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Multi-objective planning and implementation path for the integration of sports resources in private universities in Wuhan

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Abstract From the perspective of the development trend of school sports in the new era, relying only on the school to increase the time of physical activity has obviously failed to meet the students' daily demand for physical activity, and how to effectively integrate the physical education resources inside and outside the classroom to jointly promote the healthy development of the students' body is particularly important. In this paper, for the problems existing in the integration of physical education teaching resources in private colleges and universities in Wuhan, we put forward a model of physical education teaching resources integration based on cloud computing, construct a multitasking self-coder, adopt fuzzy clustering algorithm to classify the teaching resources, and build a specialized coding unit for the teaching content and physical education teaching course resources. The experimental results show that the introduction of fuzzy clustering algorithm to classify resource categories can save 5-10s of time and can speed up the clustering speed of resource integration, and the designed information integration system of physical education learning resources has a very good ability to integrate the information of teaching resources, with a high recall rate of the resource information and a low redundancy of the information, which is of great significance to enhance the teaching effect of the physical education teaching courses.

Index Terms resource integration, physical education, cloud computing, fuzzy clustering algorithm

I. Introduction

Higher education is an important position for talent cultivation in China, an important engine for scientific research and innovation, and a bridge for cultural inheritance and communication. And physical education resources play an important role in higher education, not only as a guarantee for students' physical and mental health, but also as an important means of comprehensive quality training, which has a positive role in promoting the comprehensive development of students [1]-[3]. With the development of society and the progress of science and technology, the demand for physical education resources in colleges and universities is growing, while the physical education resources in colleges and universities in the regional distribution does show uneven distribution of resources, the use of inefficiency and so on, and these problems will directly affect the development and quality of physical education in colleges and universities [4]-[6]. Effective utilization and rational allocation of physical education resources will play a positive role in promoting the quality of physical education and the comprehensive quality of students [7]. Therefore, the study of regional integration and sharing of physical education resources in colleges and universities has become an urgent task.

Cloud computing is a kind of distributed computing technology, which breaks down the huge data computing processing program into countless small programs through the network, and then processes and analyzes these small programs to get the results and feedback to the users through the system composed of multiple servers [8]. As a cutting-edge technology, cloud computing platform can realize centralized management and flexible scheduling of educational resources, effectively break the resource barriers between institutions, and greatly expand the dissemination and coverage of educational resources [9]-[11]. And through the intelligent optimization of the cloud computing platform, the utilization efficiency of educational resources may be significantly improved, injecting a strong impetus for the two-way enhancement of educational equity and educational quality [12], [13]. Specifically, cloud computing can centralize the management and scheduling of various physical education resources, such as curriculum resources, teacher resources, venue resources, etc., in order to provide various services [14], [15]. The application of cloud computing in the integration and sharing of physical education resources in colleges and universities can promote the optimal allocation and efficient use of educational resources, enhance teaching effectiveness and management efficiency, and promote the balanced development of physical education [16]-[18].

The study proposes a cloud-based physical education teaching resource integration model to realize the integration of teaching resources. In the stage of constructing a multi-task self-coder, neural network assistance is introduced so that the self-coder can keenly capture the patterns between physical education teaching curriculum resources. The resource integration model introduces cloud computing technology, and by designing the integration model framework, the digital resource service system can adapt to the mode of physical education teaching and meet the learning needs of students; then the fuzzy clustering algorithm is used to accurately classify the educational resources, and finally the decision tree is introduced for resource integration. With the exploration of sports teaching resources, the sports teaching resources integration model proposed in this paper will play an increasingly important role in the construction of sports teaching resources in Wuhan private colleges and universities.

II. Cloud Computing Based Resource Integration System for Kinesiology in Private Colleges and Universities

II. A.ECS-based 3S-Cloud system design

II. A. 1) System architecture

3S-Cloud system strictly follows the design method of layer structure and adopts a three-layer B/S (browser/server) architecture and design pattern, which is divided into a representation layer, a business logic layer, and a data storage/access layer, and each layer is developed and maintained as an independent module so that each module can be updated or replaced independently.

1) Representation Layer

The interactive pages in the representation layer of this system mainly include the system home page, registration and login page, resource upload/download page, personal resource space management page and resource retrieval page. A friendly system interaction interface will bring users a good user experience, which is the key to make an application system successful.

2) Business Logic Layer

The business logic layer receives user requests to generate query statements or update the cloud database, and displays the results of these operations in the representation layer to provide feedback to the user. This system establishes business logic classes for the corresponding operations of each functional module and provides interfaces to access these business logics in order to realize the corresponding functions.

3) Data storage/access layer

As a platform for integrating teaching resources, this system will store a large amount of unstructured resource data. The realization of many functions in the system will involve data storage and access operations. In AliCloud Open Storage Service (OSS), such data operations are encapsulated into REST API interfaces for developers to call in classes that implement different functions. In addition, OSS verifies the sender identity of a particular request by using Access Key ID/Access Key Secret symmetric encryption to realize user signature verification for access control.

II. A. 2) Analysis of typical system operations

1) File Operation and Search

Ordinary users of the 3S-Cloud system can initiate the operation of uploading resource files to the resource space by submitting upload requests for relevant teaching resources to the system. After these submitted requests are received by the system, the user will be prompted to match the descriptions and tags of the resource files. The administrator user of the system is responsible for reviewing the materials uploaded by ordinary users. After changing the resource status of the resources that have passed the audit, the resources will be released to different resource pools according to the permission control requirements of ordinary users, and the results of the operation will be fed back to the corresponding users; the resources that have not passed the audit will not be released, and at the same time, the corresponding information will be fed back to the users.

2) Community Resource Sharing

All the files uploaded to personal resource space by users in 3S-Cloud system will be distributed to different resource pools according to the user's permission settings. Among them, the resource files in the local shared group and the public shareable group will be categorized according to the corresponding labels of the resources based on subject areas or interest directions for other users in the community to search and download.

II. B.Integration methodology design

II. B. 1) Design of a model framework for integrating educational resources

The main behavioral participants in the online learning model are students and teachers, mainly around the diversified integration of teaching resources, so the relative openness of resources is a key aspect of integration.

The educated students can most directly reflect whether the online learning activities are effective or not, the teachers are mainly responsible for formulating teaching objectives and plans, and carrying out a series of implementation and supervision of teaching activities; while the technical support staff is mainly the organizer and builder of the online teaching resource base to ensure a good interaction between students and teachers.

In this paper, we design a digital education resource integration method for physical education in private universities in Wuhan, mainly based on the background of "Internet+", taking the online learning model as the basis, classifying the digital resources of physical education, broadening the scope of development and integration of curriculum resources, designing a resource integration model, emphasizing the resources of students' learning needs, building an environment based on the teaching and learning needs of the target courses, and building an online teaching resource base based on the teaching and learning objectives and plans of the target courses in Wuhan. The model of resource integration is designed to emphasize the resource construction of students' learning needs, complete the content search of teaching resources on the teaching platform according to the target courses, and provide feedback on the needs of multimedia production of teaching resources, so that the integrated teaching resources can effectively meet the learning needs of preschool children. In addition, the model can also take into account the diversified integration and optimization process of learning resources, making the curriculum resources of the whole teaching resource platform more scientific and reasonable.

II. B. 2) Multi-tasking self-encoder design

Considering the limitations of traditional fixed codebook coding in processing data, in order to realize the effective integration and processing of computer network course resources, this paper firstly constructs a multitasking self-coder to adapt to the compositional characteristics of complex computer network course resources. In the specific design process, the self-coder assisted by neural network [19] is introduced to keenly capture the laws among computer network course resources and quickly determine the optimal coding mapping by means of efficient learning, so as to reduce the training parameters and the complexity of coding computer network course resources.

In the constructed CNN-SCMA coding scheme, the data stream between the target teaching content and the computer network course resources is finely processed by CNN units to uncover the mapping relationship from the input data to the star points of the spectrum resources. The specific realization can be expressed as follows:

$$y=\sum diag\left(h_c\right)x_c+\sum diag\left(h_k\right)x_k+n \tag{1}$$

where y denotes the data flow mapping relation function between the target teaching content and the computer network course resources, diag denotes the mixing factor function of the computer network course resources, h_c denotes the information codeword of the spectrum side of the computer network course resources in the input CNN layer, x_c denotes the original computer network course resources in the input CNN layer, h_k denotes the result after mapping the information code words of the spectral side of the computer network course resources in the SCMA layer, x_k denotes the result of the output of the modulated information generating function, and n denotes the dimensionality parameter of the self-encoder.

Combining the information shown in Eq. (1), it can be seen that this paper innovatively integrates CNNs in the encoder structure and designs specialized encoding units for the target teaching content and the computer network course resources respectively. In the specific operation stage, each computer network course resource is first converted into a single hot vector recognizable by the neural network, and then deeply processed by the respective corresponding CNN coding unit. In the internal structure of the coding unit, the input single-hot vectors are processed by using multi-layer hidden layers, and the final output of the learned code word information can be expressed as follows

$$f_{dk}(x)=\left(R_d,\theta_{cd}\right)\rightarrow y \tag{2}$$

where $f_{dk}(x)$ denotes the codeword information obtained by the multilayer hidden layer after processing the input single-hot vectors, R_d denotes the modulation function of the coding unit corresponding to the target teaching content, and θ_{cd} denotes the modulation function of the coding unit corresponding to the computer network course resources. In this way, the binary data of each computer network course resource can be efficiently transformed into code word information on the spectrum resource.

In the manner shown above, a multi-task self-coder design adapted to the characteristics of computer network course resources can be realized, providing a basis for subsequent resource integration.

II. B. 3) Introduction of fuzzy clustering algorithm to classify resources

In the process of fuzzy clustering [20], the first step is to construct the data matrix, assuming that the number of digital educational resources that need to be integrated is x, using the set $Q=\{Q_1,Q_2,\cdots,Q_x\}$. For the set Q, each resource Q_i in the set has certain properties of its own, which are represented using the set of vectors $Q_i=\{Q_{i1},Q_{i2},\cdots,Q_{ij}\}$. Introducing the similarity variable r, a fuzzy similarity matrix can be established as a result of the calculation of similarity between any two educational resources Q_i and Q_i. The similarity is calculated by Euclidean distance method with the formula:

$$d(Q_i,Q_j)=\sqrt{\sum_{k=1}^{m}(Q_{ik}-Q_{jk})} \tag{3}$$

According to equation (3) can get the fuzzy similarity matrix, the matrix of itself for multiplication calculation, until the conditions are satisfied, can get the fuzzy equivalence matrix. In the process of clustering processing, fuzzy cluster analysis method is to establish an objective function, then the objective function in the fuzzy mean clustering algorithm established in this paper is shown in equation (4):

$$T(U,c_1,\cdots,c_s)=\sum_{i=1}^{c}T_i \tag{4}$$

Equation (4) can be transformed into:

$$T(U,c_1,\cdots,c_s)=\sum_{i=1}^{c}\sum_{j}^{n}u_{ij}^{m}d_{ij}^{2} \tag{5}$$

In Eq. (5), u_{ij} denotes the degree of affiliation of the element Q_j belonging to i, and n denotes the weighting index, which is also the smoothing index of the curve model, and it can reflect the relationship between the resources and clustering centers, and the constraints are expressed as:

$$\sum_{i=1}^{c}u_{ij}=1,\forall j=1,\cdots,n \tag{6}$$

In the constraints, the sum of the distances between each digital resource and each clustering center is 1. At this time, the clustering centers are in an independent state and are less sensitive to noisy data.

In the fuzzy cluster analysis model based on the objective function established above, it is also necessary to solve the model in order to achieve the final resource classification. In the set $Q=\{Q_1,Q_2,\cdots,Q_x\}$, in the fuzzy clustering algorithm, the number of clusters in the classification and the maximum number of iterations as well as the permissible error are inputted, and the degree of affiliation and the clustering center are computed during the first iteration after determining the initial clustering center and the After the error, the size between the error and the degree of affiliation is determined. If the error is less than the degree of affiliation, then the matrix and the clustering center can be obtained; if the error is greater than the degree of affiliation, then the degree of affiliation, the clustering center and the error are recalculated.

The fuzzy clustering algorithm chosen in this paper is able to take into account the clustering between the digital resources and each clustering center, and it is also able to take into account the relationship between the same type of clustering centers and digital educational resources.

II. B. 4) Introduction of decision trees to complete resource integration

Without considering the noise, the real resource data that has been classified may have some field mutilations or errors; in the state of high noise, it will interfere with the analyzing effect of the fuzzy clustering method, so that it is necessary to use the decision tree and prune it, which can improve the function of the fuzzy clustering and make it easier to use.

Firstly, according to the requirements of resource integration, a decision tree is constructed [21], and then measurement is carried out in a classification node to complete the functional evaluation of the node. In the process of measurement and evaluation, the obtained test results with strong functions are taken as the optimal node for resource integration, through which the node is classified and similar resources are integrated. In this process, the information gain rate needs to be calculated. In this paper, the information gain rate function is used in the evaluation process, which has the following form:

$$\begin{cases} gainratio = \dfrac{gain(A)}{spliti(A)} \\ spliti(A) = \sum_{1}^{v} \dfrac{p_i}{m} \log\left(\dfrac{p_i}{m}\right) \end{cases} \tag{7}$$

In Eq. (7), $gain(A)$ denotes the information gain, utilizing A as the attribute of the decision tree, v denotes the number of discrete values of A, and p_i denotes the number of positive examples. For the digital educational resources of preschool education, all of them have their fixed IP locations. Considering the factors such as running cost and using download speed, it is necessary to select the resource platforms in the same LAN or within a certain range as the integration environment.

II. C. Cloud Computing Based Resource Integration Realization for Kinesiology Classes

II. C. 1) Modeling

The model structure of the resource integration model implemented in this paper is shown in Figure 1.

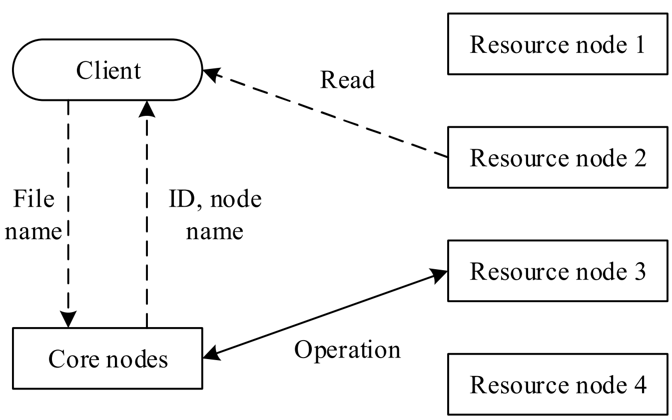

Figure 1: Model diagram

Through the above figure we can clearly see the whole process of teaching data under the integration of cloud computing: the client sends a request to the core node through the file name, the core node will then look for resources in the resource node by the file name, and the client will read it directly after finding the resources.

This model can be divided into 6 layers, namely data layer, cloud client, management layer, application layer, performance layer and hardware layer.

II. C. 2) Improvement of model speed

In order to ensure the running speed of the model, this paper incorporates a multi-objective service scheduling method, which selects the appropriate nodes according to the priority to meet the running speed optimization. Mainly consider the following parameters:

1) Completion time: i.e. the total time required for cloud computing. In this paper, the estimation is based on data such as the number of requests, previous running time and estimated running time. Then the request S_i estimated completion time T_c is:

$$T_c = Q_s = T_c + \sum_{k=1}^{QL_d} T_{kc} \tag{8}$$

$$T_c = \frac{T_{ini} + \sum_{n=1}^{Nam} T_n}{Num + 1}, Num \neq 0 \tag{9}$$

where QL_d denotes the long needed on node d and T_c denotes the expected computation time of S_i. The expected computation length of S_i is T_{inii}, which is the average value of the computation time prior to this request. Num represents the number of requests, and T_n denotes the computation duration of the S_ith n time. The more times S_i is completed the closer the value of T_c is to the true completion time of the service. The smaller the value of T_c the faster the service can be completed, we find the node with the smallest T_c and run it in that node can ensure the real-time service.

2) Load balancing: If the load of a node within the cloud exceeds the maximum load limit it can bear, it will reduce the overall performance of the platform, therefore, it is necessary to schedule the service to run on the node that does not have a heavy load as much as possible, so that the load is balanced. In the experiment, a denial-of-service threshold is set for each node, and service is denied when the load on the node device exceeds the threshold. The formula for calculating the critical value is as follows:

$$TLV = \left\{TLV_{cpu}, TLV_{mem}, TLV_{stor}, TLV_{net}\right\} \tag{10}$$

II. C. 3) Model realization

The cloud computing model implemented in this paper is built with seven servers, one of which is configured as NameNode and the other six are configured as DataNode.The hardware configuration of the servers is dual core processor with 4 G of RAM, hard disk size of 500 MB, 500 MB NIC, and the servers are connected to each other using a universal switch.

Using the Hadoop structure to develop the resource integration model allows for better cataloging of the integrated resources and easier organization of the resources. By accessing the main interface through the client, users can look for the vast amount of resources stored in the system. The Portlet sends the user's resource access request to the NameNode, which returns all the DataNodes where the resource's data block resides. The portlet selects nodes from the cloud server and reads them, selects different nodes according to the user's request, and then organizes and summarizes the read data and returns it to the user.

III. System simulation results and performance analysis

III. A. Description of the experiment

In order to verify the effectiveness of the method of this paper, the resource division method introducing fuzzy clustering is taken as experimental group 1, the physical education teaching resource integration method based on genetic algorithm (GA) is taken as control group 2, and the physical education teaching resource integration method based on back-propagation (BP) neural algorithm is taken as control group 3, and experimental comparative analysis is carried out. The input data of the samples are shown in Table 1.

In order to ensure the experimental effect, the 1st group program is the change of the index D1 value, other data remain unchanged, and so on. Each group program includes 6 groups of samples, the D1 value of sample 1 changes from 0 to 5 according to the interval of 0.5, and so on for the rest of the samples. Sample 1 was used as the simulation training group, and 5 groups of samples from sample 2 and sample 6 were used as the experimental group.

Table 1: Sample input data

Index	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6
D_1	0.54	1.04	1.54	2.04	2.54	3.04
D_2	2.65	2.65	2.65	2.65	2.65	2.65
D_3	2.65	2.65	2.65	2.65	2.65	2.65
D_4	3.52	3.52	3.52	3.52	3.52	3.52
D_5	2.65	2.65	2.65	2.65	2.65	2.65
D_6	1.78	1.78	1.78	1.78	1.78	1.78
D_7	2.65	2.65	2.65	2.65	2.65	2.65
D_8	1.78	1.78	1.78	1.78	1.78	1.78
D_9	2.65	2.65	2.65	2.65	2.65	2.65
D_{10}	2.65	2.65	2.65	2.65	2.65	2.65
D_{11}	0.54	1.04	1.54	2.04	2.54	3.04

III. B. Simulation results

The number of clustered samples for the 3 methods at different times is shown in Figure 2. From the figure, it can be seen that it takes 57s for control group 2 to complete the clustering of 5 samples, 64s for control group 3 to complete the clustering of 5 samples, and 46s for experimental group 1 to complete the clustering of the samples.The experimental results show that the experimental group has a faster convergence speed of the clustering compared with the control group.

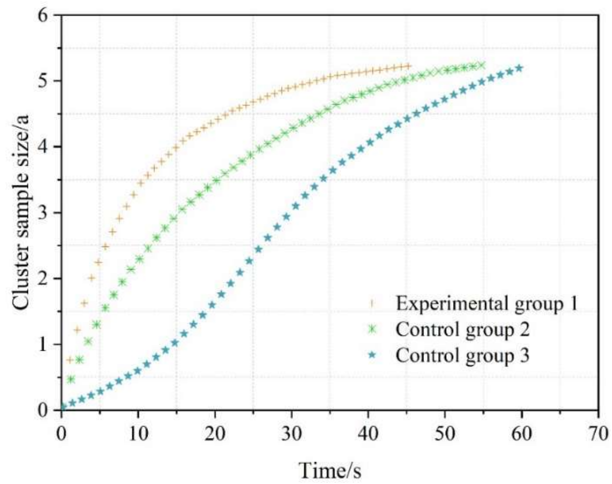

Figure 2: The three methods of clustering at different times

III. C. System Performance Analysis

III. C. 1) Performance analysis

In order to test the performance of this paper's method in realizing the application of sports teaching resources integration, simulation experiments are carried out, the experiments are designed using MATLAB, combined with the embedded bus scheduling method for sports teaching resources bus transmission control, the number of global iterations of resource integration is 1200, the sampling amplitude of sports teaching resources is taken as $A_1 = A_2 = A_3$ =1, the sampling frequency of physical education teaching resources is 1004Hz, the number of resources is 5000, the training sample set is 100, the spatial sampling rate for physical education learning resources is 24kHz, and the scheduling of physical education teaching resources is carried out according to the simulation environment and parameter settings mentioned above, and the distribution of the original resource sampling data is obtained, which is shown in Figure 3.

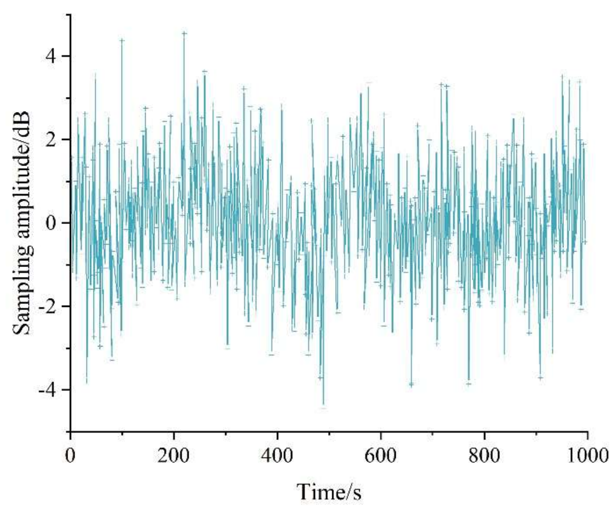

Figure 3: Raw resource information sampling data distribution

Take the resource information in Figure 3 as a test sample, carry out resource integration processing, and get the integration results as shown in Figure 4. Analyze Fig. 4 to learn that the balance of sports learning resources integration using the method of this paper is better, test the recall of resource integration, get the comparison results shown in Fig. 5, analyze Fig. 5 to learn that the method of this paper for sports learning resources integration, the recall of information management is higher, and the performance of resource integration is better.

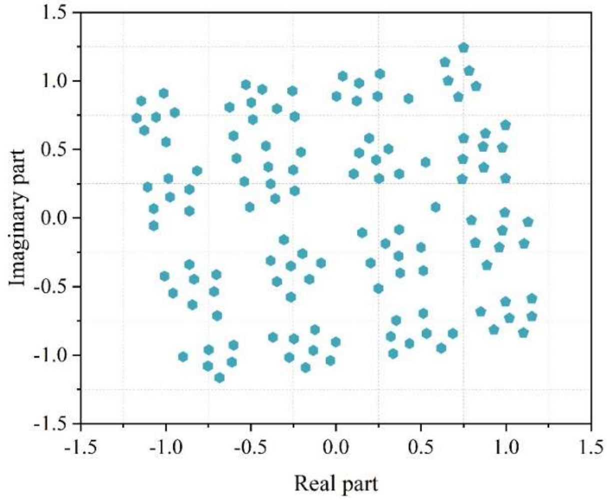

Figure 4: Resource integration output

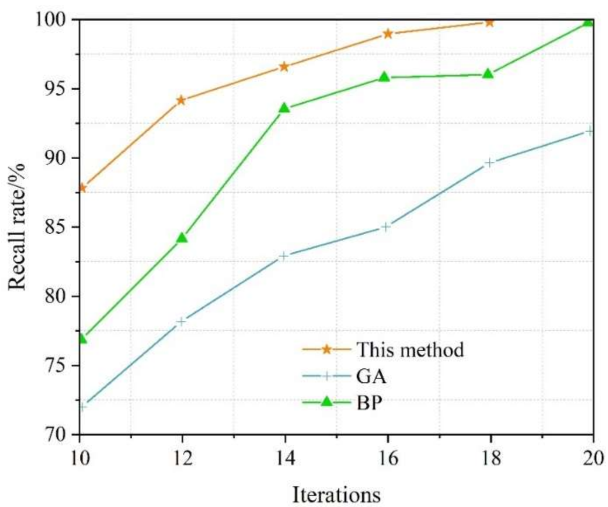

Figure 5: The recall comparison of resource integration management

III. C. 2) Test results

In order to demonstrate the feasibility of designing the resource integration system in this paper, the web technology-based resource integration system (System 1) and the SOA-based resource integration system (System 2) are used as the comparison group of the systems in the paper. The integration performance of the systems is tested by inputting the original values in the systems. The comparison results of applying different systems to integrate resources are shown in Fig. 6. As can be seen from the figure, the fuzzy clustering-based teaching resource integration system designed in this paper integrates different sizes of physical education teaching documents, and the redundancy ratios of the integrated information obtained are all much lower than those of the other two systems, which indicates that the system designed in this paper can effectively improve the efficiency of resource utilization and the integration effect is better. The reason for the difference is that each physical node in the heterogeneous server has a specific resource capacity, while System 1 and System 2 mainly use the resource prediction model to predict the data volume of the existing resources, which is unable to eliminate the non-value duplicate information, so the information redundancy of the integrated information is higher. It can be shown that the physical education resource integration system designed in this paper has good integration performance and can meet the needs of students.

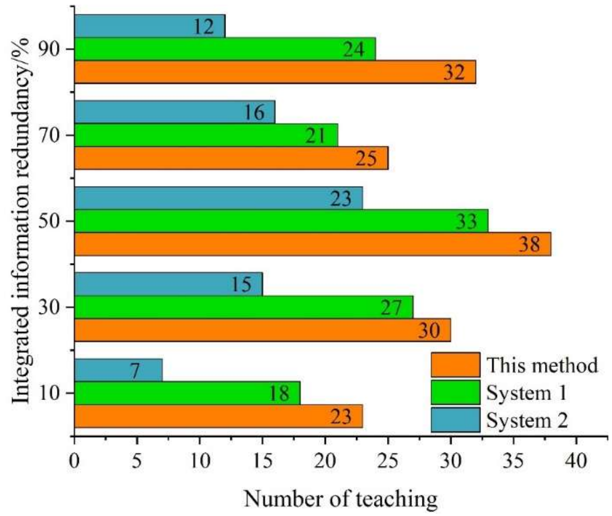

Figure 6: Different systems integrate information redundancy ratio results

IV. Conclusion

In this paper, we design and implement 3S-Cloud system, a platform for integrating physical education teaching resources based on cloud computing, to enhance the integration and utilization of digital education resources in physical education teaching resources integration, and to improve students' learning interest in physical education teaching. The experimental results show that the introduction of fuzzy clustering algorithm has better convergence speed, the designed physical education learning resources integration system has good information integration ability of teaching resources, the recall rate of information management is high, the designed resources integration system achieves lower information redundancy and better integration effect in the practice test, which is a certain promotion for the promotion of the informatization process of physical education teaching in Wuhan's private colleges and universities.

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References

[1] Huang, W., & Zhan, C. (2021). Research on the Role of Physical Education in the Comprehensive Development of College Students in the New Era and Practical Ways. Curriculum and Teaching, 4, 24-31.
[2] Huang, D. (2024). Research on the Relationship Between School Physical Education and Students' Comprehensive Development. International Journal of Educational Teaching and Research, 1(2).
[3] Lan, S. (2023). The reform of physical education in colleges and universities under the background of physical education integration. International Journal of New Developments in Education, 5(26), 11.
[4] Tolgfors, B. (2020). Promoting integration through physical education (?). Sport, Education and Society, 25(9), 1029-1042.
[5] Hu, S., Zhao, R., Cui, Y., Zhang, D., & Ge, Y. (2023). Identifying the uneven distribution of health and education services in China using open geospatial data. Geography and Sustainability, 4(2), 91-99.
[6] Liu, H., Liu, Y., & Feng, J. (2020). The realistic dilemma and breakthrough ways of improving the quality of online teaching resources of physical education in colleges and universities. Advances in Physical Education, 11(01), 1.
[7] Turner, L., Johnson, T. G., Calvert, H. G., & Chaloupka, F. J. (2017). Stretched too thin? The relationship between insufficient resource allocation and physical education instructional time and assessment practices. Teaching and Teacher Education, 68, 210-219.
[8] Wu, W., & Plakhtii, A. (2021). E-learning based on cloud computing. International Journal of Emerging Technologies in Learning (IJET), 16(10), 4-17.
[9] Peng, G., Wu, M., Lin, C., Shi, X., He, N., & Sun, W. (2022, July). Regional Sharing Model of Information Education Resources in Rural Schools Based on Cloud Computing. In International Conference on Frontier Computing (pp. 990-1000). Singapore: Springer Nature Singapore.
[10] Shen, Y., Yu, G., Liu, X., Zhang, W., Zhang, W., & Zhao, C. (2024). Resource Sharing and Allocation Excitation Mechanism of Teaching Cloud Platform Research. IEEE Access.
[11] Koch, F., Assunção, M. D., Cardonha, C., & Netto, M. A. (2016). Optimising resource costs of cloud computing for education. Future Generation Computer Systems, 55, 473-479.
[12] Qi, H. (2024). An online and offline hybrid teaching resource sharing method based on cloud computing. International Journal of Reasoning-based Intelligent Systems, 16(3), 195-205.
[13] Zheng, W., Muthu, B., & Kadry, S. N. (2021). Research on the design of analytical communication and information model for teaching resources with cloud‐sharing platform. Computer Applications in Engineering Education, 29(2), 359-369.

[14] Li, H., & Xie, C. (2024, August). Research on the Application of Cloud Computing Technology in College Physical Education Classroom Resource Management Platform. In 2024 International Conference on Computers, Information Processing and Advanced Education (CIPAE) (pp. 858-862). IEEE.

[15] He, Y. (2022). Design of online and offline integration teaching system for body sense dance based on cloud computing. Journal of Interconnection Networks, 22(Supp05), 2147001.

[16] Wang, H., & Huang, R. (2021). Application of cloud computing in the optimization of college calisthenics teaching mode. Scientific Programming, 2021(1), 9265238.

[17] Mu, D. (2025). Online Physical Education Teaching Resources Integration Method Based on Multi-Objective Optimization Algorithm. International Journal of High Speed Electronics and Systems, 2540278.

[18] Wang, C., & Wang, D. (2023). Managing the integration of teaching resources for college physical education using intelligent edge-cloud computing. Journal of Cloud Computing, 12(1), 82.

[19] Yu Li,Patrick Matgen & Marco Chini. (2025). Extraction of built-up areas using Sentinel-1 and Sentinel-2 data with automated training data sampling and label noise robust cross-fusion neural networks. International Journal of Applied Earth Observation and Geoinformation,139,104524-104524.

[20] K. Kalmutskiy & V. Berikov. (2025). Enhancing Stability of the Weakly Supervised Regression Algorithm Using Manifold Regularization and Fuzzy Clustering. Pattern Recognition and Image Analysis,35(1),16-18.

[21] Feng Xu,Yuting Huang,Hui Wang & Zizhu Fan. (2025). A novel heterogeneous data classification approach combining gradient boosting decision trees and hybrid structure model. Pattern Recognition,165,111614-111614.