Remittances Review
May, 2023
Volume: 8, No: 2, pp. 446-463
ISSN: 2059-6588 (Print) | ISSN 2059-6596 (Online)

Received: 11 November 2022 Accepted: 02 February, 2023
DOI: https://doi.org/10.33182/rr.v8i2.28

Exploring the International Chinese Language Education Exchange and Cooperation Model Combining Information Fusion Technology

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Abstract

Using information fusion technology to explore the exchange and cooperation model of international Chinese language education is to promote the globalization of Chinese language education. In this paper, firstly, the similarity measure of collaborative filtering algorithm is used for user information collection and identification, and then the similarity measure is improved with weighted coefficients and weighted similarity, and penalty factors are introduced to optimize the collaborative filtering algorithm, based on which an international Chinese language wisdom education platform is constructed. A multi-dimensional evaluation analysis is conducted for the constructed wisdom education platform, and the mean absolute error and root mean square error are used as evaluation indexes to verify the rationality and practicality of the international Chinese wisdom education platform. In terms of information collection and storage capacity, the operation rate of the smart education platform in this paper is 5124 rows/s for random writes and 3583 rows/s for sequential writes, and the respective CPU occupancy rates are 16.36% and 14.96%. In terms of transfer rate, the platform in this paper is 1.95 times and 0.75 times higher than that of OTraining system and MOOC platform. From the practicality data, the average absolute error and root mean square error of this paper are 0.36% and 0.256%, respectively. It can be seen that the international Chinese wisdom education platform built based on information fusion technology in this paper can effectively improve the communication between users and promote the globalization of international Chinese education.

Keywords: *Information fusion technology, Collaborative filtering algorithm, Similarity measure, Penalty factor, Chinese educational communication.*

Introduction

In early 2020, the sudden outbreak and global sweep of the novel coronavirus infection pneumonia epidemic affected all walks of life. For international Chinese language education, this epidemic is undoubtedly a major challenge [1, 2]. Therefore, many universities began to carry out online teaching activities through Internet platforms, and online video courses were even used as a kind of teaching materials for online teaching, and online teaching gradually became the main way of international Chinese language education in the post-epidemic period [3, 4].

Although information technology is developing more rapidly, there are still more problems in supporting real-time online teaching interaction in international Chinese language education [5]. The online platform is influenced by the network and cannot meet the real needs of students or

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achieve the purpose of real-time communication and cooperation [6]. Based on this, it is important to focus on developing a smart education platform through which to recommend international Chinese education-related video resources for users and to achieve real-time updating of video data [7]. Through this platform, a real-time communication channel will be built for each user to ensure better communication and sharing among users, thus promoting international Chinese language education to move forward even in the post-epidemic era [8, 9].

International Chinese language education carries the burden of globalization of Chinese language education. Based on the accumulation of previous practices, literature [10] relies on the brand advantages of Confucius Institute and Zhejiang Zhiyun online support teaching platform to form an innovative model of remote online Chinese language teaching, which breaks the limitation of time and space and realizes the real implementation of "Internet+ education". Literature [11] believes that online learning represented by Internet+ education is a new way of learning, and focuses on Chinese education, fully researches the characteristics of Chinese education teaching, and builds a Chinese education teaching platform based on the deep learning model. The literature [12] argues for the transformative power of cross-language based pedagogy by implementing cross-language based tasks, integrating cross-language into instructional design, considering Chinese learners as creative subjects, and coordinating a large number of symbolic resources in the meaning making process, and emphasizes the communicative role of symbolic resources in international Chinese education, and discusses the pedagogical design of cross-language based tasks in teaching Chinese and other Asian languages Implications.

In addition, the literature [13] proposed a new and comprehensive approach to the compilation of a dictionary for Chinese language learners, an innovative bilingual hybrid training model for Chinese international education teachers, and a solid theoretical framework for a Master of Arts in Chinese international education program. The literature [14] explored the relationship and predictive effects between Chinese language learning motivation, Chinese language use and Chinese language proficiency on 218 international students' cross-cultural sensitivity to Chinese culture through a series of questionnaires, and concluded that students with high Chinese language learning motivation and Chinese language proficiency were at a high level of Chinese cross-cultural sensitivity. The literature [15] shares the results of a qualitative survey of Chinese language education in the United States and argues that Chinese language education teachers' flexible use of Chinese language resources provides a basis for productive classroom practice for traditional students who struggle to use Mandarin as an imposed identity and actively participate in disrupting and dismantling traditional notions of "Chinese".

This paper firstly proposes a smart education platform and explains that the platform is divided into four modules to carry out, namely, user management, domain knowledge model, video resource module, and recommendation module. The content corresponding to each module and mainly the recommendation module is explained as the key module for international Chinese education exchange and cooperation. Next, the information fusion technology is introduced, and the information collection structure of the information fusion technology is explained, which mainly contains the modules of batch flow integrated data processing, data cleaning, data sharing and distribution. The recommendation module in the smart education platform is described, and the similarity measure of the collaborative filtering algorithm is used to recommend international Chinese education video resources to users, and the similarity measure is performed with user browsing data. The similarity measure is improved by using weighted coefficients and weighted similarity, and a penalty factor is introduced into the collaborative filtering recommendation algorithm to optimize the algorithm. Finally, a multi-dimensional evaluation analysis is conducted for the wisdom education platform proposed in this paper, i.e., platform information collection and storage capacity, transmission rate and transmission time, and platform performance evaluation, in order to verify the role of the wisdom education platform in promoting international Chinese language education exchange and cooperation.

Construction and analysis of a smart education platform based on information fusion

Basic modules of smart education platform

Wisdom Education Platform is an online international Chinese education platform with international Chinese education video courses as the main information carrier, supplemented by course evaluation tests. This paper builds a recommended wisdom education platform for international Chinese education video resources based on information fusion technology. The purpose of building the international Chinese education wisdom education platform is to solve the needs of users, innovate the international Chinese education exchange and cooperation mode, and meet the exchange of learning by means of recommendation system. Among them, the main requirements of the recommendation system are as follows:

First, it can recommend videos related to international Chinese education that are of interest to users, and video resources within the user's learning goals for users to learn.

Secondly, the recommended list of video resources of International Chinese Education can be updated by users' own behavior analysis in time.

Third, effective recommendations for content that users have not browsed, to expand their learning scope and enhance their learning ability on international Chinese education.

Figure 1 shows the main workflow of smart education platform for personalized recommendation of international Chinese education videos, which is divided into four modules to carry out, namely, user management module, domain knowledge module, video resource module, and recommendation module.

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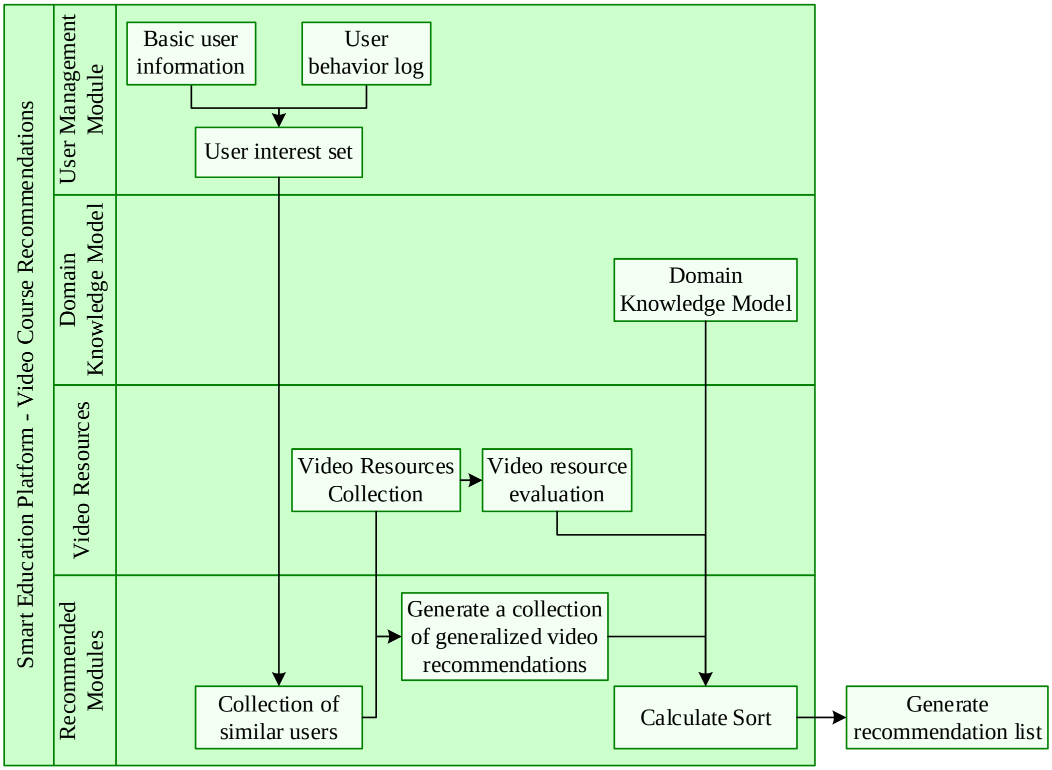

Figure 1. Video recommendation system flow chart

The user management module firstly recommends the content mainly through the student's academic information. After that, based on the learning situation, the user's interest model is finally derived by combining the recommendation system and the user's behavioral characteristics data for analysis, and then the relevant international Chinese education videos are recommended to them.

The domain knowledge model is mainly a relationship building for the content of the course system, including the basic knowledge of international Chinese education, theoretical methods, as well as learning skills, the benefits that learning international Chinese education will bring, the ways of international Chinese education exchange and cooperation, etc.

The video resource module mainly forms the evaluation system of video resources through users' explicit and implicit feedback behaviors, updates the video resources in real time according to users' learning for international Chinese education videos, and ensures that the purpose of innovative exchange and cooperation is achieved through the smart education platform.

The recommendation module is the core of the whole intelligent education platform system, which adopts information fusion technology for relevant data processing, serves as a kind of bridge to connect users with international Chinese education video resources, strengthens the communication and cooperation between international Chinese education users, and filters and sorts the communication and cooperation situation of each user to form the final result.

The international Chinese wisdom education platform built based on information fusion technology can effectively handle a large amount of user communication information and effectively provide users with relevant video resources for Chinese education through a recommendation system. The wisdom education platform can integrate video education resources from all over the world to provide effective help for online communication among users in the wisdom education platform. Moreover, the high quality video education resources and domain knowledge provided by the wisdom education platform can provide a more convenient learning method for users who learn international Chinese language. Users can make flexible choices according to their needs and promote international Chinese language education in a hundred different ways with different communication and cooperation.

Information Convergence Technology

The information collection of international Chinese education is to share and exchange the video resources in the wisdom education platform and realize the innovative communication mode among users. Using the data interface to record and collect the information of users learning international Chinese videos, the main steps include batch flow integrated data processing, interface management, data cleaning and data sharing and distribution, and its basic structure of information collection is shown in Figure 2.

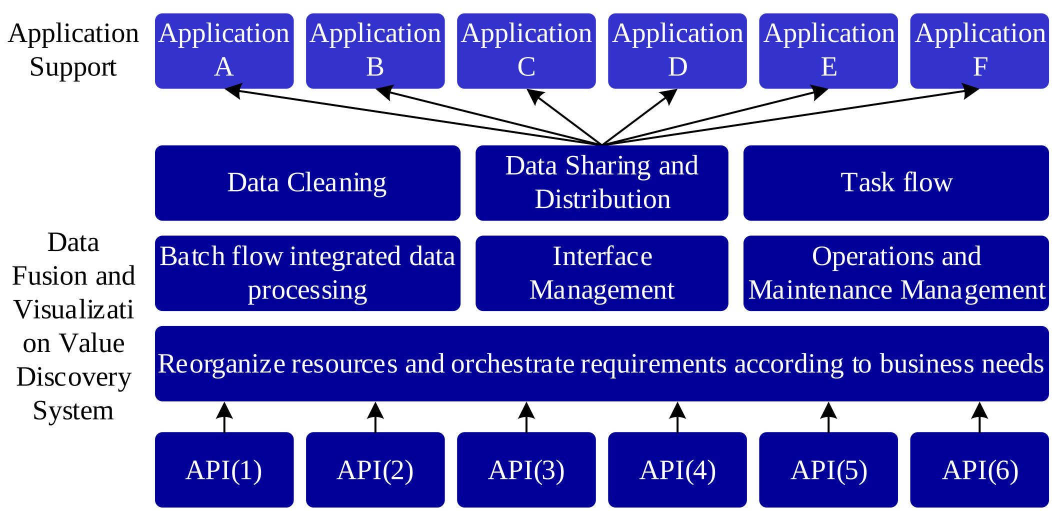

Figure 2. Information gathering with information fusion technology

The specific process of user information collection using information fusion technology is that the

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user generates a relevant browsing record during the browsing process of the wisdom education platform, and the wisdom education platform receives this browsing record. The corresponding event processor will adopt some algorithm to collect data on the user's sexual behavior, and all the collected data will be processed through the batch flow integrated data processing process, and then stored in the data cleaning module. After data cleaning, the data is then shared to the rest of the application servers through the data sharing and distribution module to provide relevant video resources for the user to communicate and cooperate with other users [16].

Information fusion technology can be used to collect and organize users' browsing and learning records on the international Chinese wisdom education platform, summarize them into data sets, and then communicate and cooperate among users through data sharing and distribution, and also visualize the data through task flow to form visual data reports, so that they can be presented in front of users with intuitive data.

The smart education platform based on information fusion technology provides an innovative direction for the development of international Chinese language education exchange and cooperation model. Using information fusion technology, it provides technical support for the analysis and traceability of user learning and exchange information on the smart education platform. The smart education platform helps to better realize the prosperous development of international Chinese language education by providing a brand new way, which is conducive to the global coverage of international Chinese language education.

Similarity metric for collaborative filtering algorithms

In this section, the similarity metric is proposed to improve the quality of CF methods and to solve the sparsity problem [17].

Taking user similarity as an example, for two users u and v, several common similarity measures are expressed as follows:

(1) The user similarity based on the inverse of the mean squared deviation can be expressed as:

$$msd\_s_{uv} = \frac{|I_{uv}|}{\sum_{i \in I_{uv}} (r_{ui} - r_{vi})^2} \tag{1}$$

where I_{uv} is the set of items jointly evaluated by users u and v.

The metric does not consider the proportion of common ratings, and ignoring the proportion of common ratings in the process of calculating user similarity may lead to a decrease in accuracy [18].

(2) The similarity of users based on Pearson's correlation coefficient is expressed as:

$$pcc\_s_{uv} = \frac{\sum_{i \in I_{uv}} (r_{ui} - \overline{r}_u)(r_{vi} - \overline{r}_v)}{\sqrt{\sum_{i \in I_{uv}} (r_{ui} - \overline{r}_u)^2} \sqrt{\sum_{i \in I_{uv}} (r_{vi} - \overline{r}_v)^2}} \tag{2}$$

where $\overline{r}_u$ and $\overline{r}_v$ are the average of the scored items by users u and v, respectively.

(3) The cosine based user similarity is expressed as:

$$cos\_s_{uv} = \frac{\sum_{i \in I_{uv}} r_{ui} \cdot r_{vi}}{\sqrt{\sum_{i \in I_{uv}} (r_{ui})^2} \sqrt{\sum_{i \in I_{uv}} (r_{vi})^2}} \tag{3}$$

(4) The user similarity based on modified cosine is expressed as:

$$acos\_s_{uv} = \frac{\sum_{i \in I_{uv}} (r_{ui} - \overline{r}_i)(r_{vi} - \overline{r}_i)}{\sqrt{\sum_{i \in I_{uv}} (r_{ui} - \overline{r}_i)^2} \sqrt{\sum_{i \in I_{uv}} (r_{vi} - \overline{r}_i)^2}} \tag{4}$$

where $\overline{r}$ is the average user rating of item i.

The similarity based on PCC and the phase velocity based on ACOS are similar in form, but the main difference lies in the way of centralization. aCOS solves the cosine similarity considering only the similarity in vector dimension, subtracting the mean correction for the common scoring item dimension, while PCC describes the linear correlation, defined as the quotient of covariance and standard deviation between two variables, naturally considering the correction work of subtracting the mean.

All the above three similarities depend on the number of common scoring items, but if the number of common scoring items is too small, the similarity relationship cannot be accurately described.

(5) The similarity of users based on Jaccard coefficient is expressed as:

$$J\_s_{uv} = \frac{|I_u \cap I_v|}{|I_u \cup I_v|} \tag{5}$$

That is, the number of items jointly rated by two users is used to divide the number of all items rated by both users. This metric ignores the absolute value of ratings, which can make it difficult to distinguish between users.

The above five similarity measures are not superior or inferior, and no single measure is universal in practical application scenarios, and the most appropriate similarity measure is usually chosen based on the specific data information of the system.

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Weighted coefficients and weighted similarity

To improve the running speed of the similarity measure, this section introduces an item scoring matrix, denoted as a $m \times n$ binary sparse matrix containing m users and n items, with U denoting the set of all users, I denoting the set of all items, and scoring entry value $r_{ui} \in \{1, 0\}$ [19]. This is shown in Figure 3.

Specifically, row u indicates the rating of all items by user u, and column i indicates the rating of item i by all users, denoted as r_u and r_i, respectively. if user u likes item i (relatively high rating), there is $r_{ui} = 1$. if user u does not like (relatively low rating) or has not yet noticed item i, there is $r_{ui} = 0$. in row u, the set of items that user u likes is I_u, and in column i, the set of users who like item 17 is 18. In column 16, the set of users who like item i is U_i.

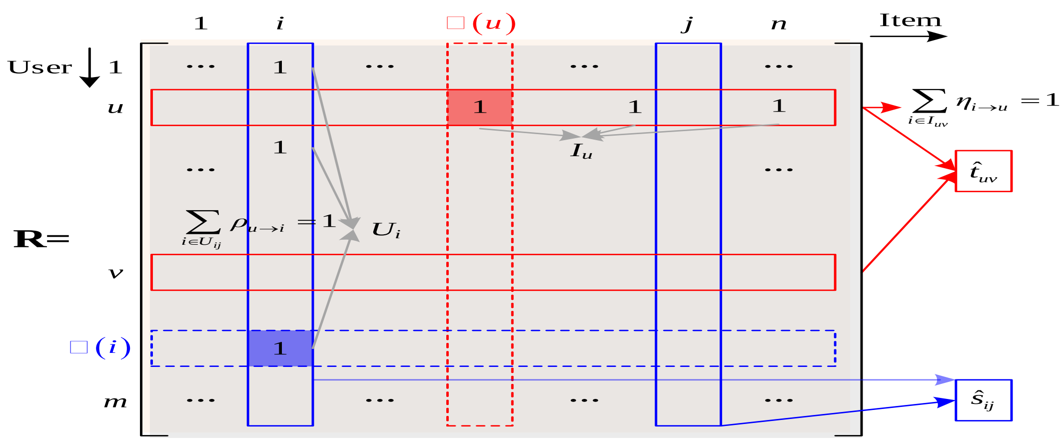

Figure 3. Binary scoring matrix and weighting factors

In this paper, we use a $m \times n$ weight matrix η to measure the importance of items to users, where $\eta_{i\to u} = \{\eta\}_{ui}, 0 \le \eta_{i\to u} \le 1$ *and* $\sum_{i \in I_u} \eta_{i\to u} = 1$, by definition, it is clear $\eta_{i\to u}$ that the larger the item, the more important the item i is to the user u, then the coefficients can be expressed as:

$$\eta_{i\to u} = \begin{cases} > 0 & i \in I_u \quad (r_{ui} = 1) \\ \le 0 & i \notin I_u \quad (r_{ui} = 0) \end{cases} \tag{6}$$

Similarly, the user's preference for the item is described by a weight matrix ρ of $m \times n$, where

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$\rho_{u\to i}=\{\rho\}_{ui}, 0\le\rho_{u\to i}\le 1$ *and* $\sum_{i\in I_u}\rho_{u\to i}=1$, if $u\in U_i$, then $\rho_{u\to i}>0$, and if $u\notin U_i$, then $\rho_{u\to i}=0$.

For a given pair of users u and v, to simplify the model, the traditional unweighted user similarity t_{uv} can be defined as the number of items shared by these two users. In addition, the traditional unweighted item similarity s_{ij} of items i and j can be defined as the number of users who share the same favorite items. That is, there are :

$$\begin{cases} t_{uv}=\sum_{i=1}^{n} r_{ui}\cdot r_{vi} \\ s_{ij}=\sum_{u=1}^{m} r_{ui}\cdot r_{uj} \end{cases} \tag{7}$$

In order to consider the differences between users and items, this paper proposes a new similarity measure, namely weighted similarity, which defines the weighted similarity between users and items as follows:

(1) User-weighted similarity:

$$\hat{t}_{uv}=\sum_{i=1}^{n} r_{ui}\cdot r_{vi}\sqrt{\eta_{i\to u}}\sqrt{\eta_{i\to v}} \tag{8}$$

That is, the weighted similarity depends not only on how many common favorite items two users have, but also on how important these common items are to them. If $r_{ui}=0$, then $\eta_{i\to u}=0$, the above equation can be reduced to :

$$\hat{t}_{uv}=\sum_{i\in I_{uv}}^{n}\sqrt{\eta_{i\to u}\eta_{i\to v}} \tag{9}$$

where, $I_{uv}\in I_u\bigcap I_v$, denotes the set of items jointly evaluated by users u and v.

(2) Item-weighted similarity:

$$\hat{s}_{ij}=\sum_{u=1}^{m} r_{ui}\cdot r_{uj}\sqrt{\rho_{u\to i}}\sqrt{\rho_{u\to j}} \tag{10}$$

Thus, if many users like items i and j, then the weighted similarity between items i and j will be large if $r_{ui} = 0$, then $\rho_{u \to i} = 0$, and the above equation can be reduced to :

$$\hat{s}_{ij} = \sum_{i \in U_{ij}}^{n} \sqrt{\rho_{u \to i} \rho_{u \to j}} \tag{11}$$

where, $U_{ij} = U_i \bigcap U_j$, denotes the set of users who like both items i and j.

Implementation process of collaborative filtering recommendation algorithm

Collaborative filtering recommendation algorithm mainly refers to a class of algorithms that use user history information to model users and then make recommendations. This chapter uses the collaborative filtering recommendation algorithm. The process of implementing the collaborative filtering recommendation algorithm is to collect the user's past behavioral data, integrate them into a two-dimensional scoring matrix, select a suitable similarity calculation formula for calculation, and finally recommend items according to the magnitude of similarity.

Algorithm implementation steps

In this paper, we use the traditional collaborative filtering algorithm to calculate the user similarity. The following are the specific steps.

(1) Collect user behavior data and generate user-item rating matrix

The simplest behavioral data of users on the smart education platform needs to be pre-processed first and transformed into a user-item rating matrix.

(2) Establish the set of nearest neighbors with similar interests of the target user

Calculate the interest similarity of target users and other users. Based on the similarity of users, generate the set of nearest neighbors of target users.传统的协同过

(3) Generate recommendations

Once the interest similarity between users is obtained, the recommendation algorithm proceeds to the final step of its work, which is to recommend the item of interest to the target user. The presence of the item of interest in the final recommendation list needs to satisfy the requirement that the target user has not seen it before, which can increase the novelty of the item to the user. The combination of user similarity measure and item similarity measure can be a good measure of the interest of user u to item i in the user-based collaborative filtering recommendation algorithm:

$$P(u,i) = \sum_{v \in S(u,k) \cap N(i)} W_{uv} \times R_{vi} \tag{12}$$

Where k in $S(u,k)$ indicates the number of users with the most similar interests to user u, W_{uv}

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is the similarity of interests between users u and v obtained by the user weighted similarity formula, and R_{vi} is the interest of user v in item i.

Algorithm flow chart

The process of collaborative filtering recommendation algorithm is shown in Figure 4. The algorithmic process of the recommendation system of the international Chinese wisdom education platform is divided into the collection of user behavior data respectively, the establishment of the user Xiangu rating matrix, the calculation of user similarity and the generation of the set of users' nearest neighbors, and finally the generation of the recommended list of international Chinese education video resources.

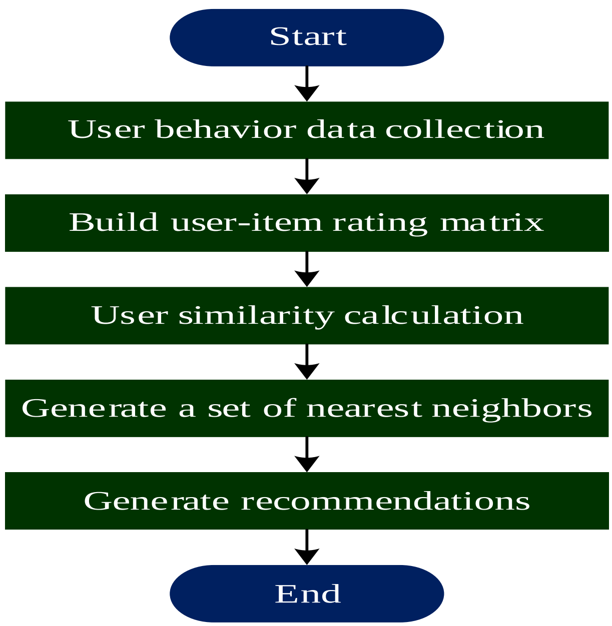

Figure 4. Algorithm process

Improvement of user-weighted similarity calculation

In a recommendation system, if the popular items appear too many times, it will make the recommendation results more homogeneous and without novelty, and the final recommendations will be the items appearing on the popular list, which is very different from the actual needs of users. In order to reduce the influence brought by popular items, this chapter adds a penalty factor as a weighting factor when calculating the user similarity. This can ensure a good recommendation effect of the recommendation system of the smart education platform. The improved algorithm flow is shown in Figure 5.

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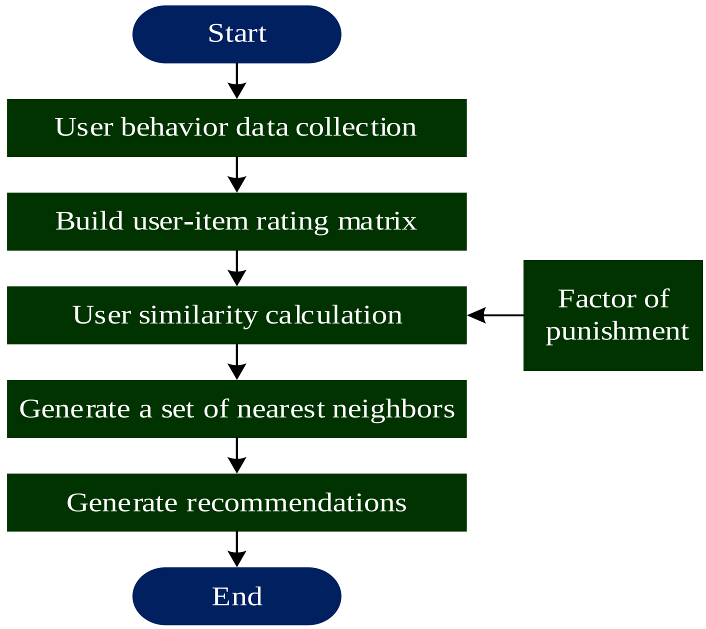

Figure 5. Flowchart of the improved algorithm

Experimental results and analysis of international Chinese wisdom education platform

In order to study the practicality and usage performance of the international Chinese wisdom education platform built based on information fusion technology, this section uses the video dataset from the UCI database for experimental data analysis. The data are analyzed in three aspects: user information collection and storage capacity, information processing rate and data transmission time of the wisdom education platform and the practicality of the wisdom education platform.

Analysis of information collection and storage capacity of intelligent education platform

This experiment uses the video resource dataset of over one million orders of magnitude in the UCI database for this experiment. The video resource dataset is connected to the batch stream integrated data processing module of the wisdom education platform through the API interface, and the data collection algorithm is used to collect and store information on the video resources, and the information collection and storage capability of the wisdom education platform proposed in this paper is determined by analyzing the operation mode of the file information.

The operation of information is divided into four ways: sequential read, sequential write, random read and random write, and the data in the wisdom education platform is operated using the four ways, and the results are shown in Table 1.

Table 1. Information literacy on the platform

Indicators	Sequential reading	Sequential writing	Random Reading	Random writing
Time/s	751	346	849	287
Speed/(rows/s)	1265	3583	1748	5124
CPU Occupancy/%	12.47%	14.96%	13.58%	16.36%

When the information operation of the intelligent education platform was performed, the operation rate of random write was 5124 rows/s and the operation rate of sequential write was 3583 rows/s, and the CPU occupancy of each was 16.36% and 14.96% respectively. The rate of sequential read is 1265 rows/s with a CPU occupation rate of 12.47%, and the rate of random read is 1748 rows/s with a CPU occupation rate of 13.58%. It shows that the batch flow integrated data processing module of the intelligent education platform in this paper can effectively collect and store the data, and ensure that the data can be analyzed and processed normally.

Analysis of information processing rate of intelligent education platform

In this section, the information processing rate and transmission time of international Chinese education-related video resources from the UCI database uploaded to the intelligent education platform are used to verify the rationality of this platform. The data are pre-processed using user-weighted similarity and item-weighted similarity and compared with OTraining system and MOOC education platform for experiments. The results of the comparison data are shown in Figure 6.

In terms of information transmission rate, the average transmission rate of the smart education platform constructed in this paper is 453.63 Kb/s, which is 1.95 times and 0.75 times higher than that of the other two education platforms, respectively, which indicates that the smart education platform proposed in this paper has better data transmission capability and can upload more data in the same time.

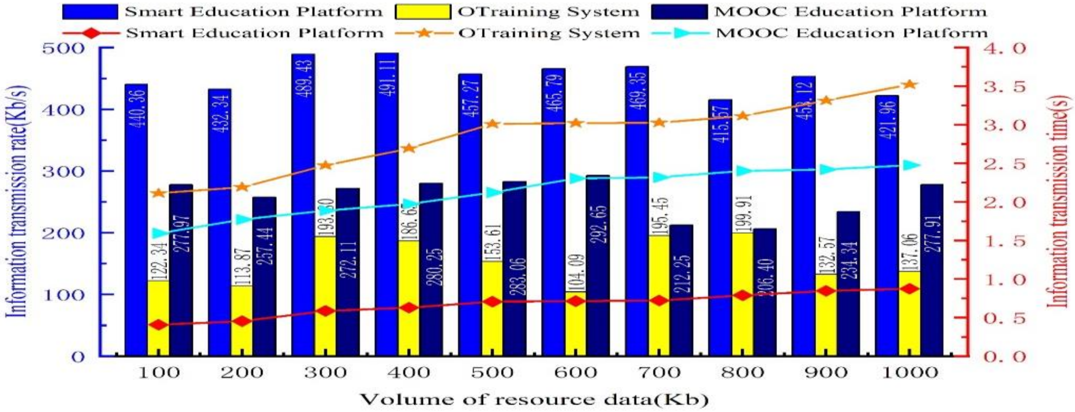

Figure 6. Comparative analysis of the four education platforms

In terms of information transmission time, the average transmission time of the smart education platform constructed in this paper is 0.673 s, which is 2.174 s and 1.453 s lower than that of the other two education platforms, respectively. this indicates that the smart education platform in this paper is more efficient and can obtain the video information data needed by users faster, helping users to communicate with each other more quickly.

Analysis of the usefulness of the intelligent education platform

For the utility analysis of the smart education platform is evaluated using the mean absolute error MAE and root mean square error RMSE, which are calculated as:

$$MAE = \frac{1}{|D_{test}|}\sum_{(u,i)\in D_{test}} |r_{ui} - \hat{r}_{ui}| \tag{13}$$

$$RMSE = \sqrt{\frac{1}{|D_{test}|}\sum_{(u,i)\in D_{test}} (r_{ui} - \hat{r}_{ui})^2} \tag{14}$$

where $\hat{r}_{ui}$ is the predicted score of user u for item i, r_{ui} is the actual score, and D_{test} is the test set data.

The MAE and RMSE were used as evaluation metrics, and the data were cross-validated with a collaborative filtering algorithm for ten folds. The analysis results are shown in Figure 7.

The minimum value of the mean absolute error of the ten-fold cross-validation of the smart education platform in this paper is 0.259%, the maximum value is 0.462%, and the mean value of the ten-fold cross-validation is 0.36%.

The minimum value of the root mean square error is 0.156%, the maximum value is 0.351%, and the average value of the ten-fold cross-validation is 0.256%.

The wisdom education platform proposed in this paper can help users communicate with other users and share the learning experience of international Chinese education videos by recommending international Chinese education video resources to them with a small error rate.

By analyzing the test results, the smart education platform can recommend more videos related to international Chinese education for users, which can promote the communication and cooperation among users and cooperate to solve the educational problems arising in international Chinese education.

This shows that the smart education platform in this paper is conducive to promoting the innovative development mode of international Chinese education, and international Chinese education through the smart education platform is a new mode of user communication and cooperation.

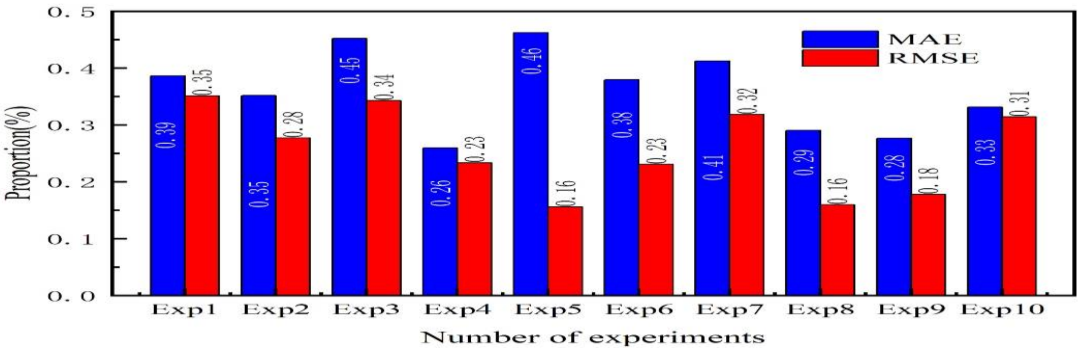

Figure 7. Ten-fold cross validation of evaluation indicators

Conclusion

This paper takes information fusion technology as an entry point and elaborates on the use of a wisdom education platform for video resource recommendation for international Chinese education exchange cooperation. Using the similarity measure algorithm of collaborative filtering algorithm, user-weighted similarity and item-weighted similarity, an international Chinese wisdom education platform is constructed to explore the international Chinese education exchange and cooperation model.

(1) In terms of the information collection and storage capacity of the platform, the operation rate of the smart education platform in this paper is 5124 rows/s for random writes and 3583 rows/s for sequential writes, and the respective CPU occupancy rates are 16.36% and 14.96%, respectively. It shows that the batch stream integrated data processing of the intelligent education platform can effectively collect and store user information, and can provide an excellent data storage environment.

(2) In terms of the information transmission rate and transmission time of the platform, compared with the other two educational platforms, the average transmission rate of the platform in this paper is 453.63 Kb/s, which is 1.95 times and 0.75 times higher than the transmission rates of the other two educational platforms, respectively. The average transmission time of the platform in this paper is 0.673s, which is 2.174s and 1.453s lower than the transmission time of the other two education platforms, respectively, indicating that the data processing module of the intelligent education platform is more efficient and can provide users with international Chinese education video resources for learning more quickly and improve their learning fluency.

(3) In terms of practicality, the average absolute error and root mean square error of this paper are 0.36% and 0.256%, respectively. It indicates that the accuracy of the smart education platform is better, and the analysis, cleaning, sharing and distribution of international Chinese education data information can be nearly perfect and accurate. And the recommended information among users can be better used in the wisdom education platform for in-depth communication and sharing,

promoting win-win cooperation among users.

References

[1] Y. Zeng and J. Xiao, "Review on Chinese Proficiency Grading Standards for International Chinese Language Education," *Frontiers in Educational Research,* vol. 4, no. 6, 2021.

[2] Y. Gong, C. Lai, and X. Gao, "The teaching and learning of Chinese as a second or foreign language: the current situation and future directions," *Frontiers of Education in China,* vol. 15, pp. 1-13, 2020.

[3] W. Xu and G. Stahl, "Working-class girls' construction of learner identities and aspirations through engagement in Chinese language education in Australia," *Discourse: Studies in the Cultural Politics of Education,* vol. 43, no. 6, pp. 886-898, 2022.

[4] D. Wang and M. East, "Constructing an emergency Chinese curriculum during the pandemic: A New Zealand experience," *International Journal of Chinese Language Teaching,* vol. 1, no. 1, pp. 1-19, 2020.

[5] Y. Wu and J. Wang, "Three-stage blended Chinese teaching online and offline for international students: a case study on Chinese teaching for international students in S university," *Journal of Higher Education Research,* vol. 3, no. 2, pp. 207-211, 2022.

[6] Y. Gong, M. Ma, T. P. Hsiang, and C. Wang, "Sustaining international students' learning of Chinese in China: Shifting motivations among New Zealand students during study abroad," *Sustainability,* vol. 12, no. 15, p. 6289, 2020.

[7] H. Yu and M. Wyatt, "The impact of L2 self-efficacy beliefs on a Chinese international student's learning approaches," *Journal of Academic Language and Learning,* vol. 16, no. 1, pp. 17-34, 2022.

[8] F. Guan, J. Cao, J. Ren, and W. Song, "The teaching of sports science of track and field-based on nonlinear mathematical equations," *Applied Mathematics and Nonlinear Sciences,* vol. 7, no. 1, pp. 191-198, 2022.

[9] F. Suan Fong, Z. Yingjiang, and L. May, "Chinese Language Education in Singapore:

Retrospect and Prospect," *Teaching Chinese Language in Singapore: Cultural Teaching and Development,* pp. 3-23, 2021.

[10] Q. Yan and Z. Shi, "Smart Cloud Education—The First Online International Chinese Education Promotion Project in Africa," *Open Access Library Journal,* vol. 9, no. 3, pp. 1-6, 2022.

[11] Y. Yang, "A ML-Based Efficient Chinese Teaching Platform Design and Implementation," *Wireless Communications and Mobile Computing,* vol. 2022, 2022.

[12] J. Tao, K. Zhao, and W. Dong, "A multimodal analysis of the online translanguaging practices of international students studying Chinese in a Chinese university," *Applied Linguistics Review,* 2022.

[13] Y. Jia, "Teaching Chinese as an International Language: A Singapore Perspective, by Goh, YS: (2017). Cambridge University Press. xviii+ 211 pp., $110 (hardback), ISBN: 9781107052192," ed: Taylor & Francis, 2023.

[14] M. Liu and Y. Zhang, "Relations among and predictive effects of Chinese-learning motivation, use of Chinese and proficiency in Chinese on international students' intercultural sensitivity," *Journal of International and Intercultural Communication,* pp. 1-21, 2022.

[15] M.-H. Wu and G. Leung, "'It's not my Chinese': a teacher and her students disrupting and dismantling conventional notions of 'Chinese'through translanguaging in a heritage language classroom," *International Journal of Bilingual Education and Bilingualism,* vol. 25, no. 5, pp. 1811-1824, 2022.

[16] Q. Qi and X. Wang, "Action of College Chinese Education and Information Fusion Teaching Based on the Background of Big Data," *Wireless Communications and Mobile Computing,* vol. 2022, 2022.

[17] M. F. Aljunid and M. D. Huchaiah, "IntegrateCF: Integrating explicit and implicit feedback based on deep learning collaborative filtering algorithm," *Expert Systems with Applications,* vol. 207, p. 117933, 2022.

[18] C. Zhang, X. Duan, F. Liu, X. Li, and S. Liu, "Three-way Naive Bayesian collaborative filtering recommendation model for smart city," *Sustainable Cities and Society,* vol. 76, p. 103373, 2022.

[19] C. Mu, W. Chen, Y. Liu, D. Lei, and R. Liu, "Virtual information core optimization for collaborative filtering recommendation based on clustering and evolutionary algorithms," *Applied Soft Computing,* vol. 116, p. 108355, 2022.