Study on multimedia network aided English teaching resource integration system based on cloud storage

Xin Han, Kun Jiao

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Xin Han

International Communication Centre,
Shijiazhuang Information Engineering Vocational College,
Shijiazhuang 05000, China
Email: 95142013@qq.com

Kun Jiao*

School of Business,
Hebei Polytechnic Institute,
Shijiazhuang 05000, China
Email: kunji7@mls.sinanet.com
*Corresponding author

Abstract: The traditional resource integration system has the problems of low recall rate, precision rate and long response time. Therefore, this paper designs a multimedia network-assisted English teaching resource integration system based on cloud storage. The hardware is mainly composed of resource acquisition and submission module, distributed retrieval sub-module, resource scheduling module and cloud storage module. With the support of hardware for software system design, analysis of multi-media network auxiliary English teaching resources integration state space, a distributed scheduling method is adopted to improve the English teaching resources transmission scheduling. Under the condition of the optimal channel resource utilisation, constructing multimedia network English teaching resources integration model, the final results are obtained. The experimental results show that the average recall rate of this system is 94.76%, the average precision rate is 94.88%, and the response time is always below 0.4 s.

Keywords: cloud storage; multimedia; network; English teaching; resource integration.

Biographical notes: Xin Han received her Master's degree majoring in English from Hebei Normal University in 2012. Currently, she is a Lecturer in the International Communication Centre of Shijiazhuang Information Engineering Vocational College. Her research interests are English education and English language and literature.

Kun Jiao received her Bachelor's degree majoring in English from Guizhou University in 2007.Currently, she is a Lecturer in the School of Accountancy of Hebei Polytechnic Institute. Her research interests are English education and English language and literature.

1   Introduction

So far, presents the leapfrog development of modern information technology, make people's study, production and way of life changed dramatically, especially the modern education patterns and learning styles have a huge change, so according to the theory of cognitive development and constructivism theory as the foundation of multimedia network technology aided English teaching mode gradually popular (Guo, 2019). In this process, the multimedia network technology can provide learners with specific English communicative situation, and thus, in the form of text, sound, image and video will be difficult to reproduce in the process of the traditional teaching phenomena and processes appear in front of English learners, make learners can intuitive feel English knowledge structure, clear the abstract concept of the English language, So the multimedia network technology assisted English teaching mode has become an important teaching mode. With the wide application of this model in the actual, multimedia network technology aided English teaching resources presents the sea quantitative growth, so for this type of integrating resources can maximise the classroom effect, improving the quality of English teaching, so the study of a multimedia network technology aided English teaching resources integration method has important research significance (Susilowati et al., 2020).

According to the above problem, based on Alyami (2020) to design a multimedia network of mobile cloud computing aided English teaching resources integration system, decentralised strong auxiliary multimedia network English teaching resources and difficult interaction as a system design background, based on the design the overall architecture of resource integration system, and the key module design, including data communication and storage module, and cloud platform module, etc. On this basis, the theme and type of resources in the process of upload, and mobile cloud computing technology in multimedia network English teaching resources of the cloud storage and cloud management, in order to improve efficiency of resource integration and sharing, but a longer response time problems in the system, the actual application effect is not ideal. Zhou et al. (2019) designed a multimedia network assisted English teaching resource integration system based on SOA architecture. In the process of discussion, the overall framework of the resource integration system based on SOA architecture was designed, and the system was divided into business system layer, shared service layer and integrated business application layer. In the process of sharing service layer with the integration of the business application layer to the key design, in which the shared library and store-and-forward mode to realise multimedia network aided English teaching resources across different departments, the application system of exchange, according to the different users of Web services to ensure efficient message transmission and safety management, based on the use of integration business application layer through resource integration. However, after using the system to integrate resources, it is found that the integration results have low recall and precision rates. Li and He (2020) designed a multimedia network assisted English teaching resource integration system based on mobile technology. The B/S architecture is mainly taken as the overall architecture of the system. The system mainly contains three layers of architecture, namely, the client, the server and the resource integration end. Among them, the client uses mobile internet technology to provide users with resource data query, access and sharing operations; at the server end, Ali cloud service technology is used to build data service module and manage massive multimedia and network aided English teaching resource. Data mining

and fuzzy clustering are used to realise the integration of resource data, and the whole system design is completed. But the system has the problem of long response time, which is far from the ideal application effect.

Due to the system in the design process is not the key to data storage method and path for the detailed design, so lead to recall ratio and precision is low and the system response time long problem, in order to solve the problem, this paper designs a multimedia network English teaching based on cloud storage resource integration system, the overall design scheme of the system are as follows:

1   The hardware is mainly composed of resource collection and submission module, distributed retrieval sub-module, resource scheduling and cloud storage module. The multi-media network assisted English teaching resource collection, retrieval, resource scheduling and cloud storage are completed through the cooperation of multiple modules.

2   With the support of the hardware of the system software design, the analysis of multi-media network auxiliary English teaching resources integration state space, a distributed scheduling method is adopted to improve the English teaching resources transmission scheduling, under the condition of the optimal channel resource utilisation, constructing multimedia network English teaching resources integration model, get the final results.

3   Compare the recall rate, precision rate and system response time of different methods through experiments.

## 2   Multimedia network aided English teaching resource integration system

2.1   Hardware design of resource integration system based on cloud storage

To provide multimedia network English teaching resources integration with more stable hardware environment, improve efficiency and the comprehensive effect of resources integration, and need to the multi-media network auxiliary English teaching resources integration system hardware design, concrete including resource acquisition and submitting module, distributed retrieval module and resource scheduling and cloud storage module. The acquisition, retrieval, resource scheduling and cloud storage of multimedia network assisted English teaching resources are completed through the cooperation of multiple modules, in order to achieve the ultimate goal of reducing the system response time and improving the overall operating efficiency of the system.

2.1.1   Resource collection and submission module

In order to ensure the integrity and comprehensiveness of the results of the integration of multimedia and network aided English teaching resource (Li, 2020), the overall workflow of the resource collection and submission module needs to be designed first, as shown in Figure 1.

Figure 1   Overall workflow of resource collection and submission module
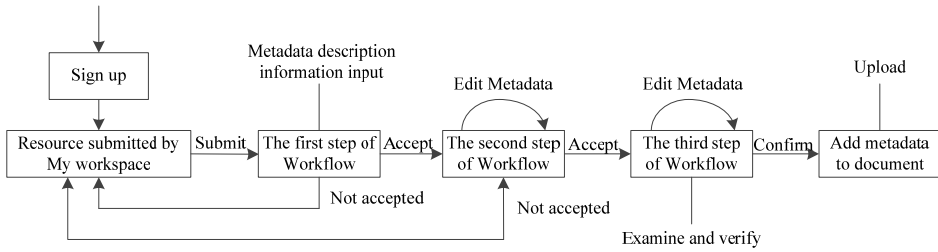
Resource acquisition and submit module whole working process of the user login system is mainly through the related resources area submit resources, system will be judged by metadata description information encoding is the data need to edit, after multiple judgement will be added to meet the requirements of metadata in the document, and upload, realise resource acquisition and submit. The main functions of the module are analysed as follows:

1   User registration, login or logout

   User register, login or exit is the most basic system functions, ordinary users can through the function realisation of multimedia network browsing, retrieval and download auxiliary English teaching resources, but for new users need to upload or e-mail notification and teaching resources management functions must be in the case of open administrator permissions to succeed; For users who have already registered, they can use the system normally only after entering their account and password on the system login page. Users can log off their personal information by choosing to exit the operation (Essig et al., 2020).

2   Uploading and submitting resources

   In this module, multimedia network assisted English teaching resources upload and submit including Web page submission and batch import two submission methods. Among them, the main process of web page submission is as follows: the user selects the upload document after filling in the relevant original data description and uploads the resources to the system through the web. However, bulk import is to upload resources on the server side of the system. After being reviewed by reviewers, the results are fed back to relevant users, and reviewers are required to upload the approved resources to the system (Zhang and Wang, 2020).

3   Open resource access

   The scattered English teaching resources in the network are searched according to specific topics and keywords, so as to realise the rediscovery, reorganisation and reintegration of such resources, improve the comprehensiveness of resource integration, and enable the network resources to be widely discovered and utilised (Mao, 2018).

2.1.2   Distributed retrieval and resource scheduling module

2.1.2.1   Distributed retrieval sub-module

This paper mainly implements the distributed retrieval of English teaching resources assisted by multimedia network through Web Services. The specific steps are as follows:

According to the multimedia network English teaching resources metadata index of distributed retrieval at the same time to complete the work in the search results, so under the condition of the confirm that the user has a relevant authority, with the full set weight of resources, and at the top, and use the Web Services from service system for users with the full text of resource data. On this basis, combined with the relevant ranking and scoring mechanism, the distributed retrieval and training of multimedia network aided English teaching resource can be completed, and the clustering processing of the result set can be realised at the same time (Luo, 2018). The distributed retrieval submodule is shown in Figure 2.

Figure 2   Distributed retrieval submodule
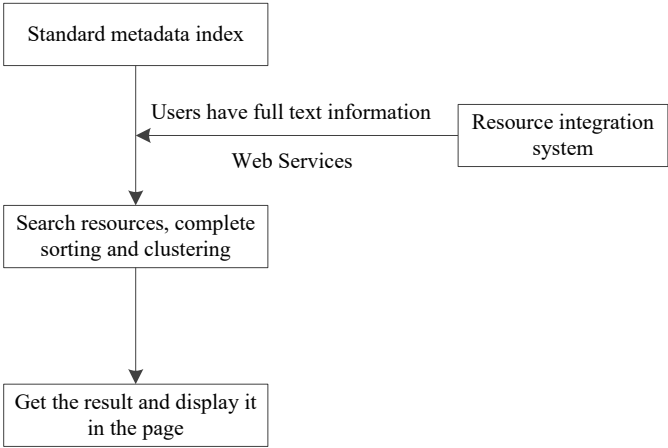
### 2.1.2.2   Resource scheduling sub-module

In the design process of this sub-module, Web Services are also used as the basis for the realisation of the basic functions of the model. This sub-module obtains the user's authority on the current resources from the system, and carries out hierarchical display of multimedia networked assisted English teaching resources (Li et al., 2019). Users with permissions can directly open the full text of the resource through openur1, while users without permissions can obtain the use permissions of the resource through login system or literature transfer (Luo, 2020). The resource scheduling sub-module is shown in Figure 3.
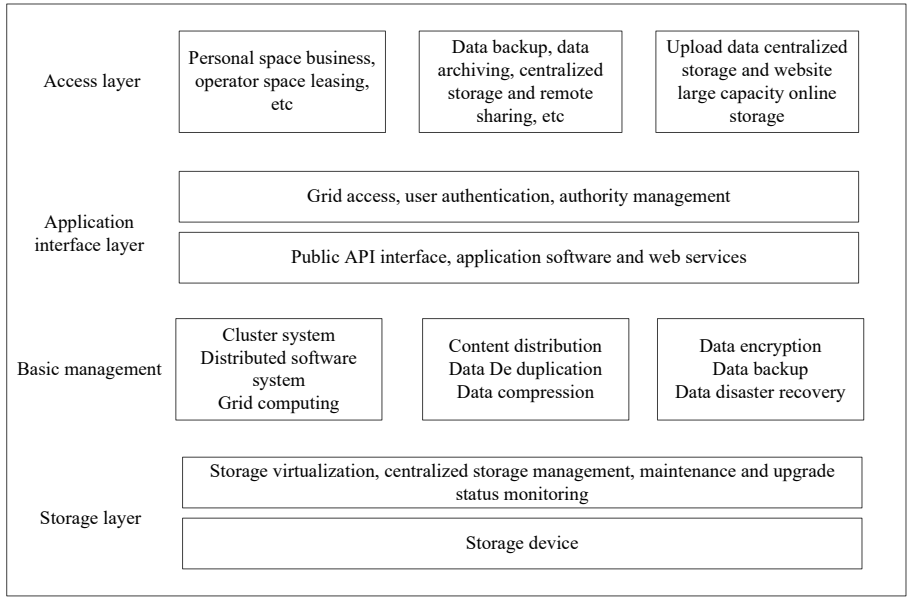
2.1.3   Cloud storage module

With the continuous development of information technology, cloud storage as a new type of information storage devices, are widely used in various fields, compared with the traditional information storage devices, cloud storage flexibility stronger and safer (Tang,

2018), so this paper focuses on cloud storage modulus module design, the module specific structure as shown in Figure 4.

Figure 3   Resource scheduling submodule
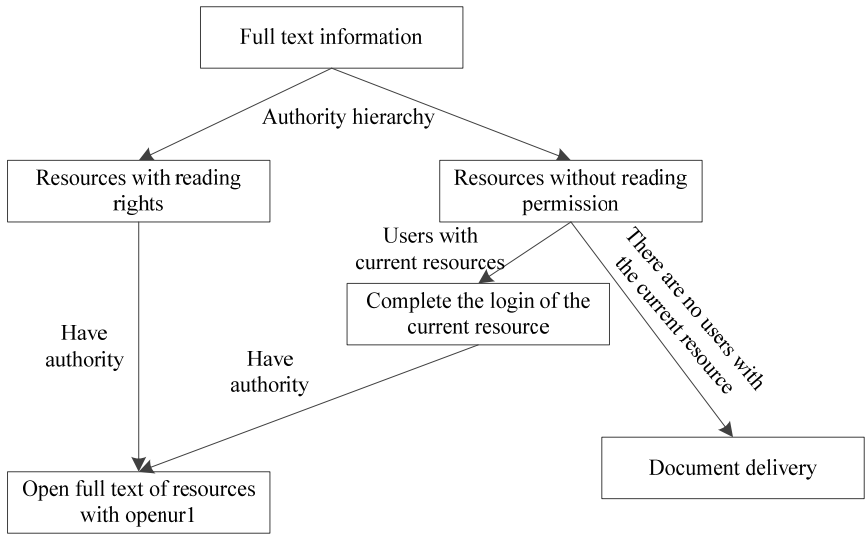
Figure 4   Cloud storage module structure

- Storage layer: storage layer is the most important part of the system cloud storage module. Its storage can include many types, such as FC fiber channel storage device, IP storage device and DAS storage device, etc. Due to the large amount of data in storage devices and the wide distribution range, different storage devices need to be

connected through certain devices or networks to ensure the synchronisation of data. On this basis, this layer also includes a unified storage device management system, which can realise the management of different storage devices, etc. (Yang et al., 2018).

- Based management: basic management is a fundamental part of the system cloud storage module, the layer is mainly, distributed file systems using cluster technology enables multiple storage devices can work together, and to ensure that the data synchronisation, on the basis of Shanghai has provided the function of the foreign service, to provide users with better access to data services. Moreover, its internal data encryption technology can improve data security. Moreover, through data backup and data disaster recovery, data will not be easily lost and the security and stability of the whole module can be improved (Shao, 2019).

- Application interface layer: the most flexible component of the system cloud storage module in the application interface layer. This layer can provide different business interfaces and services for different units, so as to improve user satisfaction.

- Access layer: after the user logs in the system and passes the authorisation, he can use the standard public application interface to access the data in the system. However, due to the different operating units, the login mode, permissions and services adopted are significantly different.

To sum up, through the design of resource collection and submission module, distributed retrieval sub-module and resource scheduling, and cloud storage module, multimedia network assisted English teaching resource collection, retrieval, resource scheduling and cloud storage are completed.

2.2 Software design of English teaching resource integration system

On the basis of the hardware design of the system, the paper focuses on the design of the software of the multimedia network assisted English teaching resource integration system with the aim of improving the effect of resource integration. This paper analyses the state space and resource distribution of multimedia network assisted English teaching resources integration, and adopts the distributed scheduling method and time slot allocation window to carry out English teaching resources transmission scheduling, so as to improve the efficiency of resource integration. In the case of the optimal utilisation of channel resources, the model of multimedia network assisted English teaching resources integration is constructed, and the final integration results are obtained.

Assuming that the initial clustering centre of multimedia network aided English teaching resource is P_0 and the distribution density of resource data is δ, the specific description of the state space of multimedia network aided English teaching resource integration in the presence of multiple temporal spaces is as follows:

$$P_n = \frac{P_0}{\delta} \tag{1}$$

Assuming that the dynamic attribute of the integration of multimedia network assisted English teaching resources is Y, and there are $m - 1$ characteristic variables with

constraints on Y, which are represented by $X_1, X_2, \ldots, X_{m-1}$, the distribution of resources can be described by the following formula:

$$P = \{p_1, p_2, \ldots, p_m\}, \qquad m \in N \tag{2}$$

Assuming that the category attribute of the data n_i of multimedia network assisted English teaching resources is r_j, the priority attribute of P can be described by the following formula:

$$P(n_i) = \{p_k \mid pr_{ky} = 1, k = 1, 2, \ldots, m\} \tag{3}$$

In the above formula, p_k represents the resource distribution feature vector, p represents the total amount of resources, and r_{ky} represents the kth data attribute.

Combined with the above analysis, this paper adopts the distributed scheduling method to analyse the resource transmission scheduling set $X = \{x_1, x_2, \ldots, x_m\}$ for multimedia network assisted English teaching. Then, the distribution function of resource data clustering centre is expressed by the following formula:

$$X_p(u) = s_c(t)e^{j2\pi f_0 t} = \frac{1}{\sqrt{T}} rect\left(\frac{t}{T}\right)e^{j2\pi(f_0 t + Kt^2)/2} \tag{4}$$

In the above formula, $s_c(t)$ represents the resource balancing configuration function, T represents the total time of resource scheduling, t represents the current resource scheduling time, and K represents the time slot distribution node.

Assuming that the task sequence of multimedia network assisted English teaching resource transmission scheduling is $\{x_n\}_{n=1}^{N}$, this sequence will generate a new mapping under the action of time division multiple address, and the result can be expressed by the following formula:

$$x_n = [x(0), x(1), \ldots, x(N-1)]^T \tag{5}$$

According to the above analysis, the time axis is divided into an independent slot allocation window with T_d units, and the window is used to carry out the transmission scheduling of multimedia network assisted English teaching resources. The autocorrelation function of slot allocation in the process can be expressed by the following formula:

$$D = \frac{\sum_{l_i=1}^{M-1} D_{l_i} + x_n}{\sum_{j=1}^{M-1} L_j} \tag{6}$$

In the above formula, D_{l_i} represents the distribution function of resource transmission scheduling node, and L_j represents the width of slot allocation window.

Then, the cloud storage model is used to integrate multimedia network assisted English teaching resources, and the problem is transformed into the problem of finding the maximum number of hops of two hops adjacent nodes, and the problem can be expressed by the following formula:

$$N_i^2 = N_i^1 D \cup \left(\bigcup_{j \in N_i^1} N_j^1\right) \tag{7}$$

In the above formula, N_i^1 and N_j^1 represent two-hop nodes of two adjacent nodes respectively.

The semantic concept index set of multimedia network aided English teaching resource integration is defined. The specific description of the set is as follows:

$$E = \left[E_G, E_T, E_W, E_L \right] \tag{8}$$

In the above formula, E_G, E_T, E_W, E_L, respectively represent different semantic conceptual indicators of resource integration.

Combined with the above analysis, the multimedia networked assisted English teaching resources are adaptive and balanced to keep the resource transmission channel balanced. In this case, the output of the balanced channel can be expressed as:

$$u_i = \frac{\sum_{m=1}^{M} x_{mi}}{N_i^2 (M + E)} \tag{9}$$

In the above formula, M represents the total amount of resource data, and x_{mi} represents the result of adaptive balanced scheduling of resources.

Assuming that the differential evolution matrix of resource data integration is represented by $X(i)$ after resource adaptive equilibrium scheduling, the matrix is decomposed into $p(i)$ submatrices X_{ij} of size $N_{ij} \times m$ by singular value decomposition method, then the eigensolution of the submatrix satisfies the following formula:

$$N_{ij} \geq m \tag{10}$$

Then the channel resource utilisation rate in the process of multimedia network assisted English teaching resource transmission can be expressed by the following formula:

$$k = \frac{1}{N} \sum_{i=1}^{N} u_i = \frac{1}{MN} \sum_{i=1}^{N} \sum_{m=1}^{M} x_{mi} \tag{11}$$

In the case of the highest utilisation of channel resources, a resource integration model of multimedia web-assisted English teaching is constructed, which is expressed as follows:

$$S_{k|k-1}^{n(j)} = Tria \left(\xi_{k|k-1}^{n(j)} - W_{k|k-1}^{n(j)} Z_{k|k-1}^{n(j)} - W_{k|k-1}^{n(j)} N_{ij} \right) \tag{12}$$

In the above formula, $\xi_{k|k-1}^{n(j)}$ represents the fuzzy clustering function of resource data, $W_{k|k-1}^{n(j)}$ represents the clustering function of resource clustering centre, and $Z_{k|k-1}^{n(j)}$ represents the optimal channel allocation function of resource.

Because of the traditional system in the design process is not the key to data storage method and path for the detailed design, so this article will resource data cloud storage, as the key to design a multimedia network English teaching based on cloud storage resource integration system, and through to the system hardware and software design process of interpretation through the system development and design, in order to achieve the final research goal. The next step is to verify the practical application effect of the system through experiments.

3   Experimental design and result analysis

3.1   Experimental scheme design

In order to verify the practical application effect of the multimedia network assisted English teaching resource integration system based on cloud storage designed in this paper, an experimental test is required. The overall experimental scheme is as follows:

1   In order to ensure the scientificity and credibility of the experimental results, the experiment shall be conducted in the same test environment. The specific test environment is as follows: The experiment was carried out in a computer, using GTX1070 CPU and INET I7-8700 CPU. The memory was 18 G, the number of CPUs was 2, the language version was Python 3.6, the storage hard disk was SAS model, the number of hard disks was 6, and the configuration of flash array controller was 542 MB. The network adopts Ethernet card, which is a 6-port 10GE network card, and the simulation software is MATLAB 7.2.

2   Experimental environment: the data crawler technology is used to capture the multimedia network assisted English teaching resources in the network, and it is preprocessed to eliminate repeated data and fill in the missing data. The processed data is used as experimental sample data in the simulation experiment, so as to improve the accuracy of the simulation experiment.

3   Experimental methods: the Zhou et al. (2019) system, the Li and He (2020) system, the Li (2020) system and the system of this paper were selected to conduct experimental tests, so as to verify the practical application effects of different methods.

4   Evaluation indicators

In order to verify the application effect of different systems, the recall rate and precision rate of the integration results of multimedia network aided English teaching resource as well as the response time of the system are taken as the evaluation indexes.

Among them, the recall rate calculation formula of the results of the integration of multimedia and network assisted English teaching resources is as follows:

$$R = \frac{w}{x} \tag{13}$$

In the above formula, w represents the number of multimedia network aided English teaching resource integrated by different methods, and x represents the total amount of multimedia network aided English teaching resource.

Among them, the calculation formula of the accuracy rate of the results of the integration of multimedia and network assisted English teaching resources is as follows:

$$R = \frac{m}{x} \tag{14}$$

In the above formula, *m* represents the number of multimedia network aided English teaching resource accurately integrated by different methods.

The system response time is taken as the system performance evaluation index. The shorter the system response time is, the better the system operation will be. The calculation formula of this index is as follows:

$$T = \frac{k_i}{k_j} + \frac{d_i}{d_v} + t \tag{15}$$

In the above formula, k_i represents the number of bits of data of multimedia network-assisted English teaching resources, k_j represents the bandwidth of data transmission, d_i and d_v respectively represent the transmission distance and speed of resource data, and *t* represents the data processing time of the system.

3.2   Analysis of experimental results

3.2.1   Comparison of recall rates

In accordance with the above experimental design, the recall rates of the integration results of multimedia network aided English teaching resource of different systems were firstly compared, and the results are shown in Table 1.

Table 1   Comparison of recall rates

Number of experiments	Zhou et al. (2019) system	Li and He (2020) system	Li (2020) system	The system of this paper
10	84.35	75.81	68.75	95.34
20	83.61	74.12	69.36	96.33
30	81.45	78.62	68.15	94.75
40	82.34	74.15	67.55	94.12
50	82.55	79.63	68.94	95.21
60	87.42	74.22	97.34	94.43
70	86.74	74.16	66.55	96.58
80	89.63	71.47	67.85	94.12
90	82.34	72.65	68.46	94.36
100	84.36	75.84	69.36	92.33
Average value	84.48	75.07	71.23	94.76

According to the data in Table 1, the average recall rate of Zhou et al. (2019) system is 84.48%, the average recall rate of Li and He (2020) system is 75.07%, and the average recall rate of Li (2020) system is 71.23%, which is the lowest of the four systems, while the average recall rate of this system is 94.76%, which is the highest of the four systems. The results show that the integration of multimedia network assisted English teaching resources using this system is more comprehensive, and the practical application effect is better. The reason is that the system through the analysis of multi-media network auxiliary English teaching resources integration state space and resources distribution, using a distributed scheduling method and time slot assignment window for English teaching resources transmission scheduling, under the condition of the optimal channel

resource utilisation, constructing multimedia network English teaching resources integration model, get the final result of consolidation, Improve the recall rate of final integration results.

3.2.2 Precision comparison

On the basis of the above experiments, the accuracy of the integration results of multimedia network assisted English teaching resources of different systems is compared, and the results are shown in Table 2.

Table 2   Precision ratio comparison

Number of experiments	Zhou et al. (2019) system	Li and He (2020)system	Li (2020) system	The system of this paper
10	82.25	85.55	79.88	93.15
20	81.75	87.66	86.31	94.75
30	82.31	79.56	84.75	94.66
40	84.41	72.33	86.78	95.17
50	85.63	84.56	87.69	94.85
60	84.75	81.14	83.51	96.33
70	89.63	82.35	81.45	95.87
80	84.12	87.66	82.56	93.28
90	81.35	85.17	81.47	96.35
100	81.47	82.57	86.34	94.37
Average value	83.77	82.86	84.07	94.88

By analysing the data in Table 2, it can be seen that the average accuracy of the Zhou et al. (2019) system is 83.77%, and that of the Li and He (2020) system is 82.86%, which is the lowest among the four systems. The average accuracy of the Li (2020) system is 84.07%, while that of the system in this paper is 94.88%. Is the highest among the four systems, indicating that the system can achieve more accurate results in the integration of multimedia and network aided English teaching resource, which can be further promoted in practice. The reason is that the system adopts the distributed scheduling method and the slot allocation window to transfer and schedule English teaching resources. Under the condition of the optimal utilisation rate of channel resources, the multimedia network assisted English teaching resources integration model is built, which improves the accuracy of the final integration results.

3.2.3 System response time

In order to comprehensively verify the performance of different systems, the response time of different systems is finally compared, and the results are shown in Figure 5.

By analysing the data in Figure 5, it can be seen that, in 100 experiments, the response time of Zhou et al. (2019) system ranges from 2.1–3.3 s, Li and He (2020) system ranges from 0.4–2.2 s, and Li (2020) system ranges from 0.3–1.3 s. However, the response time of the system in this paper is always below 0.4 s, indicating that the response time of the system based on cloud storage is shorter and the operation efficiency is higher. The reason is that the system through the resources collection and submission

module, distributed retrieval module and resource scheduling and coordination between cloud storage module to accomplish multimedia network English teaching resources collection, retrieval and resource scheduling and cloud storage, in order to reduce system response time, promote the ultimate goal of the overall system efficiency.

Figure 5   Comparison of system response times (see online version for colours)
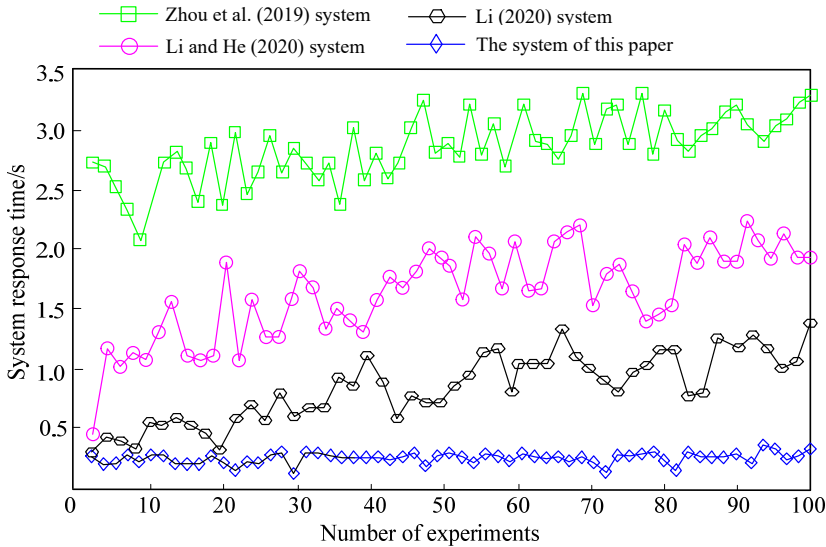
4   Conclusions

With the rapid development of information technology, great changes have taken place in the traditional education teaching mode, especially the use of network technology for online teaching has already become the important direction of the reform of education field, and with the gradually popularisation of network education mode, big increase in multi-media network auxiliary English teaching resources present situation, and for these resources integration can effectively expand the teaching of knowledge, Improve the quality of student learning. However, the traditional resource integration system has the problems of low recall rate, low precision rate and long response time. Therefore, this paper mainly designs a multimedia network assisted English teaching resource integration system based on cloud storage. The experimental results show that the average recall rate and precision rate of the system in this paper are 94.76% and 94.88% respectively, and the response time is always below 0.4 s, which indicates that the system has higher recall rate and precision, shorter response time, and has strong application advantages. The system can fully solve the problems existing in the traditional system and promote the further development of the education field. Therefore, the system has a good application prospect. In the future, the system needs to be optimised and upgraded with new technology to adapt to the development of modern education mode.

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