

Research on Resource Sharing Method of Library and Document Center Under the Multimedia Background

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Abstract—In order to improve the utilization effect of the resources of the book and document center and ensure the security of its resource sharing, the resource sharing methods of the book and document center under the multimedia background are studied. The resource layer of this method is based on multimedia technology and combined with virtual technology to build a multimedia document cloud resource pool; At the same time, the adaptive clustering algorithm of empirical mode feature decomposition is used to obtain the number of document resources clustering and resource category labels, complete the resource clustering of the book and document center, and store it in the constructed resource pool; Users log in directly through the document resource sharing service of the service layer, and enter the resource center after authentication by the management layer. The service layer uses the regional document information resource co-construction and sharing mechanism based on blockchain to encrypt, co-identify and decrypt the clustered resources in the resource pool and then share the resources of the book and document center. The test results show that the clustering purity and contour coefficient of the method is above 0.970, and the clustering quality is good; The security of resource sharing is good, and the sensitivity result is 10.11% when the resource sharing ratio is 100%; It can effectively complete the resource sharing in the book and document center, and meet the sharing needs of book and document resources.

Keywords—Multimedia background; library and reference center; resource sharing; virtual technology; multimedia technology

I. INTRODUCTION

The Library and Reference Center is a virtual scientific and technological document information service institution [1, 2]. It is to provide scientific and technological document information services to the whole country according to the needs of national scientific and technological development and the collection, store, and development of scientific and technological document resources in various disciplines of science, engineering, agriculture, and medicine [3, 4]. Document service is a major service item in the book and document center. The specific contents include document retrieval, full-text provision, online full-text, catalog browsing, catalog query, etc. Non-registered users can obtain services other than full-text services for free, and registered users can also obtain full-text services [5, 6]. The document retrieval column provides users with query and sharing services for various scientific and technological document titles or abstracts [7]. The reference types include journals, conference proceedings, dissertations, scientific and technological reports, patent standards and books, etc., the types of reference involve China, West, Japan, Russia, etc., and the fields involve

medicine, architecture, chemical engineering, etc. [8]. It provides common search, advanced search, periodical search, classified search, natural language search, and other search methods. Resource sharing refers to using information technology resources to integrate and optimize, avoid repeated construction of resources, improve the utilization of resources, and meet users' resource service needs while meeting users' interactive communication needs and complete personalized push of resources [9].

When the resources of the book and document center are shared, there are still some deficiencies in the interaction between multiple users. Therefore, to better realize the sharing of such resources, reference [10] focused on the FULink platform to carry out the research on the resource-sharing process. Through this platform, all libraries could adhere to the common concept, abide by the unified standards, establish a scientifically coordinated operation mechanism and a perfect incentive mechanism, and promote the effective sharing of books and reference resources. This method can effectively coordinate sharing of reference resources among all participating libraries. It mainly focuses on the information exchange and control between participating libraries, but the security protection for the resources of the document center is poor. In reference [11], based on information sharing needs, after carrying out relevant research, an Internet information resource model of hierarchical information resource sharing for cloud computing was proposed. This method used specific constraints, trust gradient function, cloud trust evaluation criteria, and trust constraint coefficient to establish a hierarchical information resource sharing model and complete information sharing through this model. This method has good integrity in the application process. Still, it cannot cluster information resources, so it takes a long time in the sharing process, and the sharing effect of high-level resource information still needs further verification. Reference [12] took the remote sharing of resources as the research core. It proposed a blockchain-based resource-sharing method to protect the privacy and security of the experimental platform resources during the remote sharing of resources. However, this method cannot automatically push resources during application. Reference [13] puts forward a method of sharing digital English teaching resources based on artificial intelligence. Through the collection and management of English digital teaching resources, an evaluation index system of teaching resources is constructed, so as to comprehensively and objectively evaluate digital teaching resources, promote the construction and development of digital teaching resources, effectively promote and improve teaching effect, and realize the research requirements of effective sharing of massive

teaching resources in complex environment. However, this method has poor sensitivity to resource sharing. Reference [14] puts forward a resource sharing method of state update freshness. In the automatic driving system, the traffic situation and the vehicle position must be as close as possible. The information age is a relatively new indicator, which is used to measure the freshness of our understanding of the status of remote systems in order to better share resources. However, this method is not effective for the resource sharing of library and literature center.

At present, the rapid development of media technology has greatly changed the way of communication of information resources, and the dissemination of information resources also has gradually diversified with the integration of various media into the information age. Multimedia technology is the product of this information age. It is a technology that uses computers to store and manage various kinds of information, such as language, data, audio, video, etc. so that users can communicate real-time information through multiple senses and computers. The content displayed and carried by multimedia technology is actually the product of computer technology, with the characteristics of integration, control, interactivity, nonlinearity, synchronization, and dynamic information structure. Therefore, in order to meet the resource sharing of the book and document center in the information era, this paper studies the relevant resource-sharing methods of the book and document center based on the multimedia background. This method combines cloud services to complete the clustering and storage of reference resources and constructs resource pools through virtual technology to achieve efficient management of resources; Combined with the advantages of blockchain technology, the sharing mechanism is built to realize the safe sharing of resources. The feasibility of the proposed method and the effect of resource management and sharing are verified by the relevant analysis of the method.

The research motivation of this method is:

First of all, with the rapid development of information technology and the increasing richness of multimedia resources, the form and content of books and literature resources are undergoing profound changes. How to realize the effective sharing of books and literature resources under the

multimedia background and ensure the full utilization and efficient management of resources has become an urgent problem. Therefore, studying the methods of resource sharing in the library and literature center under the background of multimedia is helpful to promote the digitalization, networking and intelligent development of library and literature resources, and improve the utilization efficiency and management level of resources.

Secondly, with the increasingly obvious trend of interdisciplinary integration, the demand for books and literature resources is also diversified and cross-disciplinary, and the exchanges and cooperation between different disciplines need to share rich literature resources as support.

Finally, from the perspective of users' demand, with the diversification of information acquisition methods and the increase of personalized demand, users' demand for books and literature resources also presents the characteristics of diversification and personalization. Studying the resource sharing method of library and document center under the multimedia background is helpful to better meet the needs of users and provide more convenient and efficient services.

II. RESOURCE SHARING OF BOOK AND DOCUMENT CENTER

A. Resource Sharing Method Framework of the Book and Document Center

The functional services are designed from two aspects, namely, common functions and spatial functions. The former meets the basic needs of users for resource services, and the latter meets the basic needs of users for resource services. At the same time, users can get more communication and personalized experience. The functional design of common functions includes resource browsing, resource retrieval, resource download, resource upload, resource evaluation, and other functions. Users can search resources in the platform according to keywords or platform navigation classification. The space function is used to meet the communication and cooperation between users and realize sharing. The overall framework of this method consists of three layers: the service, the management, and the resource. The overall framework is shown in Fig. 1.

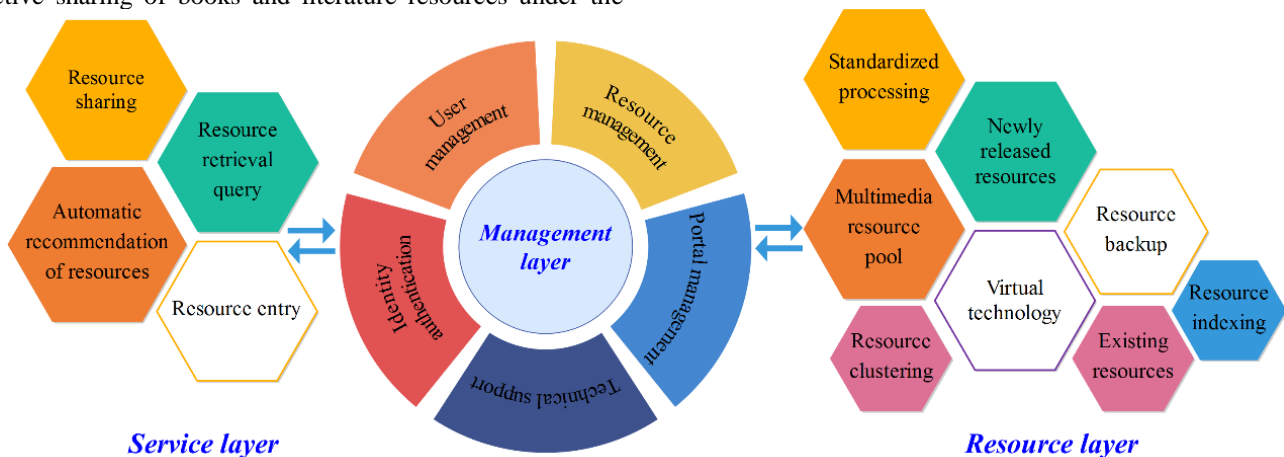


Fig. 1. Resource sharing method framework of the book and document center under the multimedia background.

The basic function of this method is to accept resource service requests from cloud computing users, deliver specific resources and services to the requester according to user needs, and reasonably schedule the corresponding resources so that users can request resources and services to run.

Service layer: The service layer is located at the top of the system platform and is also the realization part of the method of sharing. At the same time, this layer is the direct entrance to the document resource-sharing service presented to users. Users can access the multimedia resource-sharing platform through computers, mobile phones, panel computer, and other mobile devices, and can browse and download resources at any time, obtain resource services, improve user experience, and promote the sharing of document resources; In addition, the resource search method in the multimedia teaching resource sharing portal uses the classified navigation plus keyword search method to search, which can greatly improve the efficiency and accuracy of document retrieval. While meeting the user's resource demand, this layer can also provide more personalized and intelligent services. The platform can actively push information according to the user's usage habits to keep abreast of the latest developments of the resources concerned.

Management layer: As the management part of the overall framework of the method, the main role of this layer is to achieve comprehensive management of users, resources, etc. Because books and reference resources are stored in the form of a cloud resource pool and related services are provided through cloud service, the cloud service provider should be responsible for providing and managing the relevant cloud technology hardware equipment, storage, computing, and other functions while managing resource services, user accounts, resources, platform portals, etc. Account management is mainly to assign a unified authentication ID to users. It can access the resource pool and obtain relevant resource services only after applying for a unified ID number. Portal

management is mainly used to manage the service items of the resource cloud-sharing platform. It can update the website layout and columns in a timely manner so as to provide users with a better service experience and complete the timely release of website-related information and resources.

Resource layer: As the key layer to realize sharing, this layer mainly consists of two parts, namely, resource co-construction and resource storage. Resource co-construction is to summarize the original book and reference resources through a unified interface according to the specified standards through the integration method, and then filter index, clean the collected resources and store them in the document resource cloud resource pool to provide resource service support for the platform. In this paper, when storing resources, it can use virtual technology to build resource pools, which have storage space disaster tolerance technology, data encryption technology, and often backup resources to ensure the security of resource storage and avoid the loss of resources caused by Internet attacks. Redundant storage technology is adopted to make the storage of resources safer and more environmentally friendly.

B. Design of Resource Layer

1) *Structure of the reference resource pool:* The resource layer is the support for the realization of document sharing. In order to achieve better resource services, the storage of resources is particularly important. In this paper, multimedia technology is used to build a multimedia document cloud resource pool to achieve efficient resource integration; In addition, in order to ensure the cloud storage effect of resources, the virtualization of the resource pool is completed in combination with virtual technology to achieve efficient storage of resources. The structure of the multimedia reference cloud resource pool is shown in Fig. 2.

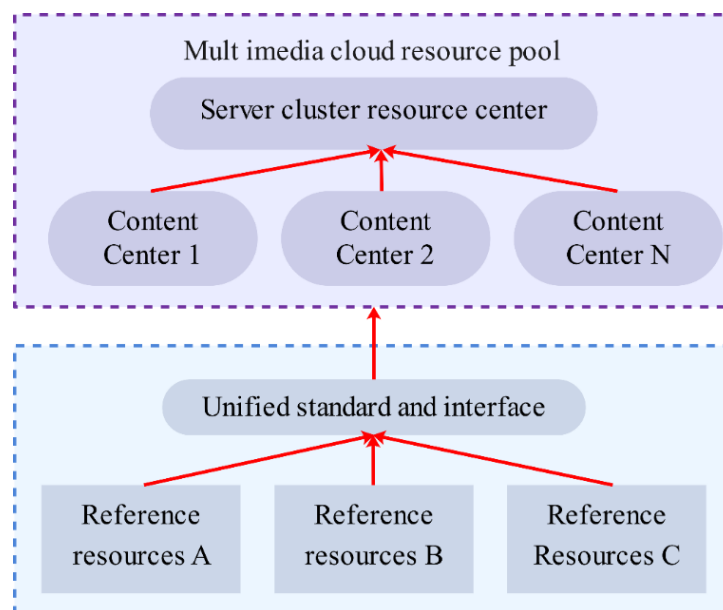


Fig. 2. Cloud resource pool structure of multimedia reference.

During resource integration, the resource layer uses the resource clustering algorithm to cluster and upload resources to cloud storage through the unified platform interface. All colleges and universities can access the resources uploaded to the cloud, further improving the efficiency of resource sharing. The resource storage method cloud service providers adopt centralized storage and multiple redundant backups, which is more secure. Even if one of the data analysis servers loses data due to natural disasters or other reasons, the data control center can recover data from other backups in time to ensure normal service delivery.

2) *Document resource clustering*: Before resource sharing, it is necessary to cluster the document resources. Due to the differences in the category and attribute of resources, in order to efficiently cluster the document resources, the adaptive clustering algorithm of empirical mode feature decomposition is used to complete the clustering, and the concept of cosine similarity is introduced to ensure the clustering effect.

Before clustering the reference resources, it should normalize the resources to limit them to a certain range, to eliminate the impact of resource structure differences on the clustering effect [15]. Assuming that the parameters of the adaptive clustering algorithm are represented by K , if the multi-source heterogeneous document resource set is represented by $X = \{x_1, x_2, \dots, x_n\}$, the number of resource categories contained therein is k , and the attributes of different resources are represented by S_k , and k is the maximum number of attributes. Based on this, the equation for calculating the confidence distance between samples of different reference resources is:

$$d(x_1, x_2) = K \times \sum_{k=1}^n S_k X_k \frac{1}{n \times u(x_1, x_2)} \quad (1)$$

In the formula: $u(x_1, x_2)$ represents confidence; n represents the number of reference resource samples. The normalization result of $X = \{x_1, x_2, \dots, x_n\}$ can be obtained after compression processing, and the equation is:

$$x_n = d(x_1, x_2) \times \left(1 + \frac{S_k}{\eta}\right) \quad (2)$$

In the formula: η represents the normalization factor.

After the normalization of reference resources is completed according to the above steps [16], the initial clustering center C_i is determined, and its calculation equation is:

$$C_i = \frac{x_n}{\sum_{i,k=1}^n y_{ik}} \quad (3)$$

In the formula: y_{ik} represents the degree of membership. After determining C_i , the document resources are clustered. In order to ensure a more reliable clustering effect, the concept of weighted cosine distance d_{ij} is introduced in the clustering

process to ensure the reliable clustering of resources of the same category. The calculation equation of d_{ij} is:

$$d_{ij} = 1 - \frac{\sum_{g=1}^G \sum_{k=1}^K (w_{gk} \times z_{igk})(w_{gk} \times z_{jgk})}{\sqrt{\sum_{g=1}^G \sum_{k=1}^K (w_{gk} \times z_{igk})^2} \sqrt{\sum_{g=1}^G \sum_{k=1}^K (w_{gk} \times z_{jgk})^2}} \quad (4)$$

In the formula: $g = 1, 2, \dots, G$; $k = 1, 2, \dots, K$; $i, j \in 1, 2, \dots, n$; w_{gk} represents the weight, corresponding to the g -th resource in the k -th category; z_{igk} and z_{jgk} represent the standardization results respectively. The former corresponds to the i -th resource, and the latter corresponds to the j -th resource.

On the basis of cosine similarity, the weighted cosine distance is used to objectively weight the different characteristics of the document resource samples, and the characteristic that the angle cosine measures the difference between any two individuals of different resource samples is retained, which can provide reliable guarantee for resource clustering [17].

If each resource is a category, the initial category and the distance between categories are expressed by $D_{i,j}$, and $D_{i,j} = d_{ij}$, then the initial category and the distance matrix between categories are expressed by $D^{(1)} = (d_{ij})_{N \times N}$. On this basis, after determining the distance $D_{k,r}$ between the merged class and other classes, the number of clusters is determined; If the given threshold of the number of clusters is Ψ , the relationship between it and any classes X_i and X_j is:

$$D_{k,r} = \Psi \times (X_i, X_j) \quad (5)$$

According to the calculation results of this equation, it can compare the distance and threshold results between different classes and classes of resources [18]. If Equation (5) is satisfied, that is, the distance between classes is less than or equal to the threshold, X_i and X_j are combined into one class. And one resource category is reduced according to the calculation result of $D_{k,r}$. The above contents are processed circularly. When the distance between all resource categories and categories is less than Ψ , the final document resource cluster quantity and resource category label can be obtained, and the book and document center resource cluster can be completed [19].

C. Realization of Resource Sharing

1) *Structure of resource sharing mechanism*: After completing the resource clustering of the book and document center through the above sections, the service layer will share the resources after clustering. To ensure security in the sharing process, the regional document information resource co-construction and sharing mechanism based on blockchain is adopted for resource sharing. The sharing structure of this mechanism is shown in Fig. 3.

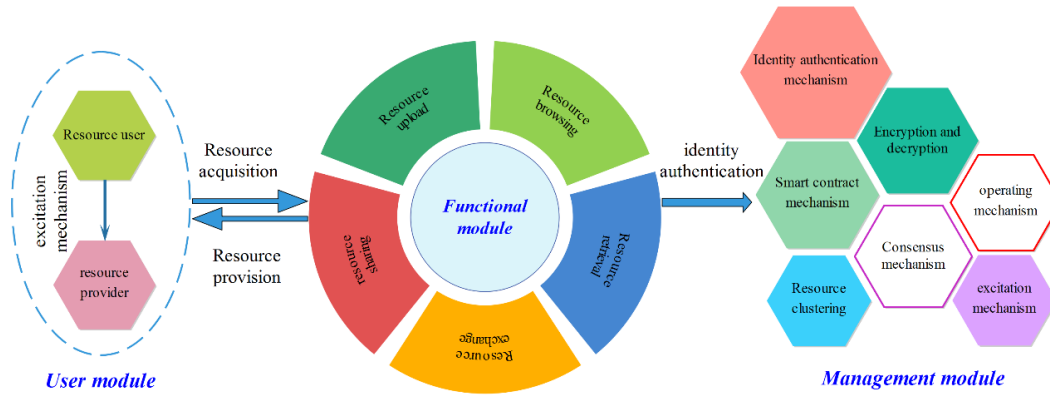


Fig. 3. Structure of regional document information resources co-construction and sharing mechanism based on blockchain.

The sharing mechanism proposed in this paper includes three modules, namely the user, function, and management modules. Through the mutual assistance of the three modules, a resource-sharing alliance chain is formed to realize the safe sharing of resources.

- **User module:** This module is based on the private chain of user behavior, which includes all service objects of the Alliance, namely users of information resources, as well as alliance resource providers, such as various types of databases, publishers, and libraries. Therefore, users can become both providers and users of the Alliance's reference and information resources, thus expanding the types and service scope of regional reference and information resources co-construction and sharing.
- **Function module:** The service layer includes a data sub-module and function sub-module, which are used for uploading, browsing, searching, downloading, and other functions of information resources. Users can upload data resources within certain rules through the data sub-module. They can select corresponding functions to download information resources according to their own needs through the function sub-module.
- **Management module:** The management layer uses the blockchain-based distributed ledger technology [20], and the member libraries of the Alliance store their reference data resources in different blocks in a distributed manner. They use point-to-point communication to achieve efficient use of resources, solve the problem of resource islands, promote the free circulation and safe sharing of information resources among university libraries in the Alliance, and improve the sharing efficiency. The member libraries of the Alliance are interrelated and independent of each other. Through identity authentication mechanism, consensus mechanism, incentive mechanism, and smart contract mechanism, they are jointly built in the framework of the Alliance to identify the rights and responsibilities of document resource allocation within the Alliance and to standardize the behavior of the member libraries of the Alliance.

2) *Implementation method of resource sharing:* When using the regional reference information resource co-construction and sharing mechanism based on blockchain to share the resource, in order to ensure the sharing effect, ensure the stability in the sharing process, and complete the sharing among multiple nodes, this mechanism uses consensus algorithm to maintain the resource sharing, with good decentralized characteristics [21]. According to different principles, the algorithm can be divided into a verification pool mechanism, proof of rights and interests' mechanism, and proof of workload mechanism. The practical Byzantine fault-tolerant algorithm, system fault-tolerant performance [22], response time, and throughput are the main factors in judging the performance of the consensus algorithm. The parameter of consensus algorithm is fault tolerance, the calculation equation of fault-tolerant performance f during resource sharing is as follows:

$$f = \left\lfloor \frac{m-1}{3} \right\rfloor \quad (6)$$

In the formula: m represents the number of shared user nodes.

If the time of the consensus node of the algorithm for resource reception and consensus is t' and \tilde{t} respectively, the calculation equation for the response time t of resource sharing is:

$$t = t' + \tilde{t} \quad (7)$$

In unit time, the total amount of resources shared on the blockchain $T_{PS\Delta t}$ is calculated as follows:

$$T_{PS\Delta t} = \frac{T_{total} \times T_{\Delta t}}{\Delta t} \quad (8)$$

In the formula: $T_{PS\Delta t}$ represents the total amount of resources shared on the blockchain per unit of time, which also represents throughput; Δt represents the response time change of resource sharing, $T_{\Delta t}$ represents the amount of resources shared on the blockchain. T_{total} represents the total amount of resources shared on all blockchains.

3) *Privacy protection of shared resources:* The decentralization of the blockchain makes every node contain

all the information of the system, so the link's capacity restricts the further improvement of the blockchain and how to protect data privacy. At the same time, not affecting blockchain performance is the main problem to be solved. Privacy protection mainly adopts password technology, mixed currency technology, etc. This paper uses the aggregate signature method in encryption technology. The aggregate is superimposed into a single data through the input and output of multiple signature information. This algorithm has a high-security factor and can provide block transaction information without increasing the system burden. The specific process is as follows:

In the case of resource sharing transaction, input and output resources are represented by x and y respectively, and the relationship between them is shown in Equation (9):

$$\sum_{i=1}^x ix_i = \sum_{j=1}^y out_j \quad (9)$$

In the formula: x_i and out_j both indicate that resources need to be hidden; $i \in [0, x]$; $j \in [0, y]$.

If the resource sharing transaction generator is represented by z , the conversion equation of the resource sharing transaction mode of x_i and out_j is:

$$\begin{cases} I_i = x_i \times z \\ O_i = out_j \times z \end{cases} \quad (10)$$

According to Equation (10), if the results of x_i and out_j cannot be obtained through I_i and O_i during resource sharing, it means that the shared resource cannot be found, which can greatly ensure the security of the resource and realize safe sharing.

4) *Shared resource decryption*: After the shared resource encryption is completed in the above section, users need to decrypt before sharing resources [23]. If the random number received by the resource provider is X_i , its ID is I_x , and the ID

of the resource receiver is I_y , the expression of the harvest factor S_{x*y} of the decoding work can be obtained as follows:

$$S_{x*y} = (e^x, e^y) \quad (11)$$

In the formula: e^x and e^y both refer to the shared secret key, the former corresponds to the resource provider, and the latter corresponds to the resource receiver. To obtain the decryption parameter H_{x*y} , its calculation equation is:

$$H_{x*y} = \prod_{i=1}^n h^{Rx} + h^{Ry} \quad (12)$$

In the formula: h^{Rx} and h^{Ry} both represent encrypted resource parameters. The former corresponds to the resource center and is transmitted to the processor, while the latter corresponds to the processor and is transmitted to the resource receiver.

On the basis of the above steps, the resource receiver needs to decrypt the secret text resources [24]. The equation for decrypting the plaintext resources is:

$$\xi_{xu} = \frac{b_{2xj}}{W^{-\mu}} \quad (13)$$

In the formula: the resource receiver I_y decrypts and obtains the plaintext resource, which is expressed as ξ_{xu} ; b_{2xj} indicates the location of the private key; $W^{-\mu}$ represents the weight attribute.

D. Shared Resource Push

After the decryption of resources is completed in the above section, the service layer will share and push the decrypted resources. During the implementation of this push, users can easily obtain the rich required resource content. With this automatic push function, users can easily obtain a certain type of frequently updated resource information without having to search on the resource platform. The automatic push process of shared resources is shown in Fig. 4.

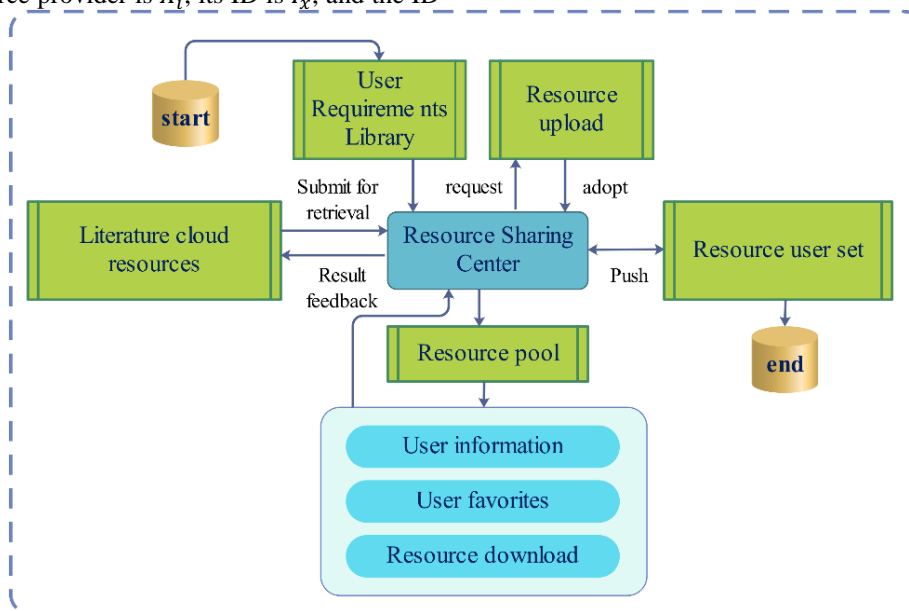


Fig. 4. Push process of resource sharing resources in the book and document center.

As shown in Fig. 4, the active resource push process shows that the cloud-sharing platform will push the decrypted shared resources and can build a user demand library; when the user is on the next visit, the document center can understand the user's preference for resources through the user demand database. According to this user demand database, the resource information matching the user demand database in the relevant resource pool is searched. Then the searched resource blockchain is encrypted and pushed to the user. After the user decrypts the information, the automatic push of the information is realized to complete the resource sharing.

III. TEST ANALYSIS

In order to verify the application effect of the method in this paper, it takes a university's book and document center as an example research object. It applies this method to the

document resource sharing and exchange platform management center. 2000 medical resources in the center are selected as the document resource data for testing. The resources are divided into three categories according to the publishing form: books, special documents, and continuous publications. The test document resources include 1000 traditional Chinese and 1000 western medicine document resources. The method in this paper is used to share the document resources and obtain the sharing results to analyze the application effect of the method in this paper.

During the test, users are all high school students and distributed in the same base station. The MEC computing capacity deployed in the base station is 20GHz/s, and the computing resources of other devices are randomly distributed in the range of [2,4] GHz/s. Other relevant parameters of network communication are shown in Table I.

TABLE I. DETAILS OF COMMUNICATION PARAMETERS

Parameter Name	Numerical Value
Cellular channel bandwidth /MHz	12
Uplink transmission power /mW	200
D2D bandwidth /MHz	12
D2D transmit power /mW	100
noise power /dBm	-100
Channel gain	0.00006
Number of cellular orthogonal channels	20
Number of D2D orthogonal channels	20

In order to verify the clustering effect of the method in this paper on different document resources, the paper uses the clustering purity ρ and the contour coefficient φ as the evaluation indicators, ρ is to measure the clustering quality of the method, and φ is to measure the advantages and disadvantages of clustering. The value range of the two indicators is between [0~1] and [- 1~1], respectively. The closer the value is to 1, the better the clustering quality and the better the clustering effect. The calculation equations are as follows:

$$\rho = \frac{1}{N} \sum_{k=1}^K n_k \quad (14)$$

$$\varphi = b \frac{d'}{\max\{d', b_{min}\}_{min}} \quad (15)$$

In the formula: N represents the total number of resource samples; n_k is the sample number of most classes in the k -th cluster; b_{min} represents the minimum vector, and represents the average distance between the point i and points in different classes; d' represents the average distance between resource i and other resources in its same category.

According to Eq. (14) and Eq. (15) above, it can calculate the results of the two indicators with the gradual increase of the number of resource samples when clustering the three reference resources using this paper's method, as shown in Table II.

TABLE II. TEST RESULTS OF THE CLUSTERING EFFECT OF DIFFERENT REFERENCE RESOURCES

Number of Clusters/Piece	Reference Category					
	Books		Special reference		Series publications	
	Cluster Purity	Profile Factor	Cluster Purity	Profile Factor	Cluster Purity	Profile Factor
100	0.954	0.943	0.922	0.952	0.955	0.952
200	0.963	0.951	0.941	0.949	0.947	0.936
300	0.948	0.946	0.928	0.962	0.944	0.939
400	0.939	0.955	0.931	0.954	0.952	0.944
500	0.954	0.933	0.956	0.986	0.971	0.967
600	0.966	0.926	0.947	0.971	0.968	0.935
700	0.978	0.947	0.962	0.983	0.949	0.974

800	0.972	0.952	0.958	0.966	0.933	0.987
900	0.959	0.946	0.934	0.924	0.945	0.958
1000	0.977	0.977	0.977	0.936	0.962	0.962
1100	0.954	0.979	0.961	0.958	0.957	0.984
1200	0.928	0.959	0.958	0.966	0.981	0.967
1300	0.936	0.928	0.969	0.927	0.975	0.986
1400	0.941	0.981	0.972	0.958	0.982	0.981
1500	0.952	0.982	0.958	0.986	0.985	0.964
1600	0.953	0.963	0.974	0.977	0.956	0.959
1700	0.964	0.957	0.947	0.985	0.986	0.937
1800	0.956	0.924	0.955	0.965	0.928	0.962
1900	0.944	0.932	0.928	0.972	0.974	0.955
2000	0.922	0.944	0.931	0.982	0.979	0.978

According to the test results in Table II, after clustering the three kinds of reference resources using the method in this paper, with the gradual increase of the number of samples, the results of the clustering purity ρ and the contour coefficient φ of the book resources are very close to 1, the maximum value of ρ is 0.978, and the maximum value of φ is 0.982; The maximum results of clustering purity ρ and profile coefficient φ of special reference are 0.977 and 0.986 respectively; The maximum results of cluster purity ρ and contour coefficient φ of the continuous publications are 0.986 and 0.987, respectively. Therefore, the method in this paper has a good clustering effect on document resources, can effectively complete the clustering of different categories of document resources, and provide a reliable basis for resource sharing.

In order to verify the security of resources in the method of this paper when sharing resources, resource sharing sensitivity ψ is used as the measurement uncertainty. ψ can measure the security degree of resources in the process of sharing, and its value range is between 0% and 100%. The larger the value is,

the higher the sensitivity of sharing is, and the worse the security of information sharing is. The calculation equation of this indicator is:

$$\psi = \frac{\sum_{i=1}^{B_n} \frac{|\alpha_i - \beta_i|}{\alpha_i}}{B_n} \quad (16)$$

In the formula: B_n represents the sensitive category threshold of resource sharing, α_i represents the frequency efficiency of document resource i sharing, β_i refers to the efficiency of frequency estimation of shared resources.

In order to intuitively reflect the security of resource sharing of the method in this paper, the three methods in reference [10], reference [11], and reference [12] are used as the comparison methods for the method in this paper. According to Eq. (16), the calculation results of ψ are shown in Table III, with the increasing proportion of total resources successfully shared when the above algorithms share different amounts of resources.

TABLE III. RESOURCE SHARING SECURITY TEST RESULTS OF FOUR METHODS

Method category		Successful share ratio /%		
		10	50	100
Reference [10]method	Number of shared resources 500/ strip	14.32	17.66	22.76
	Number of shared resources 1000/ strip	20.17	26.62	31.46
Reference [11]method	Number of shared resources 500/ strip	15.33	18.47	20.86
	Number of shared resources 1000/ strip	22.33	27.45	30.22
Reference [12]method	Number of shared resources 500/ strip	16.26	19.44	23.76
	Number of shared resources 1000/ strip	21.82	26.36	29.97
Method in this paper	Number of shared resources 500/ strip	4.36	5.96	7.44
	Number of shared resources 1000/ strip	5.82	7.68	10.11

According to the test results in Table III, with the gradual increase of the number of shared resources under different successful sharing ratios, the sensitivity results of the method in Reference [10], [11], [12] and the method in this paper for resource sharing also have different changes. Among them, the method in reference [10], the method in reference [11], and the method in reference [12] have different results when the

number of shared resources is 1000. The sharing success ratio reaches 100%, and the highest results of them of ψ are 31.46%, 30.22% and 29.97%, respectively, while the results of ψ in this paper's method are 10.11%. The reason is that in the process of sharing, the method in this paper introduces the regional document information resources co-construction and sharing mechanism based on blockchain, which can encrypt the shared

resources and combine the consensus algorithm to process the shared resources. The resource receiver can obtain the resources of the resource center after decryption, so the security of resource sharing can be greatly guaranteed.

In order to verify the applicability of document resource sharing in the system of this paper, after obtaining the application of the method in this paper, the management results of the university's document resource sharing and exchange platform management center for book and document resources are shown in Fig. 5.

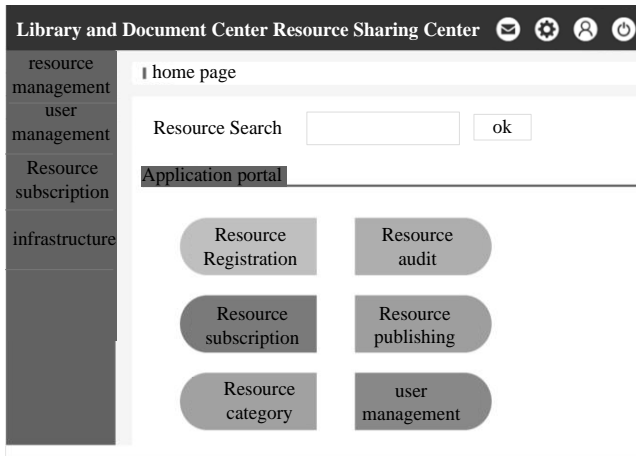


Fig. 5. Management results of book and document resources.

According to the test results in Fig. 5, after the application of the method in this paper, the university's document resource sharing and exchange platform management center can view the details of different types of resources through resource clustering. At the same time, it can view the release of users, the review of resources, the subscription of users, and master users' browsing and needs for document resources. Because this method has good applicability, it can complete the unified storage and management of different types of document resources after application and provide a resource guarantee for resource sharing.

In an ideal state, the maximum coverage of resource sharing in the library and literature center is 100%. Based on this data standard, if the actual coverage of the research method is closer to this value, it means that the wider the coverage of resource sharing is, the more it meets the resource sharing requirements of the library and literature center. According to the above discussion, calculate the coverage rate of the shared range, and the formula is:

$$\lambda_{\alpha\beta} = \frac{\sum_{i=1}^n N_i}{M_i} \times 100\% \quad (17)$$

In the formula: $\lambda_{\alpha\beta}$ represents the coverage rate of the shared range; N_i represents the amount of shared resources in a certain link; M_i represents the total resources of this link. Based on the above formula, the coverage results of resource sharing range of the four methods are calculated respectively, as shown in Table IV.

From the experimental results recorded in Table IV, it can be seen that method in this paper has a sharing coverage rate of over 98% each time, while the other three reference methods can only reach 85.47% at the highest, and the sharing coverage rate is small. Therefore, through the above experimental results, it can be proved that the research on the resource sharing method of book and document center proposed in this paper has a higher coverage of sharing scope in practical application, which can fully meet the sharing needs of book and document center resources.

TABLE IV. COMPARISON TABLE OF SHARING SCOPE COVERAGE OF FOUR METHODS

Sharing times	Method in this paper/%	Reference [10] method/%	Reference [11] method/%	Reference [12] method/%
The first time	98.25	54.21	55.26	56.25
The second time	98.36	53.36	64.52	62.15
Third time	98.52	61.36	71.41	64.58
The fourth time	98.95	68.20	84.25	71.25
The fifth time	99.61	73.35	85.47	75.69

IV. DISCUSSION

Under the background of the rapid development of multimedia, it is particularly important to study the resource sharing method of library and document center. This research is not only an innovation of the traditional management of books and documents, but also a deep exploration of the knowledge dissemination and sharing mechanism in the information age.

First of all, the application of multimedia technology has brought unprecedented development opportunities for the library and documentation center. Through digitalization, networking and other means, books and literature resources can be spread and utilized more conveniently and efficiently. However, how to effectively share the resources of the library and literature center under the multimedia background is an urgent problem to be solved. The importance of this research lies in that it can provide a set of scientific and reasonable resource sharing methods for the library and literature center, thus promoting the maximum utilization of library and literature resources and improving the efficiency of knowledge dissemination.

Secondly, the research on the resource sharing method of library and documentation center is helpful to promote the interdisciplinary and integration. Under the background of multimedia, books and literature resources are no longer limited to a certain discipline or field, but show an interdisciplinary and cross-disciplinary trend. Therefore, how to build a shared platform that can accommodate diversified resources and promote exchanges and integration between different disciplines has become an important research direction. This research can not only promote the intersection and integration of disciplines, but also provide fertile soil for the generation of new knowledge.

Finally, the research on the resource sharing method of library and document center is of great significance for acquiring new knowledge. Through the research and practice of sharing methods, we can dig deeper into the value of books and literature resources and discover the new knowledge contained in them. At the same time, the optimization and innovation of sharing methods can also provide strong support for knowledge innovation and promote the in-depth development of academic research.

To sum up, the research on the resource sharing method of library and literature center under the multimedia background has important theoretical value and practical significance. It not only helps to promote the maximum utilization of books and literature resources and the intersection and integration of disciplines, but also provides strong support for the generation of new knowledge. Therefore, we should strengthen the research investment in this field and constantly promote the innovation and development of resource sharing methods in book and document centers.

V. CONCLUSION

The application field of multimedia technology has gradually expanded, and people's demand for resources in the field of multimedia has also increased significantly. For the book and document center, it is of great significance to maximize the utilization of its resources and expand its capabilities. However, in the current book and document center, there are many types of resources and a large amount of information, which leads to low processing efficiency in the process of using or sharing resources, and there are certain security risks. Therefore, this paper starts from the human problem in the resource sharing of the book and document center and combines several major problems in the resource sharing under the current multimedia background, including the storage, security sharing, and overall management of resources, and puts forward the resource sharing method of the book and document center under the multimedia background. This method makes use of the advantages of multimedia technology to uniformly store the scattered resources in different data sources and realize the sharing of data resources in different servers, which can expand the sharing range of information resources and effectively meet the personalized needs of users for resources.

With the continuous development and popularization of multimedia technology, the research on resource sharing methods in book and document centers is facing broader prospects and higher requirements. In the future, the following aspects can be further studied:

1) The future research work will pay more attention to the intelligence and personalization of the resource sharing platform. By applying advanced technologies such as artificial intelligence and big data, the platform will be able to understand users' needs more accurately and provide more accurate resource recommendation and personalized services.

2) Future research work will be devoted to promoting cross-domain and cross-regional cooperation of resource sharing platforms. In the future, the sharing platform will pay more attention to cross-disciplinary resource integration and

sharing, and promote exchanges and integration between different disciplines.

3) Future research work will also be devoted to promoting the openness and sharing of the resource sharing platform. By opening API and providing data interface, the platform will be able to realize seamless docking and data sharing with other systems and platforms, and further promote the sharing and utilization of books and literature resources.

DATA AVAILABILITY

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

CONFLICTS OF INTEREST

The authors declared that they have no conflicts of interest regarding this work.

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