Multimedia Resources Search Service System of Preschool Education Based on Augmented Reality Technology

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Abstract. The search and utilization of multimedia network teaching resources is a work that cannot be ignored in information education. Based on the in-depth study of the content characteristics of multimedia network teaching resources, this paper develops a multimedia network teaching resource search system for basic education. Based on the automatic analysis of content, structure, and theme of images, videos, and Flash related to basic education in the Web, establish a basic education multimedia network teaching resource index database, increase indexing depth, and use conditional retrieval and natural language fuzzy query. The combined method realizes a basic education multimedia network teaching resource search system based on content characteristics, and provides a good platform for effective use of multimedia network teaching resources.

Keywords: Augmented reality · Preschool education · Resource search

1 Introduction

Multimedia network teaching resources are a kind of network resources with specific topics. With the development of network and multimedia technology, multimedia teaching resources in the web are increasingly rich. How to quickly and effectively find and use these teaching resources and make them play a full role in information education is a problem of great concern to educational technology workers [1]. However, due to the extremely rich content of multimedia information, it is sometimes difficult to describe with a few simple keywords, and sometimes the automatically extracted keywords do not match the multimedia content, resulting in unsatisfactory results of multimedia retrieval based on keywords. Search results often contain too much content that does not match the search topic, and users often need to browse and choose from them, which consumes a lot of time, reduces the efficiency of network resource utilization, and also dampens the enthusiasm of users [2]. The main reason for this phenomenon is that the search engine system does not index the content of multimedia information deeply enough. Therefore, this paper proposes a design method of multimedia resources search service system

W. Fu et al. (Eds.): eLEOT 2021, LNICST 390, pp. 562–575, 2021.
https://doi.org/10.1007/978-3-030-84386-1_46

for preschool education based on augmented reality technology. From the content level of multimedia information to solve the retrieval problem, improve the retrieval accuracy, avoid the subjective one sidedness and incompleteness caused by text description [3]. Multimedia information retrieval is to automatically analyze the content of multimedia information, extract low-level audio-visual features, obtain middle-level object features and high-level topic features through pattern recognition technology, and carry out multimedia information retrieval according to these content features.

Based on the automatic analysis of the content, structure and themes of images, videos and Flash related to basic education in the Web, this paper establishes a basic education multimedia network teaching resource index database, increases the index depth, and uses conditional retrieval and natural language fuzzy inquiries. The combined method realizes a basic education multimedia network teaching resource search system based on content characteristics.

2 Design of Multimedia Resources Search Service System for Preschool Education

2.1 Hardware Configuration Optimization of Multimedia Resource Search Service System

Based on the research on the visual features, structure, theme and other content features of multimedia network teaching resources, especially the basic education teaching resources, according to the subject words of multimedia teaching resources in the basic education textbooks, we search for images, videos and flash in the web, then automatically analyze the content and structure, extract the visual features and object features, combined with the features extracted from the relevant texts The key words are classified and identified, the indexing depth is increased, and the index database of multimedia network teaching resources of basic education is established. Finally, the search of multimedia network teaching resources of basic education is realized by using conditional search combined with natural language fuzzy query, which provides a support platform for the effective use of multimedia network teaching resources [4]. Teaching resources automatic search system is mainly composed of intelligent word segmentation module, search module, index module, acquisition module and other key parts. The structure model of multimedia resource search service system is as follows (Fig. 1):

The main function of the index module in the system is to understand the information of teaching resource materials, extract index items from the searched teaching resource web pages, and use them to represent documents and generate the index table of document library [5]. For the automatic search system, the selection of index words in the index module is a core problem. If the common words are selected as the index word list, although the memory requirement is less, the frequency of each index word will be very high. And because many words are not included in the index thesaurus, they will be cut into single words when they are inverted. The more frequent words appear in the indexing process, the more conjunctive operations will be done during retrieval, resulting in longer query response time of the system [6]. On the contrary, if the number of index words is large, it will occupy a lot of memory resources during retrieval. Many index words with

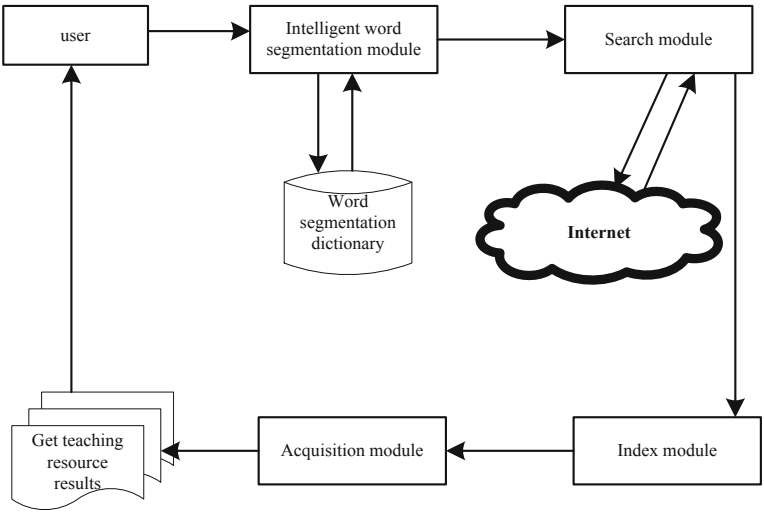

Fig. 1. Structure model of multimedia resource search service system

low frequency are rarely used during retrieval, wasting memory resources. Therefore, the balanced selection of index words is very important [7]. Another key point of the index module is to use inverted index technology, which includes the establishment of forward index and reverse index. Based on this, the index architecture of multimedia teaching resources is further optimized, as follows [8] (Fig. 2).

The main function of the system search module is to search the web teaching resources through the web spider according to the needs of users. The web spider searches for the target web page through the link address of the web page on the Internet, starts from a certain page (usually the home page) of the web site, reads the required content of the web page, finds other link addresses in the web page, and then looks for the next web page through these link addresses, so it continues to cycle until all the web pages of the web site are captured. If the whole Internet is regarded as a website, then the web spider can use this principle to collect all the target content on the Internet [9, 10]. The performance of search module is directly related to the coverage of the whole resource search system. According to the distribution characteristics of web teaching resources, the system adopts incremental collection and breadth first algorithm to improve the search efficiency and recall of teaching resources as much as possible [11, 12]. Multimedia information resources search engine is a system specially designed for rich information resources and their use characteristics. The search engine follows the retrieval habit of users' Internet search mode, and provides users with comprehensive search from three aspects of discipline, learning progress and resource type on the basis of keyword search, so as to obtain professional related information resources more conveniently and comprehensively [13, 14]. At the same time, to ensure the stability and security of the system operation, the retrieval response time, data update frequency, precision and other indicators should reach a higher level. The system structure of multimedia information resources search engine is shown in the Fig. 3.

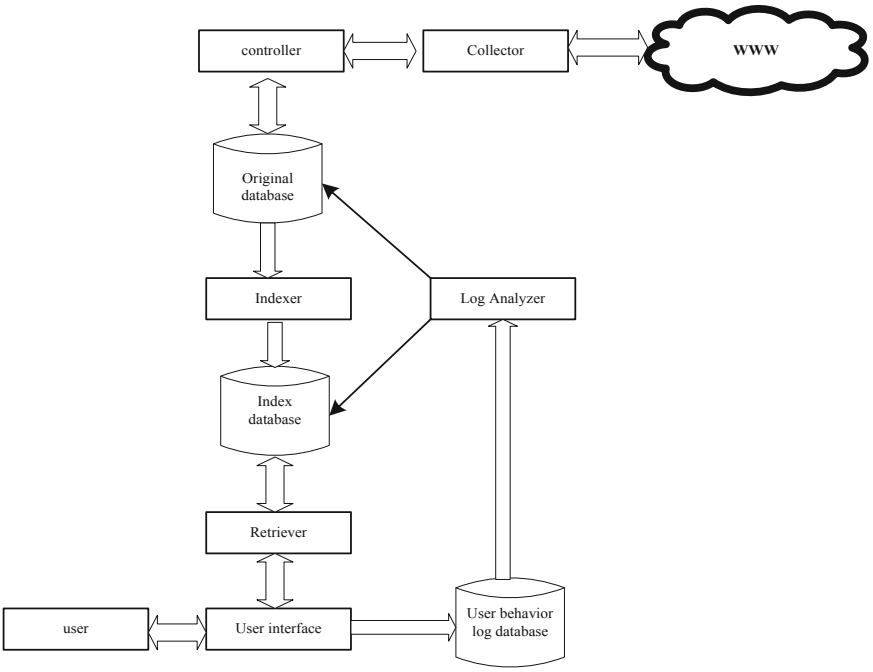

Fig. 2. Index structure of teaching resources

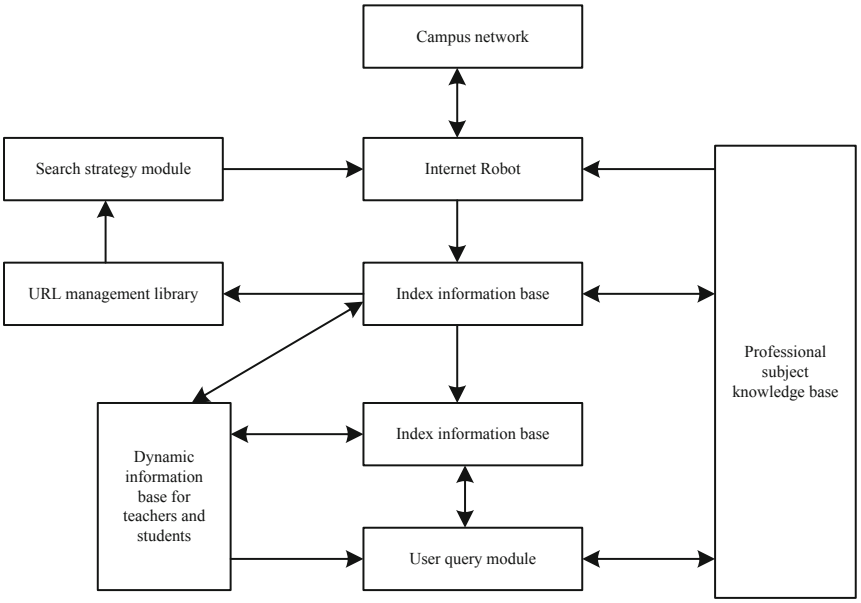

Fig. 3. Structure of information resource search engine

The multimedia information resource search engine system adds two modules to the common Internet search engine: professional subject knowledge base and teacher-student dynamic information database, which automatically extracts new or updated network resources according to the algorithm determined by the search strategy. It is a web resource, but a comprehensive multimedia information resource, which is classified according to the knowledge of professional disciplines. The collected information must be classified and indexed according to the knowledge of the discipline through a professional processing module, and an index database suitable for its own use and development is established [15, 16]. When teachers and students use the user query function, they will automatically form comprehensive query keywords according to their own disciplines and their own dynamic information, accurately or fuzzy match with the indexing words in the index database, return the query results to users, and the query results can also be updated to the professional subject knowledge base, providing standards for future information collection. The multimedia information resources search engine system not only adds two modules, but also enhances its internal functions. It develops a meta engine search with a unified interface, forwards the required format to multiple databases containing keywords through the multimedia information resources search engine, and displays the information indexed by each database system to users after unified processing and sorting. The search engine itself does not have its own physical storage of web page information, and it plays a role of transfer station or agent in function. In fact, the data search engine adopts intelligent technology in the designed meta search: it preprocesses the keywords, phrases or statements requested by users, selects the appropriate professional database according to the identification of the system knowledge base, and converts them into corresponding numbers According to the request format required by the database, it is sent to each database. So as to reflect the efficiency of resource search.

2.2 Software Function Optimization of Multimedia Teaching Resource Search System

Multimedia teaching resources search system software is analyzed and designed from two aspects: search engine subsystem and background management subsystem. The main task of the search engine subsystem is to collect, analyze and filter the web pages, index the function legend of the background management subsystem, input the query keywords, calculate the similarity with the content of the system index, and sort the key technology result web pages of the 2 teaching resources search engine system and return them to the users. The background management subsystem is mainly to maintain the collection of the system. In order to collect more subject terms related to multimedia teaching resources that may be used in basic education, the submission system of multimedia subject terms in basic education is established, which provides more multimedia subject terms related to basic education. Please indicate the media type, learning period and subject, and the type of multimedia teaching search terms, such as Table 1:

In the system, the user searches the document file, and the search results need to intercept part of the content to show to the user, so that they can know the basic information of the document as soon as possible. If they are interested in the file, they can browse the full text, and they can download and save the valuable resources. Audio files:

Table 1. Types of search words in multimedia teaching

Key words	Type				Subject				
	Image	Video	Animation	Voice	Chinese	Mathematics	English	Science	Sipin
Cheetah	√	√					√		
Dissolution		√	√	√					

audio files should have online audition function, and download and save favorite files. For the search results of video files, they should be shown in video screenshots, and can be played online. They always control the online playing process, and can download and save valuable videos. When users search for image files, they need to show the thumbnails to the users after isometric reduction, and they can browse the whole picture, and save their favorite pictures locally. When the user enters "language" for document search, it can list the relevant information about the language and preview the full text. If the user wants to save a document, he can download and save it. Based on this, the system search function structure is optimized, as shown in the Fig. 4.

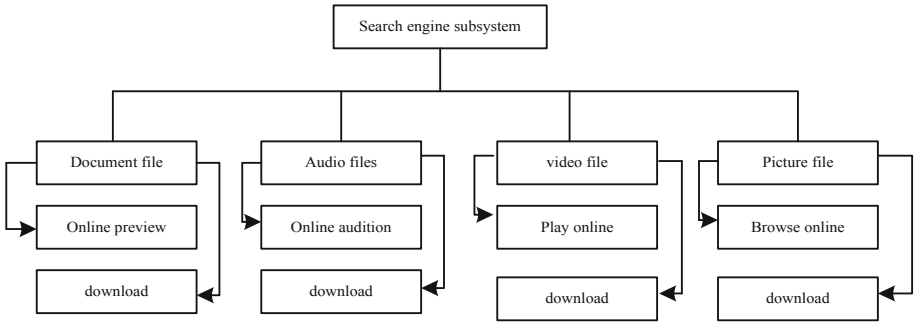

Fig. 4. Optimization of search function of teaching resource system

Background management subsystem, mainly for the maintenance and management of search engine subsystem. It includes the management of users, resources and sensitive words. User management can view, search, add and delete users; resource management can add new resources, browse and delete existing resources, and re index resources; sensitive vocabulary management can filter illegal words searched by users, so you need to add filter words here, modify and delete them. The functional structure is shown in the Fig. 5.

For search engines, the selection of index words (or keywords) is a core problem. If common words are selected as the index words of search engines, although the memory requirement is less, the frequency of each index word will be very high. And because many words are not included in the index thesaurus, they will be cut into single words when they are inverted. The more frequent words appear, the more conjunctive operations will be done, the more comparison times will be, and the longer the system response time will be. On the contrary, if the number of index words is large, it will occupy a

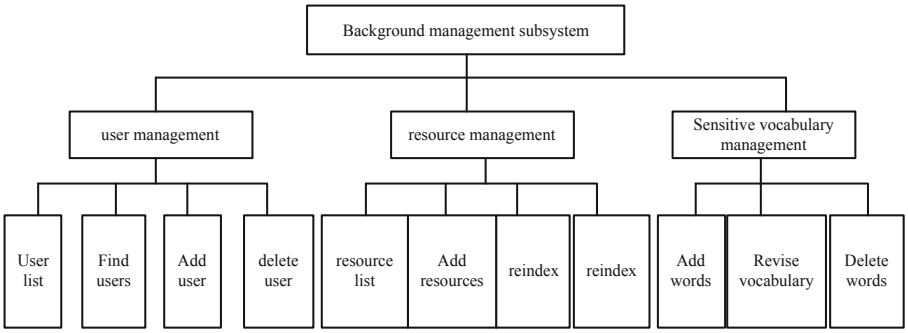

Fig. 5. Function optimization of background management subsystem

lot of memory resources in retrieval. Many index words with low frequency are rarely used in retrieval, wasting memory resources. Therefore, the selection of index words is very worthy of attention. In this case, the index vocabulary is divided into two parts. The first part is the words in ordinary dictionaries, whose entries are fixed in length and total number is fixed, which is called static dictionaries; the second part is the words not appearing in dictionaries, which are identified by unknown words, which is called corpus based dictionaries. The length of these entries is variable, but for 1g of database capacity, it is considered that the number of entries in the whole index thesaurus should be controlled at 500000. However, the number of unknown words is so large that it is not suitable to introduce them into the index vocabulary. Therefore, the statistical method is used to filter the unknown words. Statistical vocabulary acquisition is another way to identify unknown words. In a large enough corpus, the appearance of words with certain expressive ability is not isolated, but presents certain statistical rules, which makes it possible to obtain words automatically by using the co-occurrence information between words. In terms of form, a word is a stable combination of words. Therefore, in the context, the more adjacent words appear at the same time, the more likely they are to form a word. Therefore, the frequency or probability of word to word co-occurrence can better reflect the credibility of the word. We can count the frequency of the combination of the adjacent co-occurrence words in the corpus and calculate their mutual occurrence information. The mutual occurrence information of two Chinese characters is defined, and the adjacent co-occurrence probability of two Chinese characters X and Y is calculated. The mutual information reflects the close relationship between Chinese characters. When the degree of closeness is higher than a certain threshold, it can be considered that this phrase may constitute a word. After analyzing the web page and cutting its words, we need to use inverted index technology to build an index for the segmentation. Creating inverted index includes building forward index and reverse index, as shown in the Fig. 6:

In the figure, after analyzing the web page, the forward index table with the web page number as the primary key is obtained. When the reverse index is established, the whole process needs to be completed in memory in order to speed up. When the amount of data is small, there is enough memory to ensure that the creation process can be completed at one time. When the data scale increases, the strategy of grouping index and then merging

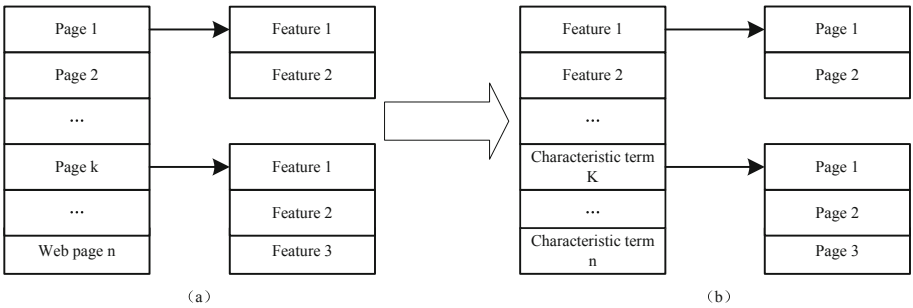

Fig. 6. Building reverse index from forward index

index can be adopted. The strategy is that the index module divides the index into k groups according to the memory size of the computer running the system at that time, so that the memory required for each group of operations is less than the maximum memory size that the system can provide. According to the generation algorithm of inverted index, K groups of inverted indexes are generated. Then the K groups of indexes are merged, that is, the data corresponding to the same index words are merged together, and the final inverted file index with the index words as the primary key, that is, the reverse index, is obtained. Based on the above steps, teaching resources are index and search activities, which can better guarantee the effect of teaching resources search service.

2.3 The Realization of Educational Multimedia Resources Search

In addition to providing users with active search engines, the multimedia information resources search system also provides intelligent agent services to provide users with customized information, so as to save the time and energy of teachers and students. The intelligent agent in the expert processing information module actively searches the relevant information on the campus network according to the contents concerned in the dynamic information database of teachers and students, sorts it out, and pushes it to the dynamic information database of teachers and students for users to use directly. The key of intelligent agent is to command the search engine of multimedia information resources. It can also search the customized information on the Internet according to the theme. The search method can extract the active information from the relevant websites stored in the local database, or use the vertical search. The intelligent agent analyzes the information transmitted by these searches, and analyzes and processes it according to the subject knowledge base To improve the accuracy of knowledge. The construction of teaching information resources includes the collection, sorting, classification, description, storage, index, query, and later resource management and maintenance. The management process of multimedia teaching resources is shown in the Fig. 7.

According to the actual needs of course teaching resource sharing and the shortcomings of the traditional website sharing course resources based on stand-alone server, the server cluster mode can be used for course resource sharing after investigation and research, which needs to be reasonably designed combined with cloud computing,

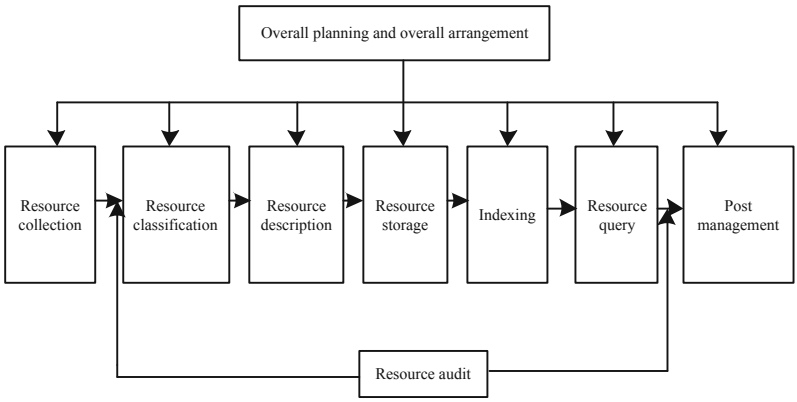

Fig. 7. Multimedia teaching resource management process

big data and other technical means. The function of curriculum resource sharing system based on augmented reality technology mainly includes user management, system management and curriculum resource management.

User management function: user management function module mainly includes non registered users, login users and system administrators. Non registered users can search the course teaching resources on the platform, but can not download the course resources on the platform. Such users can open the registration page to register, and then audit their registration. Login users are legal users who have been verified by the system. Such users can operate on course resources. For example, users can share course resources, upload course resource data to HDFS distributed storage system, view their own uploaded data files, and delete the uploaded course resource data. Based on this, the course resource sharing management module is optimized. The specific steps are as follows (Fig. 8):

The data in the course resource sharing module is based on two places for storage management. One part is to store the basic information of users and course resources. This part of data is structured data, which is mainly stored in my SQL relational database; The other part is to store course resource data, most of which are unstructured data, stored in the distributed storage HDFS system of Hadoop cluster. The course resource information related to the data files stored in HDFS system is also recorded in the course resource information data table of my SQL database. The web server of the course resource data sharing system based on augmented reality technology is respectively connected with my SQL database and HDFS distributed storage system, and its data storage and main function modules are shown in the Fig. 9.

Curriculum resource sharing system based on Augmented Reality Technology in the Internet information age, curriculum resource data shows a blowout growth, in which more and more junk information, the amount of information users get is also growing geometrically. Too much information leads to the cost of users to obtain valuable information will be greatly increased. On the sharing platform, according to the log data produced when users access the server, and the similarity between curriculum resources, we analyze the curriculum resource data, and mine valuable curriculum resource data to

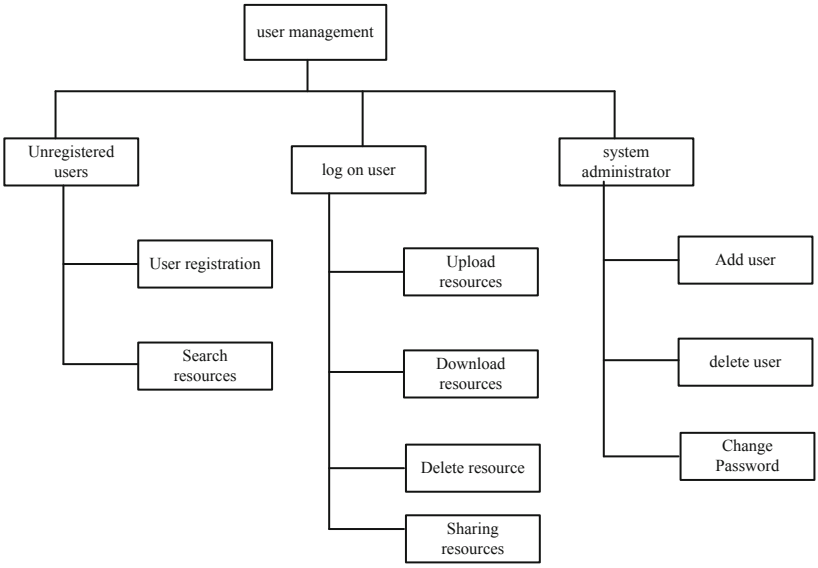

Fig. 8. Course resource sharing management module

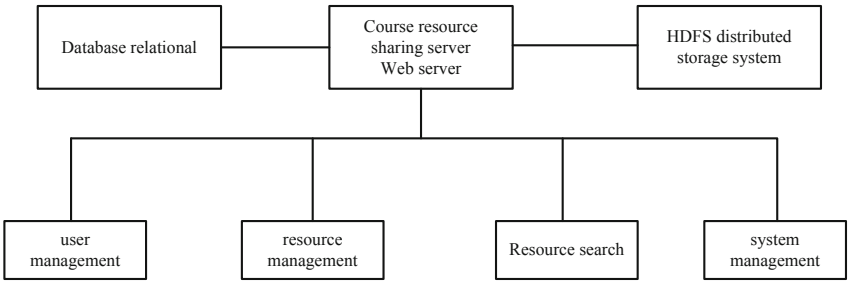

Fig. 9. Main function modules of the system

recommend to users, so that users can gradually change from actively obtaining information to passively receiving information In order to reduce the cost of users to obtain information and improve the efficiency of users using the course resource sharing platform. The search engine of course resource sharing system based on augmented reality technology adopts distributed search elastic search, and deploys elastic search on Hadoop distributed cluster system Search distributed search engine, establishes the index data of course teaching resources, carries out full-text retrieval of course teaching resources data on the resource sharing platform, and realizes the function of course teaching resources data search. The search process is shown in the figure below (Fig. 10):

To query the course resource data, the user submits the query request through the form. After receiving the request information, the background calls the elasticsearch API to search the relevant data in the index library. If the relevant index information is found, the specified course resource data will be returned to the user.

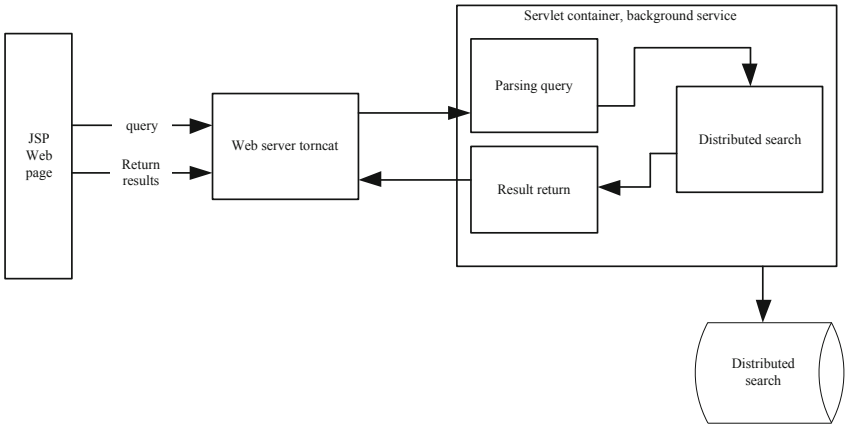

Fig. 10. System search process optimization

3 Analysis of Experimental Results

The course resource sharing system based on augmented reality technology is tested. The physical host is virtualized into several virtual computers, and the software and hardware resources of the computer are fully utilized through virtualization technology, so that the software and hardware resources of the computer can be bigger and more fully utilized. The virtual machine server is established on the host computer through the virtualization technology of VM ware, and then multiple computers are virtualized. The server is managed through the client VM ware sphere client. The server is connected on the client, and then multiple Linux operating systems are installed on the server, and then Hadoop, spark and elastic are installed on the Linux operating system Search and other software, configure the Hadoop configuration file, build Hadoop cluster, call the HDFS distributed storage system API interface of Hadoop, realize the map reduce computing programming, and use the web Server to provide course teaching resource sharing services, based on Hadoop augmented reality technology, provides a solution for massive data processing of course resource sharing, and realizes fast upload and download of shared course teaching resource data. Based on this, the parameter table of experimental cases is optimized as follows (Table 2).

Table 2. Experimental case parameters

Case name	Create directory/upload file/query/download file/delete file
Test purpose	Create directory/upload file/query/download file/delete file
Default conditions	(1) Hadoop cluster system is normal (2) There are virtual hosts running normally in cluster system

Further optimize information resource management information, as shown in the following Table 3:

Table 3. Curriculum resource information table

Field name	Significance	Data type	Constraint
ResourceID	Course resource serial number	int	Primary key
ResourceName	Course resource name	Varchar(50)	Not empty
Uptime	File upload time	Time	Not empty
Type	Types of curriculum resources	Varchar(40)	Not empty
Userid	File owner ID	Int	Foreign key constraints
size	Resource data capacity	Varchar(20)	Not empty

Through the system platform construction, test Hadoop distributed file storage platform, test MapReduce distributed computer framework, and test the system development environment, as well as the operation of webserver server in the course resource sharing system, the course resource sharing system based on augmented reality technology is tested systematically (Fig. 11).

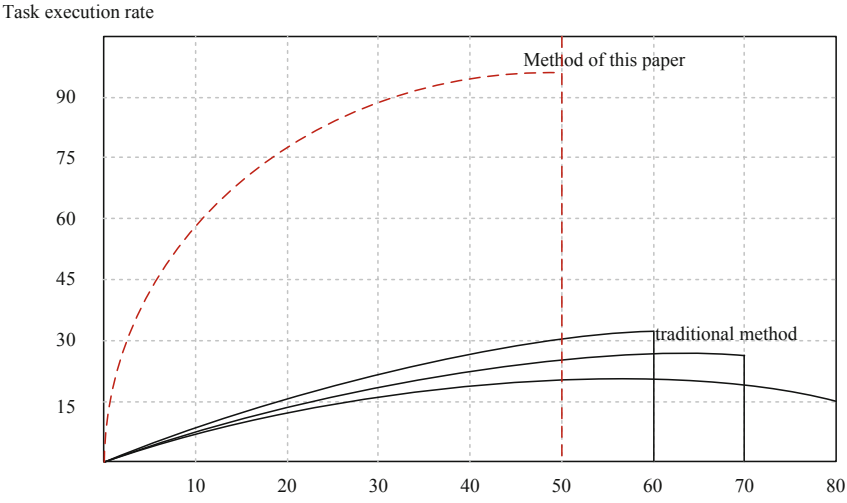

Fig. 11. Comparison test results

Experiments prove that the course resource sharing system based on augmented reality technology shares course resources by building a server cluster, which has a considerable advantage in course resource search function and course resource recommendation function than traditional course resource sharing based on a single server. Its data search and server response time are significantly improved compared to the traditional network sharing method of a single server.

4 Concluding Remarks

Multimedia information resources are very important resources for teaching and scientific research. How to improve the sharing of campus resources through search engine is an important mode of campus network application. This paper studies the use of various multimedia information resources in the school, and designs an information search engine technology which is more suitable for the use of learning and research multimedia information resources. Information security is a problem in many systems today. We should try to use the multimedia information resources search engine which takes the security factors into account when designing from the bottom to achieve the highest security level. In the future, the engine needs to be further expanded, so as to realize the joint search between the two, so as to facilitate the sharing of multimedia information resources in the whole higher education system.

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