a single MS. During positioning, the Kalman filter can process the measurement values of TOA, TDOA, and AOA and directly estimate the MS position. You can also use the static positioning method to estimate the position first and then use this method to smooth the estimated position; from the theoretical description of the Taylor series expansion positioning algorithm, it is an iterative loop positioning algorithm, when it is the obtained position of the positioning node; when the coordinate error exceeds the acceptable range, the calculated value is brought back into the formula.

$$\sum \log \phi(w) - \log(4pir) - \left| \frac{1}{2} x^t x - y' y \right| = 0, \quad (3)$$

$$\left| \frac{1}{2} x^t x - y' y \right| - \left| x' x + \frac{1}{2} y' y \right| = (x + y)^2. \quad (4)$$

When there is NLOS propagation, the distance from the mobile station to the base station is restored according to the measured AOA value to be greater than the real distance, so the measured AOA value is gradually reduced until the AOA is obtained as the value under only LOS propagation. Taking the value of the measured AOA as the initial quantity, through iteration, this quantity is approximated to the measured AOA without the influence of NLOS propagation, and then, this more accurate AOA value is used in other algorithms.

$$x^t \times x + \log(x - y) \geq 1 \geq y^t \times y + \log(y - x), \quad (5)$$

$$\cap_{i=1, j=1}^{i+j} \text{mix}(2pi - x, 2pj - y) + \text{nix}(i, j) = 0. \quad (6)$$

It performs 100 simulation experiments for each corresponding signal-to-noise ratio to extract the positioning coordinates. In the figure, it can be seen that the root mean square error of the positioning estimate and its variance gradually decrease with the increase of the signal-to-noise ratio. The larger the ratio, the higher the positioning accuracy. When there is attendance information inserted into the attendance information record table, the program needs to determine whether the attendance information of this

month's physical education has statistics.

$$\left\{ \begin{array}{l} \cap_{i=1, j=1}^{i+j} (1 + \sqrt{2x - y})(x - 1) = 1, \\ \cap_{i=1, j=1}^{i+j} (1 - \sqrt{2x - y})(y - 1) = 1. \end{array} \right. \quad (7)$$

For various events triggered by operations, it can use JavaScript to process DOM data and draw the interface according to XHTML and CSS specifications. The clarity of the structure lays the foundation for the asynchronous response. All communications with the server are centrally submitted to the RFIDHttpRequest object for processing, which encapsulates the RFID. The RPC protocol supports asynchronous requests, which is equivalent to providing a dedicated thread for communication with the server in addition to the independent user interaction thread. In short, with RFIDHttpRequest, it is possible to use JavaScript to make a request to the server and process the response without blocking the user. This asynchronous communication mechanism is at the heart of the AJAX model and completes the initialization of the radio frequency transceiver by specifying the transmit power and transmission rate and the length of the received data packet. This feature determines that it is suitable for environments that require frequent interaction with the server and require immediate response to operations.

In the experimental environment of Figure 1, the average positioning error using the traditional trilateration method is about 13, and the maximum error is 27; after using the improved algorithm, the average positioning error is within 10, and the maximum error is 26. The robustness of the positioning accuracy of the improved algorithm has been improved, and the average error has decreased significantly compared with the traditional trilateration method, which is in line with the improvement expectations that this paper hopes to improve the positioning and positioning effect and basically meet the requirements of indoor positioning for errors, to achieve the purpose of improving the positioning accuracy. In the ValidateAndOperate.cs class file, the function will use regular expression matching operations and database queries and other related operations, so add using System.Text.RegularExpressions and using System.Data.SqlClient to the namespace used by this class. For the problem of smooth transmission, the data transmission in the embedded network needs to meet the various layer protocols specified by the network model to reach the transmission destination.

3.2. Wireless Tag Coding Design. The wireless tag coding attendance system designed and implemented in this paper is composed of the attendance basic data subsystem and the daily attendance subsystem. Among them, the basic data system of attendance mainly provides basic data management for attendance management personnel, including basic student information, class basics, course basic information, course schedule information, teacher basic information, attendance record query, password modification, and other modules; the daily attendance system is mainly to realize

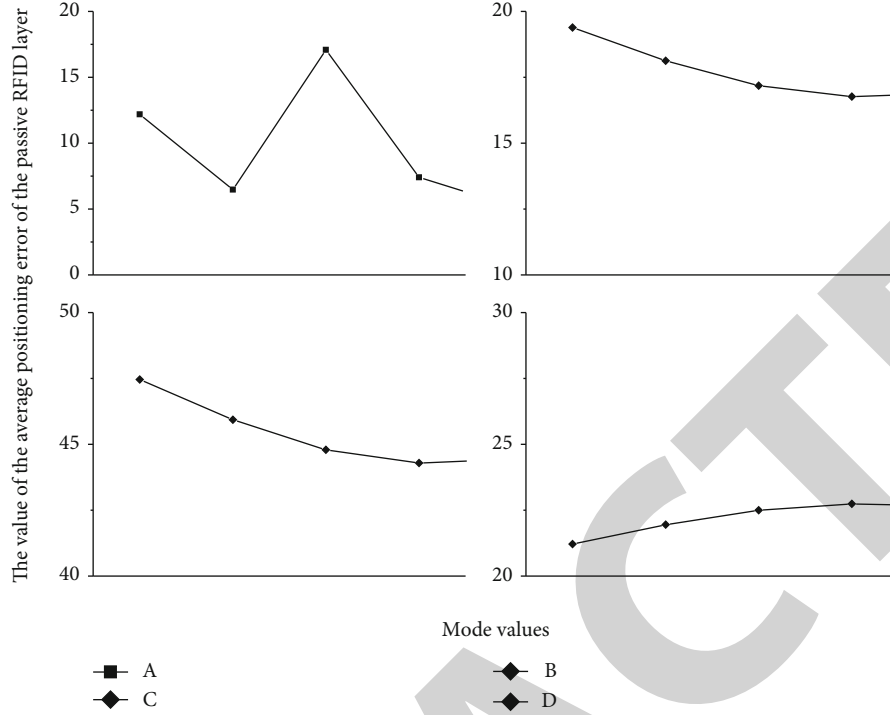


FIGURE 1: Average positioning error of passive RFID layers.

the daily attendance function of physical education, mainly the credit card module.

$$\begin{cases} \frac{\partial \beta - y(\text{qurt}(x - x'))}{\partial \beta - y * x} - 1 = 0, \\ xt \rightarrow 1, yt \rightarrow 1 - x, \end{cases} \quad (8)$$

$$\frac{\partial \omega(\text{ant}, x)}{\partial x} - \sum \omega(y(\text{ant}) + x(\text{ant})) = \frac{y(\text{ant})}{r - \text{ant}}. \quad (9)$$

Attendance records: record each student's clock in and out of class. School leaders, teachers, and students can query the corresponding attendance information with their own authority. *Attendance query:* it can query the attendance statistics of eligible students by class, course, name, and date. Click the number of late arrivals, the number of early departures, and the number of absenteeism, and the page will jump to display detailed information. *Attendance report:* those with the right of attendance management can quickly export the attendance form of all students within the specified time range in the attendance report, and monthly statistics are convenient and simple.

$$\begin{cases} \frac{\partial \ln(y - x)}{\partial x} > 1 - x, \\ x - \sum \ln(x - 1)(y - x) = 0, \end{cases} \quad (10)$$

$$\begin{cases} x^t \times x + \sqrt{1 - f(x - y)} \geq 1 - \delta, \\ y^t \times y + \sqrt{1 + f(x - y)} \leq 1 + \delta. \end{cases} \quad (11)$$

In the case of temporary network failure, we provide teachers with privileged users to temporarily enter data. An indivisible data processing process is defined as a transaction submitted to the server for completion. That is to say, the integrity of data processing is ensured through the data consistency of the relational database management system, and the consistency and correctness of data in the process of data processing must be guaranteed when writing application programs.

$$\text{abs} \left\{ \frac{\text{side}(x - y, x + y) - x - y}{\text{diameter}(x - y, x + y) - x - y} \in R \right\} > 0, \quad (12)$$

$$\begin{cases} \frac{1}{n} \ln(\sqrt{\text{side}(x) - \text{diam}(x)}) = p, \\ \frac{1}{2} \ln(\text{side}(x) - \text{diam}(x)) - \frac{1}{3} \ln(\sqrt[3]{\text{side}(x) - \text{diam}(x)}) = 0. \end{cases} \quad (13)$$

The power supply supports redundant technology. When one power supply unit fails, the other power supply unit can take over all the loads, so that the system can continue to operate normally; in order to ensure the performance of data sports teaching, various levels of SCSI RAID are used to meet different application requirements; to support hard disk hot-swap, if a hard disk fails, you can pull it out without shutting down, replace it with a new hard disk, and perform data recovery through RAID.

$$g(x) = \begin{vmatrix} p^t \times x + p & -1 \\ 1 & p^t \times x - p \end{vmatrix} \times \begin{vmatrix} p & -1 \\ -p & 1 \end{vmatrix}. \quad (14)$$

The system provides fixed IP, user authority management, and operator password encryption functions and performs multilevel authority control to ensure that data is not modified by illegal operations. It provides the management function of operation authority, allowing the system administrator to assign and manage the authority of each operator. It can check the recent consumption status of the student's meal card; if the dormitory is equipped with an information collection system, teachers also have a clear understanding of the students' accommodation situation.

In the database design of Figure 2, the data storage in the data dictionary obtained by the system analysis should be analyzed first, the relationship between each data storage should be analyzed, and then, the relationship mode of the system can be obtained. The local area network mainly connects the data information reading equipment, various display processing terminals, and servers in the venue area. Data information reading equipment mainly includes video camera, RFID reader, and access control system. The read information is transmitted to the database and video network matrix through the local area network for data processing and then displayed on each display terminal. The main work includes researching the anticollision algorithm of RFID tag identification. Aiming at the information collision phenomenon when RFID reads electronic tags, various collision types are introduced in detail, and the binary search method and ALOHA method are deeply analyzed. Based on the detailed study of the ALOHA algorithm, an improved dynamic frame time slot ALOHA algorithm is proposed.

3.3. Physical Education Attendance Indicators. In view of the fact that the physical education attendance system needs to realize a series of business functions, in order to avoid repetitive development, reduce project costs, and improve the quality of software, the whole is based on the .Net framework, and the structure of each layer is as shown. The front-end (client) of the system is completed by HTML, Javascript, and ajax; the Web server used is provided by the Web publishing service of IIS; and the C Sharp (C#) advanced programming language is used to realize the system functions and card swiping service functions. ADO.NET is used to call the database, the database uses SQL Server 2005, and the Microsoft SQL Server (T-SQL) language is used to complete the construction of the database organization, and the write triggers and stored procedures are listed in Table 1.

The two development platforms are very similar in terms of goals and architecture: the underlying execution engines both derive from the managed virtual machine concept; the compilation of programs goes through two similar processes; object-oriented programming is used in both J2EE and .NET platforms to obtain direct support; single root inheritance and multi-interface implementation are their common characteristics; they all share the same three-tier/multitier system; that is, they all propose development components for desktop-based applications and browser-based Web applications. In the actual design and debugging, in order to adjust to the best antenna matching, you can choose an adjustable capacitor with a larger debugging range, such

as an adjustable capacitor with an adjustable range of 12 pF to 80 pF. After matching and debugging is completed, the adjustable capacitor can be removed for measurement or a larger range of capacitors can be used for debugging. After debugging, it can be replaced with a fixed capacitor and a smaller adjustable capacitor in parallel to reduce the design cost of Figure 3.

Analysis shows that the synchronization of the system includes bit synchronization and point synchronization. Before synchronization, the PN sequence returned by the tag cannot be detected correctly, so the system cannot detect the correlation peak. During the bit synchronization process, the local clock will traverse a period of delay, and the correlation peak of the received PN sequence detected by the system exhibits an S-shaped change, as shown. After the bit synchronization is completed, the system will perform point synchronization, but the peak-to-peak variation of the correlation peak is small. The point synchronization of the system is carried out on the basis of bit synchronization. For embedded system development, the selection of an inappropriate operating system can not only reduce the workload of developers but also increase the system resources, causing the system to deal with operations that are not related to its own tasks which will inevitably reduce the smoothness of the system's operation and weaken the efficiency of the system. It is the correlation peak and synchronization delay information displayed in the Modelsim software after the point synchronization is completed. The median synchronization number is 12, the point synchronization number is 29, and the oversampling factor is 32.

3.4. Interface Output Design. Interface output communication format: baud rate: 19200; parity bit: E; data bit: 8; stop bit: 1. Data frame format: the start is hexadecimal 0x09, and the end byte is 0x0D; the data in the middle are in ASCII standard format, data 0-9 use ASCII 0x30-0x39 corresponding, respectively, A-F use 0x41-0x46 corresponding. The checksum is the XOR value of all the data in Figure 4 from the beginning of the data to the checksum and then splits the checksum into two ASCII values and transmits them separately according to the transmission rules of the data part.

The PC controls the reader to transmit a 125-bit truncated m-sequence modulated radio frequency signal, which reaches the tag simulator through the channel attenuator; the tag simulator reverse modulates the radio frequency signal, and the modulation signal is a 50 kHz square wave. All signals demodulated by the receiver are stored in the digital storage oscilloscope and sent to the PC for DSP processing. The sampling rate of the digital storage oscilloscope is 400 Msps, and the data rate processed by the DSP of the PC is 80 Msps. Therefore, the oscilloscope transmits 1 point after every 5 points sampled to the PC for processing, so as to maintain the real time and synchronization of the system. Set the sampling mode of the oscilloscope to high-precision sampling, so that dithering techniques can be used to reduce the effects of white noise and quantization noise. Due to the different sizes of the antennas, the

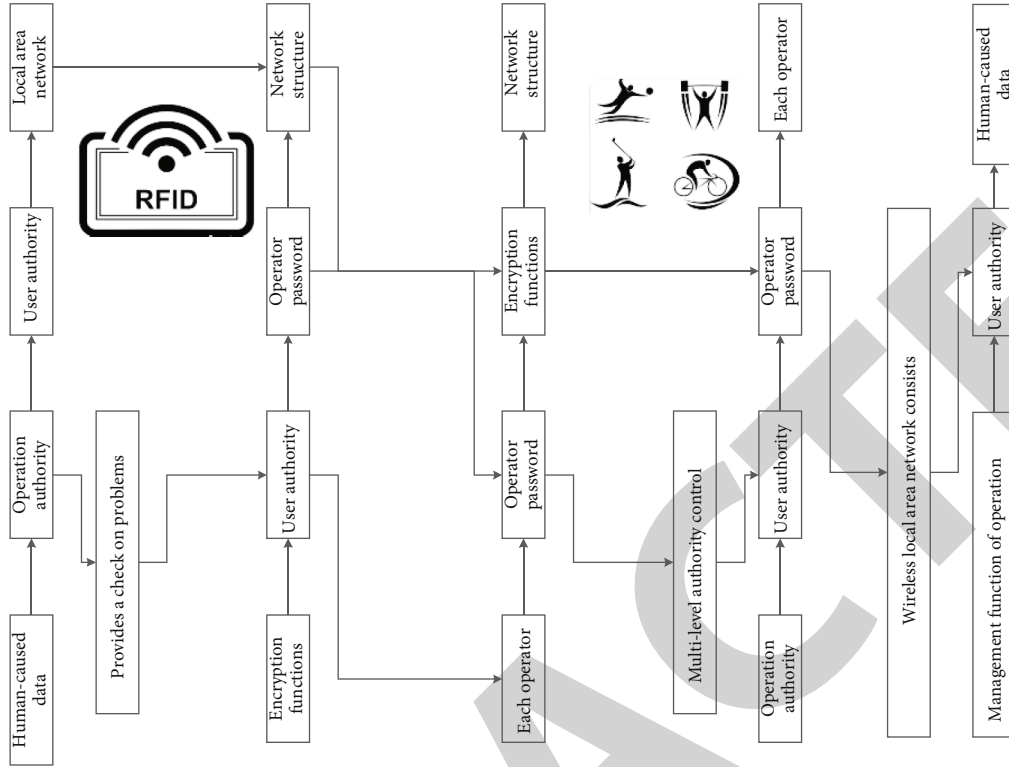


FIGURE 2: Rights management database design.

TABLE 1: Algorithm construction of attendance system.

Algorithm construction code	Text for attendance system
Def loaddataset(filename, split, trainingset = [])	Multilayer application
With open(filename, 'rt') as csvfile:	Avoid repetitive development
Lines = csv.reader(csvfile)	In view of $diam(x)$
Dataset = list(lines)	Reduce project costs $1 - \delta$
For x in range(len(dataset)-1):	$y\alpha + b$ by this framework
For y in range(4):	Improve the quality of software
Dataset[x][y] = float(dataset[x][y])	$p^i \times x + p$ is mainly distributed
If random.random() < split:	Combined with the characteristics
Trainingset.append(dataset[x])	The fact that the quart $(x - x')$
For x in range(length):	The application architecture provided $x'x - y'y$
Distance += pow((instance1[x]-instance2[x]), 2)	Physical education attendance system
Return math.sqrt(distance)	side(x) of the system

loop inductance is also different. In order to enable the matcher to match antennas of different sizes, there are multiple sets of capacitors on the FEIG antenna matcher, which can be combined by jumpers to achieve different sizes of antenna magnetic loops; due to the influence of distribution parameters such as jumper pins, the FEIG antenna has adjustable capacitors (C2, C3, C1, C40) in each branch to fine-tune the circuit matching. The matching circuit of this method is more flexible, but there are also problems.

3.5. *Attendance Database Query.* The functions of the attendance management module include intelligent attendance, manual attendance, and time setting. The intelligent attendance function is the main function of the attendance management module. This function provides physical education with the function of automatic attendance through card reading. Automatic attendance through intelligent attendance saves time and does not require manual participation, which greatly saves the time and effort of attendance and the possibility of attendance errors. The structural framework of

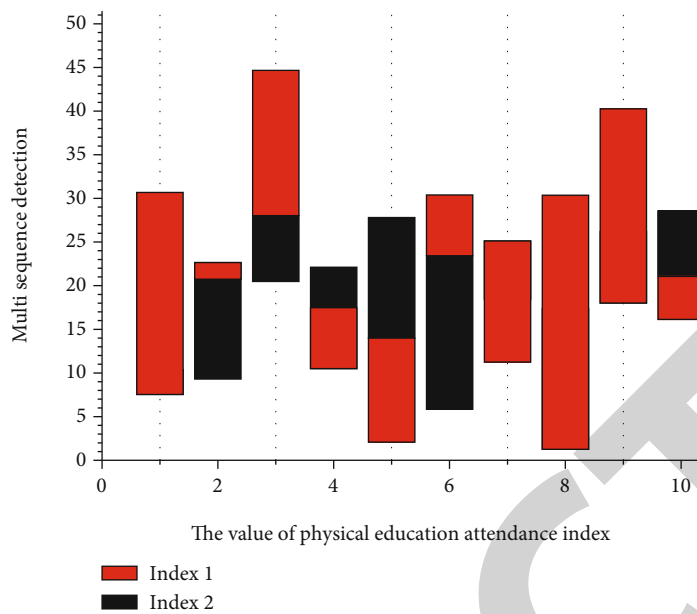


FIGURE 3: Sequence detection of physical education attendance indicators.

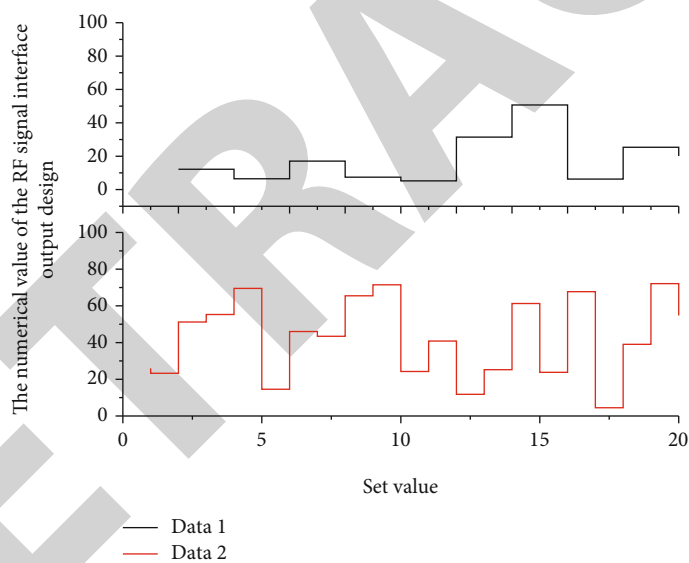


FIGURE 4: RF signal interface output design.

the system has been reentered: when the data is transmitted to the host computer through the RS485 bus, the incoming data needs to be sorted into a specific report and provided to customers with a UI interface with better human-computer interaction.

In addition, manual attendance can also supplement the missed attendance information in intelligent attendance, which fully guarantees the integrity of the data obtained by the system and RF card allocation function; first enter the RF card allocation interface, the system starts to search for the card at this time, and when it finds a valid card, it reads the card sequence. At this time, the operator needs to input the job number information twice to prevent misinput. If the input is checked correctly, write the corresponding informa-

tion in Table 2 into the card, and the RF card is allocated successfully.

Considering the physical education of this system information, in order to prevent the leakage of system rights and the illegal tampering of information, each user can log in to the system with his own username and password plus correct authority. In order to prevent system users from changing system information during query, we provide users with queryable information in the form of views in the query module. The administrator's job is mainly to maintain and manage the entire system, and the leader itself is also a type of user, but this type of user is relatively high compared to other users, but the administrator does not have the right to use attendance management.

TABLE 2: Attendance database query.

Attendance number	Database type	Query text	Database number	Query reason
10	Char	User name	83	Attendance work
20	Char	User name	57	User name
30	Char	Entire system	56	Abnormal conditions
40	Longint	Entire system	99	Special circumstances
50	Longint	Administrator data	66	Corresponding set
60	Longint	Administrator data	56	Prevent misinput

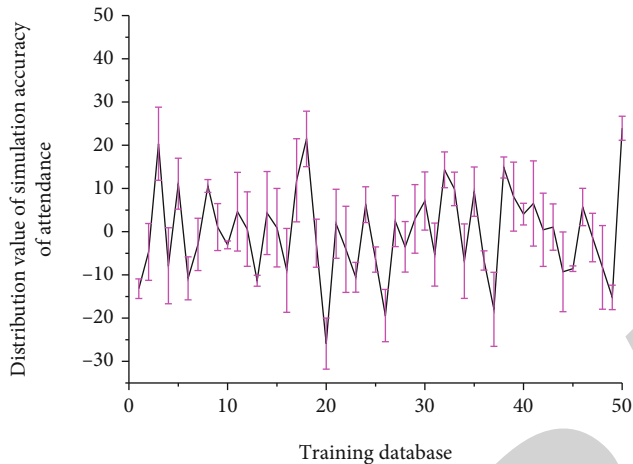


FIGURE 5: Simulation accuracy distribution of attendance database.

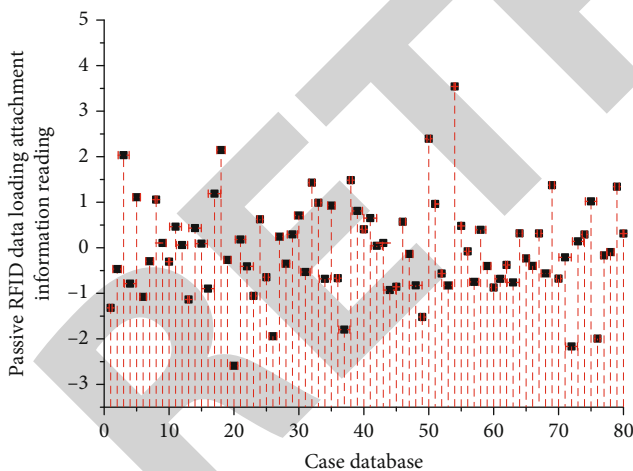


FIGURE 6: Passive RFID data loading attachment information reading.

After synchronization is complete, the system detects that the TOA of Figure 5 remains constant. In addition, the TOA detected by the actual system may vary between several sampling points. At this time, a statistical averaging method needs to be used to reduce the interference of noise and improve the ranging accuracy. The simulated accuracy of the system after calibration and statistical averaging will be given along with the test results.

4. Application and Analysis of Physical Education Attendance Model Based on Wireless and Passive RFID Technology

4.1. Passive RFID Data Reading and Processing. It mainly realizes four functions such as power-on reset, watchdog timer, voltage monitoring, and manual reset. After power-on, the RST pin generates a 200 ms reset signal to initialize the internal registers and peripherals of the processor; the SW3 switch is a manual reset button. After looking at this switch, the RST pin generates a reset signal. The key training for physical education attendance management system software design, including user function design, classroom attendance management design, college access management design, dormitory access management design 4 functional modules, on the basis of the above demand analysis and the completion of the overall design, through C++ language programming, the code writing interface of the physical education attendance system, classroom attendance, dormitory access control, and college building access control modules, as well as the design and implementation of Figure 6, is realized.

In a Windows application, you can use the MailMessage class and the SmtpClient class under the System.Net.Mail namespace to implement the mail sending function. The MailMessage class is mainly used to specify the sending address and recipient address of the mail; the SmtpClient class is used to send the e-mail to the SMTP server for delivery. During the loading process of the mail sending window, you can use the textBind() function in the public class OperationOrValidation to bind the ComboBox control to the data, so that all the user information of the mailbox and all departments of the company can be displayed. Then, display all jobs in that department based on the selected department and then filter and display the relevant information based on the selected job title. Using this layout method can realize the separation of page performance and content, Div is a markup in Html language, and Css is just a form of expression. This layout method is simple to operate and has strong visualization.

4.2. Simulation of Physical Education Attendance Model. Under the circumstance that the physical education attendance management system can complete the basic function operation, the adaptability of the campus attendance management system must be considered at the same time. On the premise that the database connection is successful and

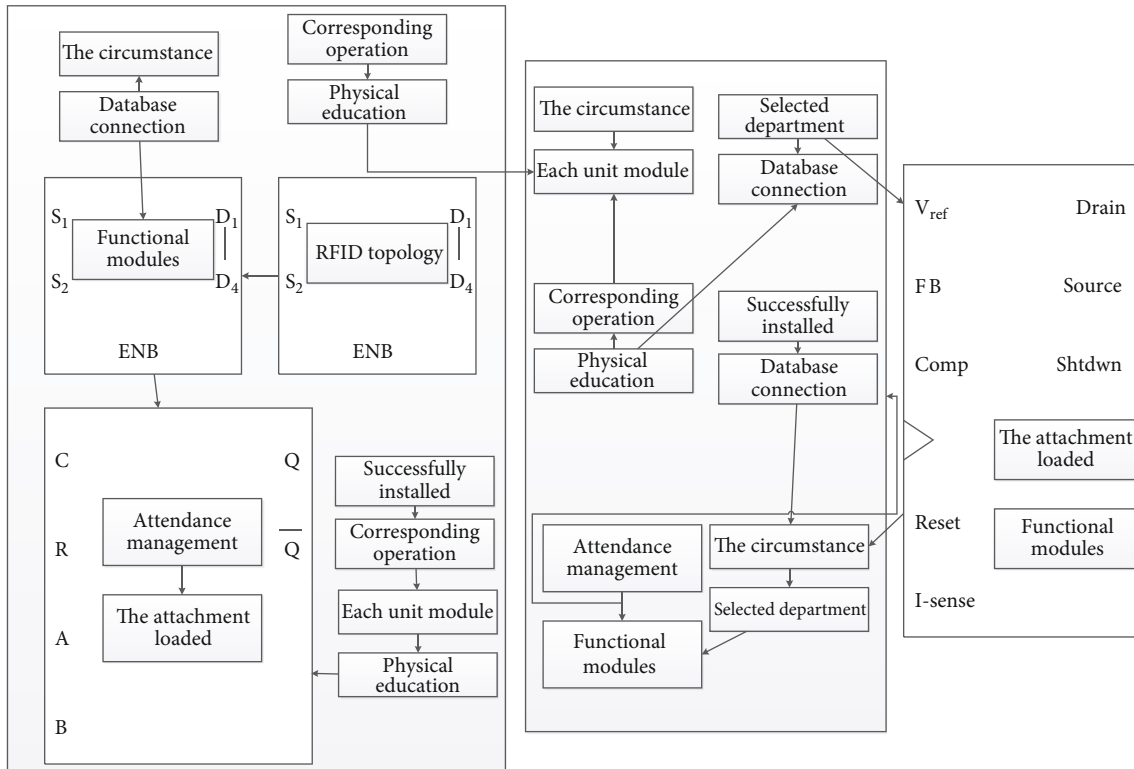


FIGURE 7: RFID topology of physical education attendance.

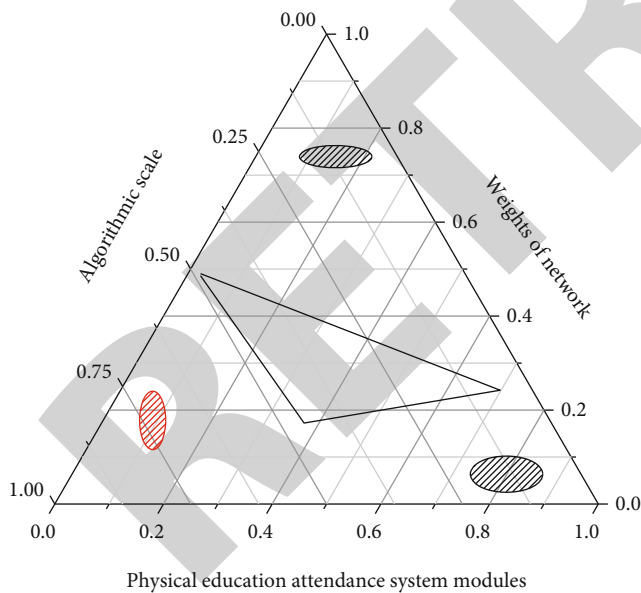


FIGURE 8: Triangular distribution of physical education attendance system modules.

the software is successfully installed, double-click the icon of the physical education attendance management system on the computer; at this time, the login interface of the physical education attendance management system will pop up; enter the exact user password and user name and click the “OK” button; the physical education attendance management sys-

tem will appear on the operation interface, and then, the function management module performs the corresponding operation. Based on the friendliness of human-machine interface and the realization of functional modules, this paper uses the following aspects to test the physical education attendance management system. The results and data in Figure 7 are shown as follows.

After testing each unit module in the physical education attendance management system based on RFID technology, first ensure that each module can achieve the previous design goals, and then according to the hierarchical module diagram in the management system design, according to the program flow, the connections between the units assemble the modules of the unit program. After the assembly module test and simulation debugging are completed, relevant tests are carried out. In the RFID-based physical education attendance management system, an assembly sequence from the lower level to the upper level is adopted to carry out the corresponding test. At the beginning, each branch of the program is gradually formed by a system module at the lowest level, until all modules of all branches are tested, so that the whole assembly and testing can be completed smoothly. After the testing of the assembled modules is completed, all modules will be integrated, thus forming a very complete application management system program.

When different users log in to the physical education attendance management system at the same time, and different users operate the same query (such as checking the attendance status of the classroom), due to the different network speeds in Figure 8, different queries take different

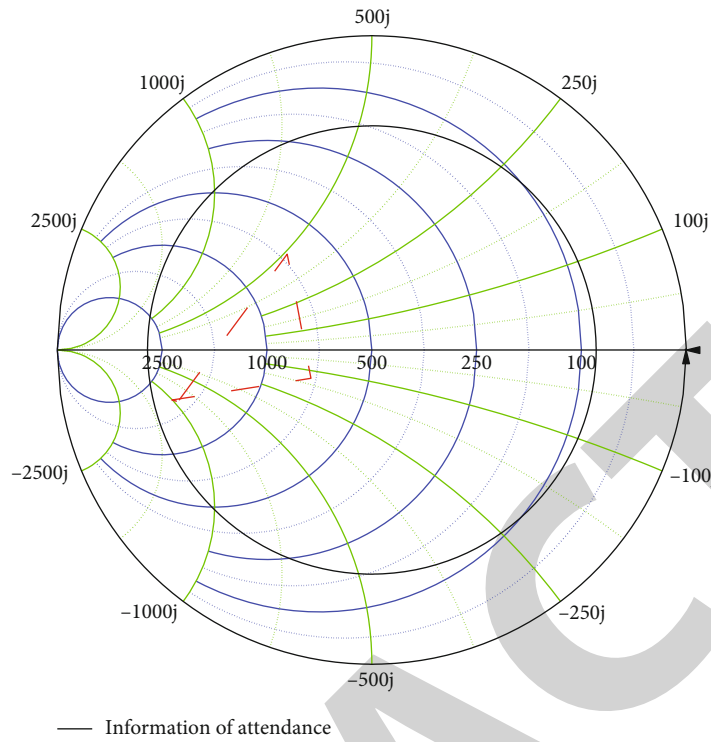


FIGURE 9: Physical education attendance compilation information.

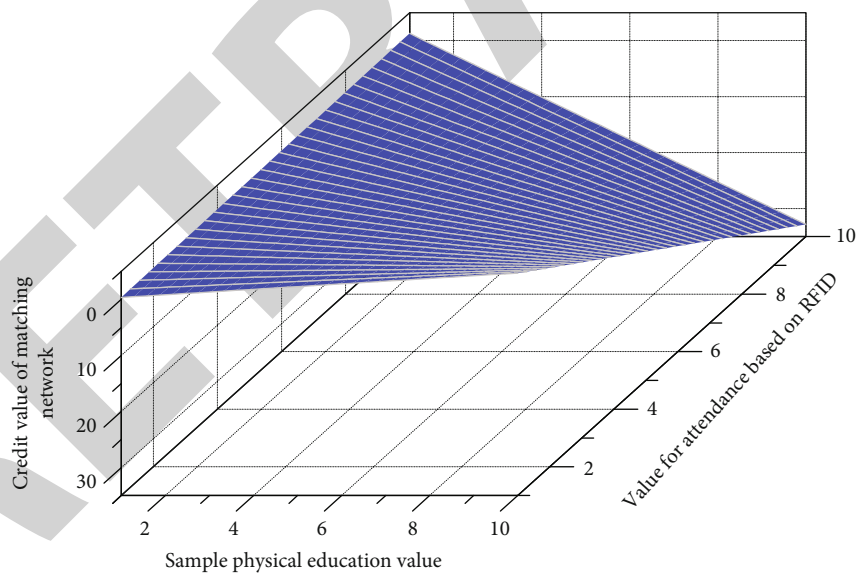


FIGURE 10: RFID-based physical education attendance matching network.

times. A survey of 100 people logging into the system at the same time shows that if the query time for access results is 6 seconds, 77% of the query users are satisfied; if the query time for access results is 11 seconds, 64% of the query users are satisfied. If the query time for the access results is 23 seconds, the query users are satisfied with 42% of the total; when the page load time is 36 seconds, basically every user says the system is too bad.

4.3. *Example Application and Analysis.* This system uses MS SQL Server 2005 as the main database system. SQL Server 2005 is a relational database management system developed and promoted by Microsoft. The electronic tag carried will send information to the reader, and the reader will access the personnel information, indicating that the person has come to the classroom; when a person leaves the classroom, the personal information sent by this person will no longer

be received by the reader; the reader automatically deletes the person after a period of time, indicating that the person has left the classroom. There is an essential difference between the load test and the code test. The system load is the system capacity test, which refers to the test of whether the entire attendance system can operate normally under the condition that the number of users logging in to the system increases and the amount of system information continues to increase, when the number of user attendance increases, the corresponding response time of the system is shown in Figure 9.

The login interface includes controls such as GroupBox, Label, TextBox, Button, Timer, and errorAllInfo. GroupBox is a frame with an optional title displayed around a group of controls; Label is used to provide some descriptive text for the user; TextBox allows the user to enter text and provides multiline editing and password character masking capabilities. The Timer controls the reader to read the card uninterruptedly at a certain time interval; the Button controls the event that occurs when the user clicks it. The Timer control reads the RFID card information every 300 milliseconds, and if the card is found, the data in the card is read.

The input matching is realized by the matching network in Figure 10, so that the input impedance can be matched to 10Q in a wide range; the output is biased with a choke inductor, providing a DC low-impedance and AC high-impedance path to the power supply, so as to prevent the output impedance having a big effect. The self-resonant frequency of the choke inductor is higher than the RF output frequency, so it has a predictable inductive reactance characteristic during normal operation, which is convenient for matching design. In addition, due to the large interference of the power amplifier to the power line and the ground line, the isolation of a single circulator under a 50 standard load is 27 dB, but when the load becomes an UHF RFID antenna, the isolation drops to about 20 dB.

The xml file is written by the server-side administrator through the data retrieved from the database in real time through the background software; the classroom headcount query webpage (Web) is also supported by the IIS server, but data can be directly retrieved from the database. After adopting carrier leakage cancellation, under the 10Q standard load, the maximum isolation of the system is improved to 55 dB: the isolation degree is greater than 45 dB in the working frequency band of RFID system from 920 MHz to 925 MHz. When the load becomes an UHF RFID antenna, the isolation of the system is increased to a maximum of 60 dB.

5. Conclusion

Based on the RFID-based physical education attendance management system that has been designed, through hardware crash test, system function test, and load test, the results show that although the RFID-based physical education attendance management system has established a good human-machine interface environment and can basically meet the requirements, and each functional module has realized the relevant requirements, the overall test effect of the

combination of each module is good, it can be tested in various environments, and it can run normally. At the same time, the physical education attendance management system based on RFID can satisfy 300 users to log in at the same time; all performance indicators are good, meet the original development purpose and requirements, and can meet various basic needs of campus attendance management. The PC is used to generate and receive baseband signals, to transmit and receive data to the RF front-end of the reader; use the periodic signal generated by the arbitrary waveform generator to control the reflection of the passive tag, and realize the return of the tag positioning command. The test includes two parts: wired test and wireless test: wired test verifies the basic functions of the designed prototype to ensure that all subsystems meet the expected design indicators and wireless test directly verifies the proposed system scheme. The test proves that the RFID-based physical education attendance management system designed this time can be put into physical education attendance management.

Data Availability

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

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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