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Retraction

Retracted: Design of Multimedia Vocal Music Education Data Integration System Based on Adaptive Genetic Algorithm

Security and Communication Networks

This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1].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

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

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

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

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

References

[1] H.-L. Zhang and P.-J. Yu, "Design of Multimedia Vocal Music Education Data Integration System Based on Adaptive Genetic Algorithm," *Security and Communication Networks*, vol. 2021, Article ID 3897696, 9 pages, 2021.

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Research Article

Design of Multimedia Vocal Music Education Data Integration System Based on Adaptive Genetic Algorithm

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In order to solve the problems of low accuracy of data integration results, low integration efficiency, and easy confusion between different types of data in traditional methods, a multimedia vocal education data integration system based on adaptive genetic algorithm was designed. Specifically, the designed system is divided into three parts: data source management module, system administrator module, and database management module. The synchronized multimedia vocal education data are first processed by the synchronous multimedia vocal education data processing and then integrated by an adaptive genetic algorithm. The experimental results show that the longest data transmission time of the system is 2.3 s, which is much lower than that of the traditional method, and the accuracy of the integration result is higher, and the probability of data integration confusion is lower, which all indicate that the designed system has better application performance.

1. Introduction

In recent years, multimedia technology has been widely used in modern vocal music teaching and accumulated massive amounts of data with the rapid development of computer technology [1–4]. Numerous multimedia teaching systems have been deployed in the education field, and massive amounts of learner information and learning process data are stored in these systems. How to transform these data into information and knowledge and serve for teaching decision-making and learning optimization has become the focus of educators and learners. Educational data integration technology helps to play the value of learning process data, making data an important basis for prudent decision-making and process optimization. However, the current data integration technology is affected by data types, data transmission, and other factors, and there is a problem of poor integration effect, which could not provide targeted guidance for vocal music teaching. Therefore, related fields

and scholars have conducted multidimensional research on data integration methods [1–4].

In reference [5], a natural gas production data integration system was designed, which greatly improves the integrity and accuracy of data and supports the application of the upper platform and report system. However, the method in [5] could not effectively solve the problem caused by the real-time variability of production data and the large amount of data. Reference [6] designed a public cultural service big data integration architecture and analyzed the types and distribution of public cultural service big data based on a full analysis of public cultural big data resources, which can process the data hierarchically and effectively improve the classification and integration of different data, but the integration efficiency is low. A method of equipment support data integration based on data middle station is proposed in [7], which lays a foundation for the efficient integration of the equipment support information system. However, because the diversity of data classification is not

considered, there is the problem of different types of data confusion in different data sets formed after data integration.

A system was created in [8] for proposals formation to user based on data integration from various sources, which can reveal a maximum opportunity for any user to develop their area and increase popularity of their services and attract new customers. However, this system is more suitable for the online tourism instead of multimedia vocal music education. Reference [9] designed a coastal international trade heterogeneous data integration and sharing system based on middleware and Extensible Markup Language (XML), which can solve the problem that traditional heterogeneous data integration and sharing system performance is insufficient, but it is still not used for multimedia vocal music education. Reference [10] described a data integration, harmonization, and visualization process and framework. It discussed the proposed approach used to tackle complex data aggregation and harmonization problems and demonstrated a set of information visualizations that can be developed from the harmonized data to make it usable for its target audience; however, it has poor data integration and poor usability.

We design a multimedia vocal education data integration system to solve the problems of low accuracy of data integration results, low integration efficiency, and easy confusion between different types of data in traditional methods. Our system is based on an adaptive genetic algorithm and is applicable for vocal music teaching and learning compared with other methods. XML technology is used as the development tool of the data integration system, and the hardware modules of the system are designed with the support of the Java language. Based on data integration results, the number of multimedia vocal education households is integrated using an adaptive genetic algorithm. First, nodes send interest agent messages to announce their location and the type of data of interest, and then target nodes send data agent messages to nodes to inform them of the data they have collected. Based on hardware design and adaptive genetic algorithm, a data integration algorithm is designed to realize the integrated processing of multimedia vocal music teaching data. In this process, we fully consider the needs of data communication network maintenance and security management in three parts of data source management module, system administrator module, and database management module in our system, to better solve the problems that arise in its actual development process comprehensively and systematically and continuously promote the safe operation and stable development of communication networks. To sum up, the advantages of our system are good data integration, short data transmission time, high practicality, and most importantly strict protection for data communication network maintenance and security management.

The rest of this paper is organized as follows. The framework and technical details of our proposed system are described in Section 2. In Section 3, we present extensive experimental results to demonstrate the effectiveness of the proposed model. Finally, we conclude our work in Section 4.

2. Multimedia Vocal Music Education Data Integration System Based on Adaptive Genetic Algorithm

2.1. The Overall Architecture of the Data Integration System. Figure 1 is the overall architecture diagram of the multimedia vocal education data integration system.

The application layer is responsible for the management and scheduling of multiple data sources for multimedia vocal education; the data layer integrates multisource heterogeneous data and, at the same time, is responsible for collecting user input data. All functions can be interrogated after being processed by the data layer without any influence; the environment layer is the calling object environment and displays system information to customers. The commonly used presentation layer technology is Jakarta Server Pages (JSP), in addition to ordinary applications, smart device terminals, and so on, allowing the data after system integration to be read through multiple interfaces within the user's authority [11].

2.2. Data Integration System Development Tools. In the process of system design, it is necessary to rely on the corresponding system development tools to achieve the design goals. This article mainly uses XML technology to convert multimedia vocal education data into XML format data files. Extensible Markup Language (XML) is a simple and flexible extensible markup language with text format. It originated from Standard Generalized Markup Language (SGML). It is a subset of SGML, which is a simplified version of SGML. It is very suitable for data exchange on the Web or among other data sources. XML technology is different from traditional the HyperText Markup Language (HTML) technology. The difference between the two is as follows: the design starting point of XML is data storage and data transmission, and data storage is the core. The function of HTML lies in data display, and appearance is the core of design. In short, the main function of HTML technology is to display data, while the main function of XML technology is to transmit data.

The operation of XML is straightforward, which makes its application range wider, and quickly replaces the position of data language, becoming the only common language for data exchange. Many types of application software support many kinds of exchange formats. Still, at the same time, they also contain XML, which shows that after the integration of application programs with windows, Linux, and other platforms, new information combinations will be produced. The XML data can be loaded into the system program to output the data results of the XML format.

2.3. System Development Language. The core of the system development language lies in Java. In system design, Java is a programming language, object-oriented, and not only has the basic functions of the C++ language but also breaks through the limitations of the C++ language, making many concepts easier to understand. It can be said that the Java language has
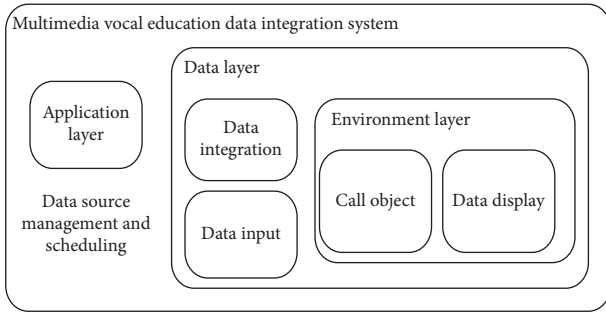
Figure 1: Architecture diagram of the multimedia vocal education data integration system.

very powerful functions and is easy to operate. In the field of programming languages, the Java language belongs to the static object-oriented nature, which perfectly interprets the object-oriented concept and at the same time provides programmers with reliable programming ideas [12].

The advantages of Java language are simple and convenient operation, object-oriented, high safety performance, independent operation, and remarkable dynamic characteristics. In addition, the Java language can meet the programmer's application programming requirements, and system design developers can use this language to complete desktop application programming, distributed system design, and other operations.

2.4. System Module Design. Following the operating standards of the system, a new multimedia vocal music education data integration system was developed. The data source management module, system administrator module, and database management module are mainly used to complete related operations in this research work. Figure 2 is a diagram of system function modules.

2.4.1. Data Source Management Module. During the operation of the system, different information data will be generated. The main function of this module is to manage different information. For example, the login information and various databases generated during the system's operation are included in the management scope of this module [12]. In addition, the data information can be changed. See Figure 3 for details.

Data source registration: In the data source standard, the registration information generated during the operation of the system needs to be added and completed by the registration function. This information will also be synchronized to the heterogeneous database. Data source deletion: Information sharing can be cancelled by deleting part of the data source information. Data source modification: The error information generated during registration is modified and corrected.

2.4.2. System Administrator Module. The system administrator module can restrict the user's operation and use authority to the system and combine the user's login
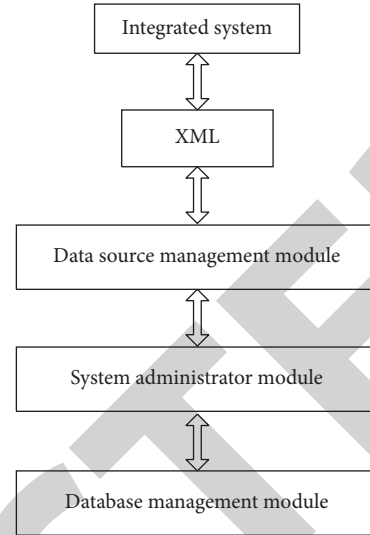

Figure 2: Function module diagram of the multimedia vocal music education data integration system.
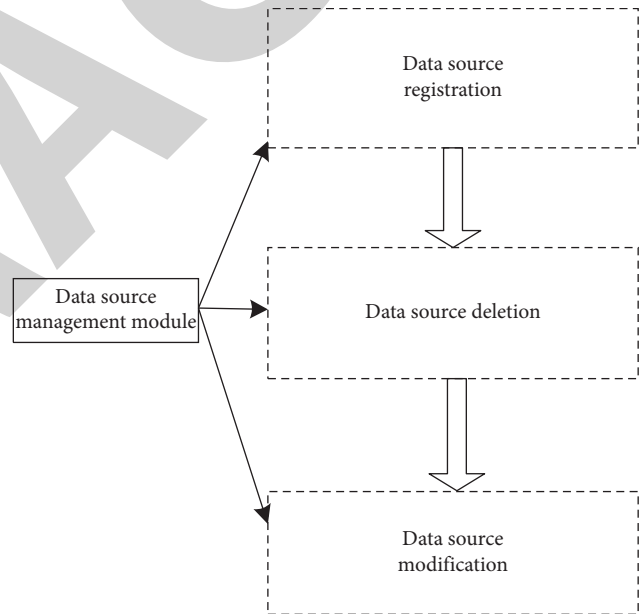

Figure 3: Data source management module function.

situation to clarify the scope of operation [13]. The staff in charge of the management system can complete related operations through different management modules after logging in to the system. In contrast, other persons in charge can only operate and manage the content within their authority in real-time. Figure 4 is the circuit diagram of the system manager module.

2.4.3. Database Management Module. The management module function can complete the operation of database information, which plays an important role in applying the main database. It can also analyze and process the data information generated during the system's operation and can transmit and store the information correspondingly. To
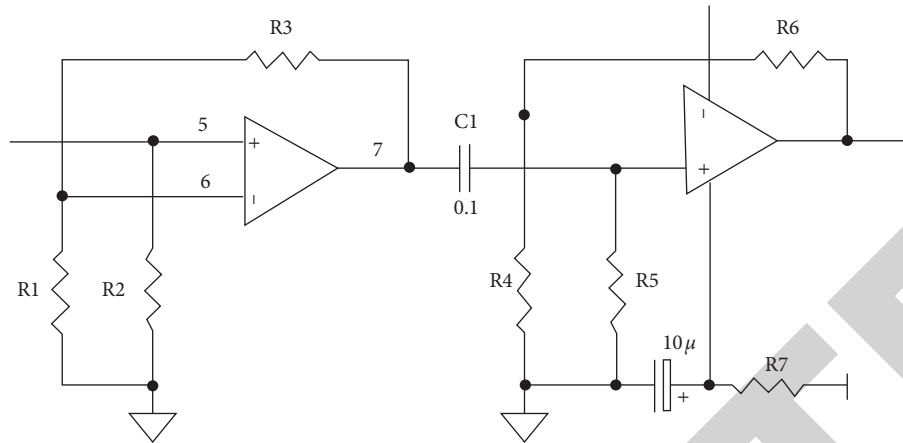
FIGURE 4: Circuit diagram of the system manager module.

properly save the information during the use of the system, the person in charge should pay attention to backing up the information and data to be retrieved in time when encountering system failures or other abnormal problems [14]. The specific operation method is shown in Figure 5.

2.5. Data Processing Methods for Multimedia Vocal Music Education

2.5.1. Data Synchronization.
There are two ways for data to transfer information. One is initiated by the database and transfers information to the main database; the other is to transfer information from the main database to the database, realizing the synchronous update of information and data.

To ensure that the data are consistent during the transfer, not only must the information be transferred to the main database but other databases also need to complete the same data transfer process. When the database receives the information, it must first complete the data conversion and transfer it in an XML document. In this process, it is necessary to clarify the information of the minimum synchronization set [15]. The source of this data information is relatively complicated, and it needs to be confirmed to be correct before it can be arranged in a certain order. The synchronous update of the data information should be completed in the order of priority. The transmitted information includes the XML document information generated by the master database and the data information of the current slave database excluded from the minimum synchronization set [16]. Figure 6 shows the synchronization process of multimedia vocal music education data. Multimedia vocal music education data synchronization processing flow is shown in Figure 6.

2.5.2. Multimedia Vocal Education Data Integration Algorithm Based on Adaptive Genetic Algorithm.
The basic genetic algorithm is a global convergence algorithm that simulates the biological evolution process. In the basic genetic algorithm, the crossover probability and the mutation probability usually take a fixed value, which cannot reflect the evolution process, so it is easy to produce the defects of
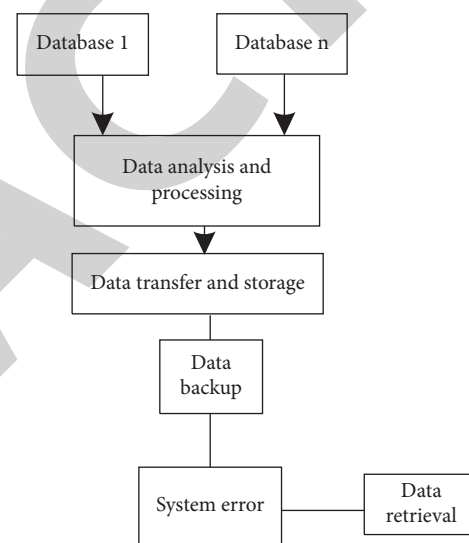

FIGURE 5: Operation process of database management module.

premature convergence and slow convergence rate [17]. In response to this problem, based on data integration results, an adaptive genetic algorithm is used to integrate the number of multimedia vocal education households [18]. First, the node sends an interest agent message to announce its location and the type of data it is interested in; then, the target node sends a data agent message to the node to inform it of the collected data. The adaptive genetic algorithm can adjust adaptively with the change of the group and individual fitness, so it can maintain the group's diversity in the evolution process and ensure the convergence of the algorithm. The adaptive genetic algorithm is designed as follows.

(1) Coding Method. Two-layer coding is used for all nodes. The first layer of coding is the arrangement of nodes in sequence on the data forwarding path; the second layer of coding is binary coding, "1" means that the node can be accessed and "0" means that the node cannot be accessed. For the data forwarding path, the feasible solution should satisfy the first-level coding sequence from the node. The first bit of the second-level binary sequence is "1," and the energy of the collected data is greater than the threshold. For
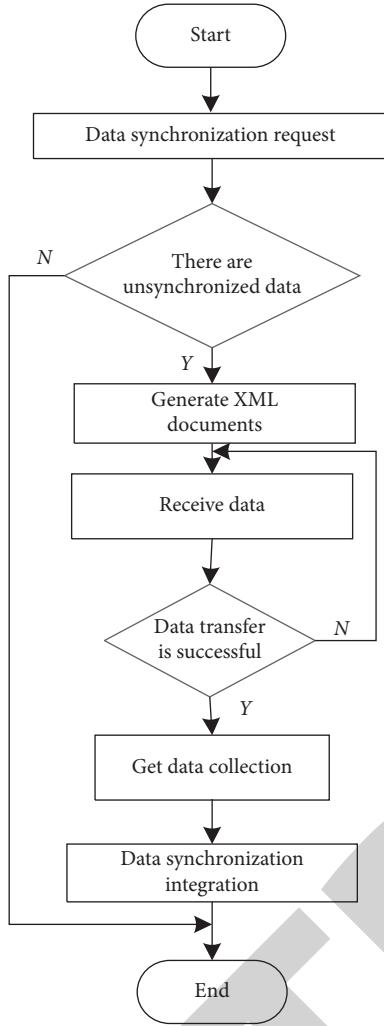
Figure 6: Multimedia vocal music education data synchronization processing flow.

the data forwarding path, a layer of code of feasible solution should start from the last visited node of the data forwarding path and return to the node. The corresponding binary sequence code position is "1."

(2) Generate Initial Population. The ergodicity and diversity of the initial population have a critical impact on the performance of genetic algorithms [22]. In the adaptive genetic algorithm, the individuals in the initial population are usually selected randomly based on probability. This selection method will make the individuals lack ergodicity and diversity [23]. This paper uses a model based on grid division to generate the initial population, which increases the ergodicity and diversity of individuals. The main idea is as follows: in the grid division, it is evenly divided into multiple side lengths of the two-dimensional square grid, all nodes in the grid can communicate with all nodes in the neighboring grids to construct a grid structure with nodes as the origin of coordinates [19], as shown in Figure 7, and the nodes in the grid are then coded to form the initial population of the adaptive genetic algorithm.

Figure 7: Schematic diagram of meshing.

Assume that all nodes in the network have the same communication radius, and they know their location, ID, and energy value. Once a node is distributed to a certain network area, it sends a HELLO message to determine the relevant information of the node within one hop range. It builds a neighbor table based on it, including the node location, ID, and grid independence flag [24]. The grid independence flag determines whether a node belongs to the same grid as its neighbor nodes, 0 is the same grid, and 1 is a different grid. Because the HELLO message is tiny, the entire network overhead during grid establishment is also minimal. Each node in the network can determine its own grid according to the following formula:

$$
X\left(C_x, C_y\right) = \begin{cases} \left[\dfrac{i_{\sin k}}{R}\right], \\[2ex] \left[\dfrac{j_{\sin k}}{R}\right]. \end{cases} \tag{1}
$$

Among them, $i_{\sin k}$ and $j_{\sin k}$, respectively, represent the abscissa and ordinate of the node's distance from the node, R denotes the communication radius, and (Cx, Cy) is the location of the node in network. After the grid is established, each node will know the grid to which it belongs [25]. For example, the grid where the node in K2 is located is represented by (1, 1). In order to ensure that nodes in adjacent grids can communicate with each other, take the communication radius R_k of the node as the longest distance between any two nodes in the adjacent grid, and then the relationship between R and R_k should satisfy the following:

$$
R^2 - \left(R - R_k\right) \geq \sqrt{R_k}. \tag{2}
$$

Practice shows that when the selected grid is too large or too small, the energy consumption of data forwarding will increase [26]. When the grid is small, the number of nodes in the grid decreases and the survival time of each path decreases, which causes the energy consumption of data forwarding to increase; when the grid is large, the number of

nodes in the unit grid increases and the increase in the number of exchanges of information with nodes in other grids will increase the energy consumption of the nodes, which will increase the energy consumption of data migration and data integration at the target node. Therefore, when the selected grid is too large or too small, it will reduce the performance of the algorithm. Therefore, this paper selects $R = (R_k/(R - R_k))$ because the network energy consumption is the smallest at this time.

(3) Fitness Function. Traditional genetic algorithms and hybrid genetic algorithms only use fitness to measure the degree of excellence of the optimal solution that each individual in the population may achieve in optimization calculations. The use of a reasonable fitness function is conducive to maintaining the diversity of the population and improving the performance of the genetic algorithm [20]. The solution of the optimal path can be expressed as the data forwarding node access sequence, and the integration process is defined as accumulating the signal gain of each node to the target. The cumulative signal gain is required to be greater than a predetermined threshold [27]. The fitness function [21] is defined as follows:

$$S(n) = \exp\left(-\frac{(i-\alpha)^2 + (j-\beta)^2}{2P^2}\right). \tag{3}$$

Among them, α represents a larger constant to ensure that the fitness value is nonnegative; β represents the cost of access along the path; and P represents the penalty term, and its calculation formula is as follows:

$$P = \frac{1}{R}\sqrt{\frac{\sum_{i=1}^{n}\left(z_i - z_j\right)^k}{N}}. \tag{4}$$

Among them, z_i represents the signal gain threshold; z_j represents the interference signal in the data forwarding signal; and N represents the penalty coefficient.

The new generation population's highest fitness is compared after each generation of genetic operations in the data forwarding path with the highest fitness of the previous generation population. If it is less than the highest fitness of the previous generation, an individual in the new generation will be randomly eliminated. The individuals with the highest adaptability in the previous generation are added to the new generation to ensure that the current optimal individuals will not be destroyed by genetic operations such as crossover and mutation, thereby completing the design of the adaptive genetic algorithm, that is, realizing the integration of multimedia vocal education data.

2.6. Analysis of Evaluating the Multimedia Vocal Music Education. We use the following experimental indicators to evaluate the performance of the proposed multimedia vocal music education: (1) accuracy of data integration results; (2) integration efficiency; and (3) data integration confusion probability. And the method in reference [5], the method in reference [6], the method in reference [7], the method in reference [8], the method in reference [9], and the method in reference [10] are selected as the comparison methods to verify the efficiency of our system.

3. Simulation Experiment

In order to verify the effectiveness and application performance of the designed multimedia vocal education data integration system based on the adaptive genetic algorithm, a simulation experiment is designed.

3.1. Experimental Hardware Environment and Parameter Settings. Using Matlab Simulink as the simulation tool, select the database type including SQL, Server 2008, Oracle, and other common database types, enter the basic information of the data source, click the "Save" button, when the input information is correct, the system opens the database link and executes SQL statement, and save the data source information in the database. Table 1 shows the specific experimental parameter settings.

3.2. Analysis of Experimental Results

3.2.1. Accuracy of Data Integration Results. Taking the accuracy of the data integration result as the experimental index, the different methods are compared, and the comparison result is shown in Figure 8.

According to the analysis of Figure 8, when the number of iterations is 12, the accuracy of data integration results of the method in reference [5] is 42%, that of the method in reference [6] is 64%, that of the method in reference [7] is 55%, that of the method in reference [8] is 48%, that of the method in reference [9] is 62%, that of the method in reference [10] is 81%, and that of the designed system is 84%. Therefore, the accuracy of data integration results of the designed system is higher than that of reference [5], reference [6], reference [7], reference [8], reference [9], and reference [10]. Therefore, the designed system can provide better use effect for data users after integrating multimedia vocal music teaching data.

3.2.2. Data Integration Efficiency. Data transmission time can describe the efficiency of multimedia vocal education data integration. Generally, the shorter the data transmission time, the higher the efficiency of multimedia vocal education data integration, and vice versa. Table 2 records the actual changes in the data transmission duration of different methods.

By analyzing the data in Table 2, it can be seen that with the increase in iteration times, the data transmission time of different methods basically keeps a relatively stable growth state. During the whole experiment, the maximum data transmission time of the method in reference [5] reaches 8.5 s, the maximum data transmission time of the method in reference [6] reaches 8.0 s, the maximum data transmission time of the method in reference [7] reaches 7.4 s, the maximum data transmission time of the method in reference [8] reaches 5.9 s, the maximum data transmission time of the method in reference [9] reaches 6.1 s,

TABLE 1: Experimental parameter settings.

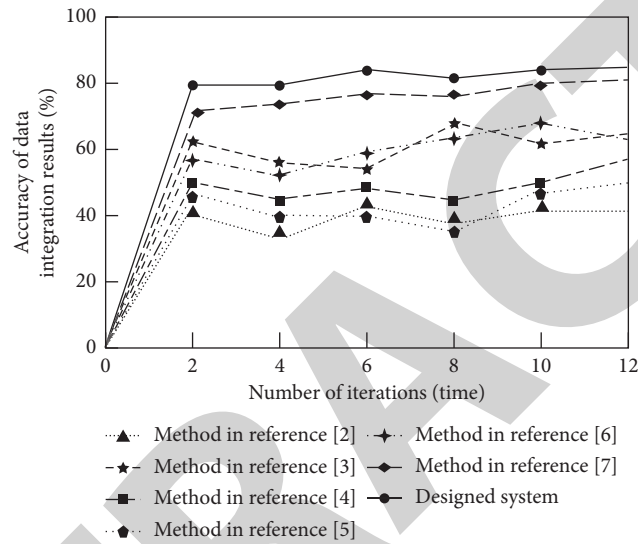| Name	Parameter
LAN host	TUSB7320IRKMT
Total amount of education data to be transmitted	7.5×10^{15}T
Ideal transmission time of data information	0.33 ms
Development language	Java
Whether to allow data sharing and integration behavior	Yes
Middleware	Mycat
Connection tool	Navicat
Server	Tomcat 7.0 version
Operating system	Windows server;

FIGURE 8: Comparison of accuracy of data integration results.

TABLE 2: Comparison of data transmission time.

Number of iterations/ time	Data transmission time (s)						
	The method in reference [5]	The method in reference [6]	The method in reference [7]	The method in reference [8]	The method in reference [9]	The method in reference [10]	Designed system
2	5.6	6.1	4.9	3.6	4.5	5.4	0.9
4	6.2	6.4	5.3	3.8	4.6	5.5	1.0
6	6.5	6.7	5.6	4.2	4.8	5.8	1.2
8	6.7	6.9	5.8	4.8	4.9	6.0	1.5
10	6.9	7.2	5.9	5.2	5.2	6.3	1.6
12	7.0	7.5	6.2	5.3	5.3	6.4	1.8
14	7.2	7.8	6.3	5.4	5.6	6.7	2.1
16	7.5	7.8	6.8	5.6	5.7	7.0	2.3
18	8.0	7.8	7.2	5.7	6.0	7.2	2.3
20	8.5	8.0	7.4	5.9	6.1	7.3	2.3

the maximum data transmission time of the method in reference [10] reaches 7.3 s, and the data transmission time of the designed system showed a continuous growth trend in the early stage of the experiment. Still, the data transmission time remained stable at 2.3 s in the late stage of the experiment. After the continuous rise, the data transmission time gradually tended to be stable, and the global maximum was only 2.3 s. Compared with traditional methods, the rising trend of data transmission time is not obvious, and the data transmission time is shorter. In

conclusion, after the data integration of the multimedia vocal music education data integration system based on an adaptive genetic algorithm, the consumption time of data transmission has been effectively controlled. The level of data integration can be greatly improved.

Taking the accuracy of the data integration result as the experimental index, the different methods are compared, and the comparison result is shown in Figure 9.

It can be seen from the analysis of Figure 9 that with the increase in experimental iterations, the data integration
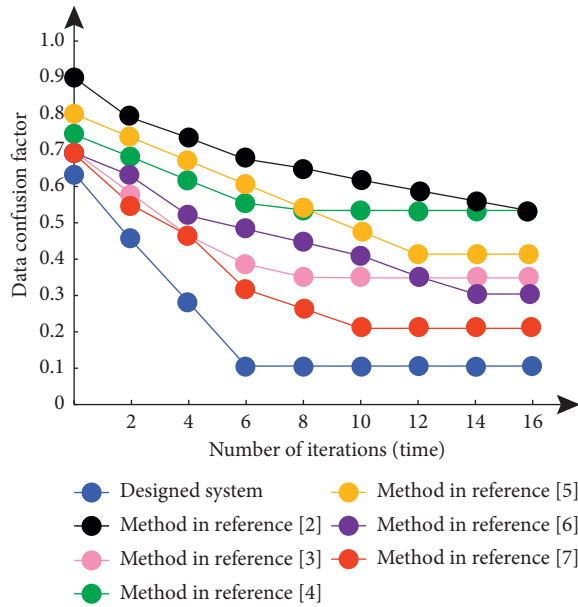
Figure 9: Confusion probability comparison of data integration.

confusion probability of the traditional method and the designed system shows a continuous downward trend. Still, the numerical curve of the traditional method is always above the designed system, and the downward trend of the data integration confusion probability of the designed system is more obvious. Compared with the traditional method, the data integration confusion probability of the designed system is significantly lower than that of the traditional method and has an obvious downward trend. In conclusion, after applying the data integration system of multimedia vocal music education based on an adaptive genetic algorithm, the probability of data integration confusion is constantly reduced, which can better meet the data processing needs of vocal music education.

4. Conclusion

The current data integration technology is affected by data types, data transmission, and other factors; there is a poor integration effect, which cannot provide targeted guidance for vocal music teaching. Therefore, this paper designs a multimedia vocal music education data integration system based on an adaptive genetic algorithm. Based on the extensible markup language XML and Java language, the hardware module of the system is designed. At the same time, the preliminary data processing results are obtained through the data synchronization of multimedia vocal education, and the synchronized multimedia vocal education data are integrated by an adaptive genetic algorithm. The experimental results show that the data transmission time of the designed system is short, the accuracy of data integration results is high, the probability of data integration confusion is low, and the advantages are obvious, which indicates that the system has high practical applicability. Also, our method does strict protection of data communication network maintenance and security management. However, our

method also has some limitations. For instance, our system lacks query function and erased data recovery function. Therefore, it would be important to improve system functionality in the future.

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 conflicts of interest.

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