

## *Retraction*

# **Retracted: Intelligent Recommendation System of Dance Art Video Resources Based on the Wireless Network**

## **Security and Communication Networks**

Received 26 December 2023; Accepted 26 December 2023; Published 29 December 2023

Copyright © 2023 Security and Communication Networks. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

## **References**

- [1] J. Chen, "Intelligent Recommendation System of Dance Art Video Resources Based on the Wireless Network," *Security and Communication Networks*, vol. 2021, Article ID 3226580, 7 pages, 2021.

## Research Article

# Intelligent Recommendation System of Dance Art Video Resources Based on the Wireless Network

Jianhua Chen 

Tourism College of Zhejiang, Hanzhou 311231, Zhejiang, China

Correspondence should be addressed to Jianhua Chen; [chenjianhua@tourzj.edu.cn](mailto:chenjianhua@tourzj.edu.cn)

Received 18 August 2021; Revised 14 September 2021; Accepted 24 September 2021; Published 21 October 2021

Academic Editor: Jian Su

Copyright © 2021 Jianhua Chen. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Aiming at the problems of low recommendation accuracy and long recommendation time of the traditional dance art video resource intelligent recommendation system, an intelligent recommendation system of dance art video resource based on the wireless network was designed. In this paper, the hardware part of the smart recommendation system of dance art video resources is designed with the MCU as the system control core, the MAX3232 chip as the hardware transceiver chip, and the RS323 bus circuit. On this basis, according to the user's existing relationship, a social network is constructed through wireless network technology to obtain user information, Bayesian network is used to predict the user's preference for dance videos. The probability that users like dance videos is given in the form of data, and related videos of dance art are recommended based on intelligent video resources. The simulation results show that the designed system has higher accuracy and shorter recommendation time for dance art video resources.

## 1. Introduction

Dance is an art style that takes organized and rhythmic human body movements as the main means of expression and uses rhythm, composition, modeling, and other elements to create images and express emotions. It is both visual and auditory art [1]. It is precise; because we can flexibly use visual video materials in dance teaching, we can receive unexpected results. Use video resources to carry out various dance teaching activities, supplement and deepen classroom teaching content, expand students' knowledge, and provide new ways to improve students' understanding [2]. As a traditional dance teaching method, oral and personal teaching has some advantages, but it still seems relatively outdated in the information age. In addition to learning knowledge, it is more important for students to learn the methods and skills of acquiring knowledge [3]. "Teaching fish is better than teaching fish." By using dance art video resources, students can learn new knowledge and methods by themselves. Therefore, the design of an intelligent recommendation system for dance art video resources focuses on current research [4].

Zheng and You [5] designed a dance art video resource recommendation system based on a collaborative filtering algorithm, combined with the correlation between dance art video attributes and user preferences, mapped the type, director, actor, and other information in dance art video information into graph elements, and fused the graph structure characteristics to calculate the similarity of dance art video resources. This method replaces the similarity calculation method which only uses the score matrix in the traditional collaborative filtering algorithm and alleviates the problem of affecting the recommendation accuracy due to data sparsity to a certain extent. Experiments verify the effectiveness of the system. However, the video resource recommendation time of the system is extended. Ming [6] designed a personalized microcourse video teaching recommendation system, deeply analyzed and discussed the characteristics of microcourses, personalized learning theory, and personalized recommendation technology, focused on the application of collaborative filtering recommendation in the microcourse system, and analyzed the overall architecture and data storage structure of the personalized microcourse system. The recommendation process and

function modules are studied and designed in detail, and finally, the personalized recommendation from video resources to system users is realized. Ding and Liu [7] developed a precise recommendation system of learning resources based on multidimensional association analysis, introduced the tensor theory to construct a “learner resource” fusion tensor, and used a high-order singular value decomposition algorithm to mine the association relationship between learners and resources according to the principle of multidimensional association analysis, to realize the accurate matching between learners and resources. Through the comparative experiment of 9 groups of data of different scales, it is found that the recommendation performance of the multidimensional correlation analysis method is better than the collaborative filtering algorithm in the recommendation field, and its recommendation performance is better with the increase of data scale. The multidimensional correlation analysis method is conducive to the accurate recommendation of personalized learning resources in the big data environment and improves online education quality and customized learning effect. However, the video resource recommendation accuracy of the above two systems is low, resulting in a poor recommendation effect. Aiming at the problems of the above system, this paper designs an intelligent recommendation system of dance art video resources based on wireless network.

## 2. Intelligent Recommendation System of Dance Art Video Resources Based on the Wireless Network

### 2.1. Hardware Design

*2.1.1. Single-Chip Microcomputer Design.* In the hardware design of the dance art video resources intelligent recommendation system, single-chip microcomputer is mainly used as the core of system control. Because the display part of the system designed in this paper mainly adopts a metal capacitor screen, the method includes four components: website terminal, server controller, client controller, and playback program [8]. The hardware part of the system is mainly composed of the main circuit board, control module, interface module, and wireless transmission module of the ALIENTEK MiniSTM32 microcontroller. The main circuit board of the single-chip microcomputer mainly includes the microcontrol unit (MCU). During the setting process of the control unit, the M32 single-chip microcomputer constitutes the core component of the control system. Under the expansion, the control circuit needs to be expanded and set. Only the circuit module can be configured through  $BOOT_0$  and  $BOOT_1$ , and the configuration mode is shown in Table 1.

In SRAM startup mode, it is mainly used for debugging code in SRAM; in system storage mode, after the system’s built-in memory is started, the hardware will rely on the serial port to download the source code, which can be used for serial download. At any value, press the reset button to start the program operation of the system, and the user flash mode starts, mainly relying on the user flash memory to

TABLE 1: System startup mode configuration settings.

$BOOT_0$	$BOOT_1$	Start mode
1	1	SRAM boot
0	X	User flash mode
1	0	System storage mode

complete the flash startup [9]. In the interface design of SWD and OLED, through a general LCD module interface LCD1 of M32 single-chip microcomputer and another OLED interface, it is possible to realize the SWD and OLED interface to supply power to the display module and realize the connection between OLED and MCU. Also, the communication network structure of the system is shown in Figure 1.

*2.1.2. RS323 Bus Circuit Design.* The dance art video resource intelligent recommendation system has synchronous data transmission and asynchronous data transmission when recommending dance art video resources. Designing the RS323 bus circuit is necessary to ensure that the system can receive all different types of information [10]. The RS323 interface has nine pins or 25 pins. The design chooses RS323 with 25 pins. Predict whether the transmission rate of RS323 is 50, 100, 600, 1200, 2400, 4800, 9600, and 19200 baud. Allow 2500 pF capacitive load, and on expanding the communication distance, ensure that the hardware can suppress noise and suppress other interference information. Figure 2 shows the designed bus circuit.

Considering that the system is connected to the computer, when designing the RS323 bus circuit, use the MAX3232 chip as the transceiver chip of the hardware. The selected MAX3232 chip has the characteristics of dual channels and its proprietary low-dropout transmitter outputs. Through two receivers and two drivers, data transmission and reception at a data rate of 240 kps can be realized, ensuring that the recommended system can handle massive dance art video resources [11].

So far, the intelligent recommendation system for dance art video resources has been completed.

### 2.2. Software Design

*2.2.1. Wireless Network Technology.* People have higher and higher requirements for life, wanting high-speed and quick information exchange and wanting more convenient access to the network. With the continuous development of wireless communication technology, people’s needs have been continuously met, and wireless communication technology has been well applied in many fields. Although wired networks still dominate at present, wireless networks also play an inaccessible role in communication networks due to their unique flexibility and convenience. The interconnection and intercommunication of wireless networks are actually achieved through the combination of wireless communication technology and network technology. Professionally speaking, the communication meson of the

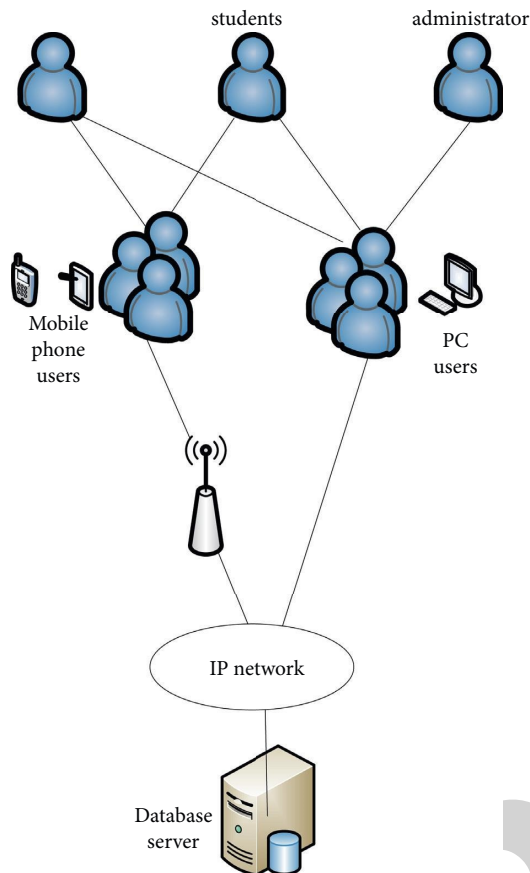


FIGURE 1: Communication network structure design.

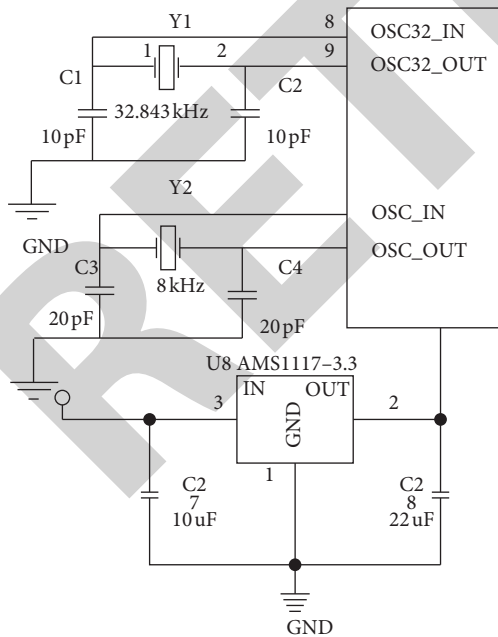


FIGURE 2: Bus circuit design diagram.

wireless network is the air, which uses electromagnetic waves to transmit information in the air to realize the interconnection and intercommunication of the network. There is no

need to invest in cables or optical cables, so the investment cost is relatively low. In summary, the application prospects of wireless networks are broad, and the market demand is also rising day by day. Coupled with its technical feasibility, the wireless network technology is continuously improved and the industrialization development is more rapid [12]. It has many advantages:

- (1) Flexibility and mobility: in wired networks, the location of terminal equipment is restricted by network cables or optical fibers, while terminals in wireless networks can access the network in all areas covered by their signals. In addition, terminal devices connected to the wireless network can move in space while maintaining normal Internet access.
- (2) Easy to install: the wireless network only needs to place wireless devices in several locations in an area to cover the entire area of the network, eliminating the need for complicated network wiring work [13].
- (3) It is easy to carry out network planning and adjustment: in the case of users who want to expand capacity or directly change their office locations, wired networks need to splice fiber cores or lay out network cables, while wireless networks can avoid the above problems.
- (4) Easy fault location: wired networks have many physical lines, so it is difficult to determine the point of failure once a fault occurs quickly. The wireless network only needs to determine whether there is a problem with the access network to determine the point of failure [14].
- (5) Easy to expand: there are a variety of configuration methods for wireless local area networks, which can quickly expand from a small local area network with only a few users to a large network with thousands of users and can provide features that cannot be achieved by wired networks such as “roaming” between nodes.

2.2.2. Resource Recommendation Based on Wireless Network Technology. Extract user data from web pages through wireless networks, build social networks based on user connections, and obtain user information. The user information acquisition in the HTML-based web pages is usually implemented according to the API interface provided by the online social network. According to the characteristics of the authorization mechanism of the online social network, the steps for obtaining user data are as follows:

- (1) Request a signature.
- (2) Obtain request token.
- (3) User authentication.
- (4) Obtain an access token.
- (5) Obtain user information.

After getting the authorization, call the API interface to get the user list. After obtaining the user’s relevant data

information, the user data are organized in a specific format and input to the social network visualization tool Prefuse, and the visualized social relationship network is output [15].

Use the user information obtained above to recommend dance art video resources intelligently. The stage of predicting the user's preference needs to be based on user interest modeling, using Bayesian network to predict the user's preference for dance art videos, presenting the likelihood that users like dance art videos in a probabilistic way, and intelligently recommend dance art video resources based on users. This article recommends dance art video resources to new users based on the user's basic information and behavioral information and uses the Bayesian probability model to calculate the dance art video recommendation probability to clarify the current user's preference. The specific process of recommending dance art videos to users is as follows:

- (1) User set:  $U = \{u_1, u_2, \dots, u_n\}$  represents a set of  $n$  users, where user  $u_i (i \in n)$  contains the following attributes: user ID (uld), gender (uSex), age (uAge), hobby (uLocation), and sign-in time (uTime), that is, the form  $\langle \text{uld}, \text{uSex}, \text{uAge}, \text{uLocation}, \text{uTime} \rangle$  describes a user.
- (2) Video collection:  $A = \{a_1, a_2, \dots, a_n\}$  represents a collection of  $m$  videos. Video  $a_i (i \in m)$  contains the following attributes: Video ID (ald), User (uld), Video Feature (aContent), Video Type (aLocation), Video Tag (aTag), and Number of Check-in (aTimes), that is,  $\langle \text{ald}, \text{uSex}, \text{aContent}, \text{aLocation}, \text{aTag}, \text{aTimes} \rangle$  describes a video gather.
- (3) Video recommendation probability:

$$P(a_i | u_j) = \frac{P(a_i)P(a_i | u_j)}{P(u_j)}, \quad (1)$$

where  $P(a_i | u_j)$  represents the probability of user  $u_j$  recommending video  $a_i$ , that is, the degree of recommendation of the video to the user.

- (4) User attribute similarity: the user attribute similarity is used to measure the similarity between users' basic information, and the expression of user attribute similarity  $Sim_f(u, k)$  is

$$Sim_f(u, k) = \frac{N_{f_u} \cap N_{f_k}}{N_{f_u} \cup N_{f_k}}, \quad (2)$$

where  $N_{f_u} \cap N_{f_k}$  represents the intersection of the attributes of user  $u$  and user  $k$  and  $N_{f_u} \cup N_{f_k}$  represents the union of the attributes of user  $u$  and user  $k$ .

- (5) User behavior similarity: it is used to measure the similarity of user behavior, and the expression of user behavior similarity  $Sim_b(u, k)$  is

$$Sim_b(u, k) = \frac{\sum_{a \in c_{u,k}} N_{s_{u_a}} N_{s_{k_a}}}{\sqrt{\sum_{a \in c_u} N_{s_{u_a}}} \sqrt{\sum_{a \in c_k} N_{s_{k_a}}}}, \quad (3)$$

where  $c_{u,k}$  indicates the number of shared videos,  $N_{s_{u_a}}$  represents the number of times,  $c_u$  represents the number of videos, and  $c_k$  represents the number of videos signed in.

- (6) Similarity between users:  $Sim(u, k)$  represents the similarity between user  $u$  and user  $k$ , including user behavior similarity and user attribute similarity. The calculation formula is

$$Sim(u, k) = bSim_b(u, k) + (1 - b)Sim_f(u, k), \quad (4)$$

where  $b$  represents a weighting factor used to adjust user behavior and the similarity of user attributes. If the user is a new user,  $b=0$  at this time, thus solving the cold start problem of the new user.

- (7) Video rating:  $R_{u,a}$  represents user  $u$ 's rating for video  $a$ , and the expression is

$$R_{u,a} = \gamma \frac{N_{u,a}}{\sum_{j \in A} N_{u,j}}, \quad (5)$$

where  $N_{u,a}$  represents the number of times,  $\sum_{j \in A} N_{u,j}$  represents the total number of times, and  $\gamma$  represents the adjustment vector, which determines the value range of  $R_{u,a}$ .

- (8) According to the user's invisible rating of the dance art video, whether the video is worth recommending to the user is judged.

### 3. Simulation Experiment Analysis

To verify the effectiveness of the wireless network-based intelligent recommendation system for dance art video resources in practical applications, a simulation experiment is performed. The experimental environment configuration is shown in Table 2.

According to the aforementioned experimental environment configuration, construct the experimental network topology, as shown in Figure 3.

Perform intelligent recommendation experiments on dance art video resources based on the experimental environment. The analysis data used in the experiment mainly come from the dance art education online school. The online school offers more than 50 dance courses, covering a wide range, and the number of online students has reached more than 10,000. The data obtained by the crawler method include all the basics of the students. Information, behavior retrieval and browsing, information collection, and various mathematical knowledge points are used as relevant information and knowledge evaluation standards. Therefore, by using the online school for research data, the recommendation results will be more accurate and more reliable [16].

In the experiment, 3563 pieces of student scoring data on dance art videos were extracted to build a dataset, including 3316 students' scores for 26 basic knowledge units of dance

TABLE 2: Experimental environment configuration.

Serial number	Configuration	Data
1	Computer hardware configuration	CPU: AMD Athlon (TM) II X4 640; main frequency: 3.01 GHz; RAM: 3.25 GB
2	Operating system	Microsoft Windows XP
3	Metadata editing and course content packaging	Reload Editor 2.5.5
4	Low-level software	Xampp1.7.7 Java
5	Testing platform	Joomla 1.7.3
6	Use templates	Schoolnerdfree-1.0.0
7	Use plug-ins	Google Analytics

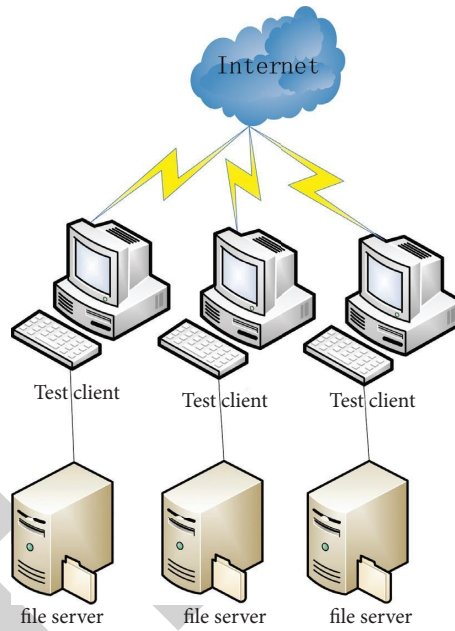


FIGURE 3: Experimental network topology.

art videos, and the score of each student's basic knowledge unit must be fixed. For 10 or more, the scoring value is set to all integers from 0 to 100. In addition, the higher the students' scores on knowledge points, the more they are eager for knowledge points.

Use the evaluation index of prediction accuracy to calculate the accuracy of the recommendation algorithm and use MAE to measure its error:

$$MAE = \frac{\sum_{s \in S} |R_s - \hat{R}_s|}{|S|} \quad (6)$$

Among them,  $S$  represents the collection of all dance art video resources,  $R_s$  represents the true score of the dance art video, and  $\hat{R}_s$  represents the current user's predicted score of the dance art video  $s$  calculated by the recommendation system.

The smaller the average error value between the predicted score and the true score calculated by MAE, the higher the quality of the recommendation algorithm and the better the recommended results.

In order to make the experimental results more comparable, 100 users were randomly selected and their rating data were set to zero to simulate the situation of new users entering the recommendation system. Zheng and You [5] and Ming [6] designed a dance art video resource recommendation system based on collaborative filtering algorithm, designed a personalized micro-class video teaching recommendation system as a comparison system, and compared it with the intelligent recommendation of dance art video resources based on wireless networks. The results are shown in Table 3. MAE comparative experimental data are shown in Figure 4.

According to Table 3, the average absolute deviation of the dance art video resource intelligent recommendation system based on wireless network designed in this paper is smaller than that of literature [5] based on the collaborative filtering algorithm dance art video resource recommendation system and literature [6] designed based on personalization. The recommended system of video teaching for microclasses shows that the intelligent recommendation system of dance art video resources based on wireless network designed in this paper has high accuracy and

TABLE 3: MAE comparative experimental data.

Nearest neighbor student users (a)	Text system	Literature [5] system	Literature [6] system	Literature [17] system	Literature [18] system
5	0.520	0.792	0.952	0.865	0.821
10	0.510	0.781	0.935	0.873	0.835
15	0.504	0.774	0.916	0.842	0.816
20	0.592	0.761	0.905	0.839	0.805
25	0.585	0.756	0.993	0.841	0.773
30	0.571	0.752	0.982	0.832	0.772
35	0.565	0.741	0.971	0.836	0.771
40	0.552	0.730	0.961	0.821	0.761
45	0.541	0.721	0.958	0.817	0.757
50	0.532	0.701	0.949	0.812	0.747
55	0.520	0.700	0.932	0.807	0.732
60	0.510	0.692	0.921	0.801	0.721
65	0.505	0.682	0.910	0.792	0.710
70	0.501	0.671	0.905	0.791	0.705
75	0.592	0.668	0.992	0.787	0.772
80	0.582	0.652	0.982	0.783	0.772
85	0.571	0.647	0.971	0.779	0.771
90	0.569	0.638	0.961	0.764	0.761
95	0.554	0.624	0.954	0.747	0.754
100	0.541	0.617	0.941	0.735	0.741

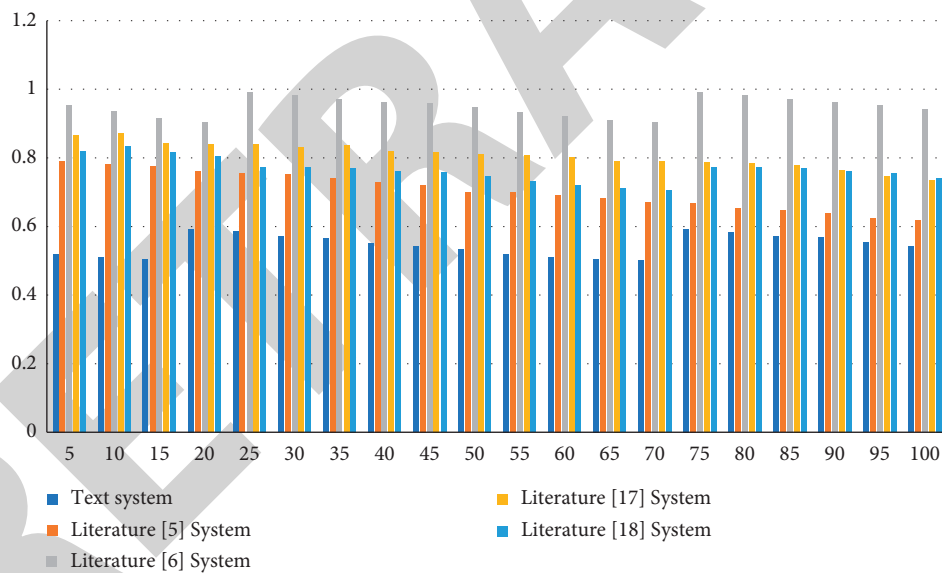


FIGURE 4: MAE comparative experimental data.

better recommendation effect. In order to analyze the results more intuitively, corresponding bar charts are presented, and the results are shown in Figure 4.

In order to further verify the effectiveness of the design system in this paper, a dance art video resource recommendation system based on collaborative filtering algorithm is designed in the document [5, 6]. Based on the personalized microclass video teaching recommendation system, the recommended time of dance art video resources is compared and analyzed. The comparison result is shown in Figure 4.

According to Figure 5, it can be seen that the intelligent recommendation time of dance art video resources is

shorter in the designed dance art video resource intelligent recommendation system based on wireless network, the dance art video resource recommendation system based on collaborative filtering algorithm designed in [5], and Ming [6] designed a dance art video resource recommendation system based on collaborative filtering algorithm. The time is shorter than that of the dance art video resource recommendation system based on the collaborative filtering algorithm designed in literature [5] and the dance art video resource intelligent recommendation system based on the personalized microclass video teaching recommendation system designed in literature [6].

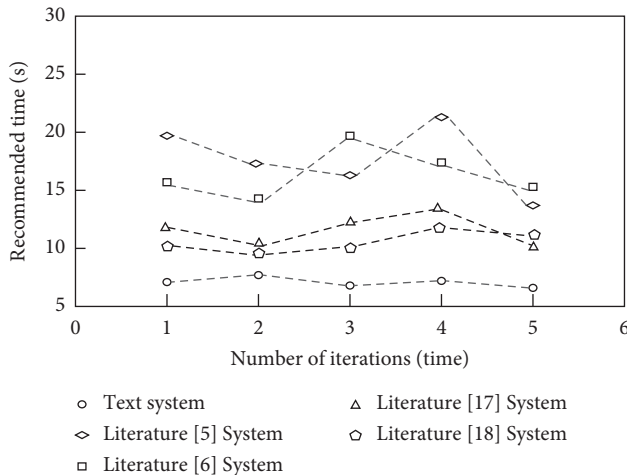


FIGURE 5: Comparison results of recommended time for the three systems.

#### 4. Conclusion

Dance is a kind of performance art and a kind of physical art and visual art, and its artistic image is shaped by rhythmic movement. On the one hand, dance education can improve people's ability to perceive art, aesthetic ability, and appreciation and meet people's high-level pursuit of beauty. On the other hand, dance training can strengthen the body and beautify the body, thereby enhancing people's awareness of appreciation of beauty and self-confidence. In the teaching process, it is difficult for teachers to clearly explain the style, rhythm, and emotion contained in dance. Using video and video resources can make teaching content intuitively and vividly presented in front of students, making students immersive. So as to be infected by art, stimulate students' thinking mode through multiple senses. Therefore, in response to the needs of different students, this article designs an intelligent recommendation system for dance art video resources based on wireless networks and verifies the effectiveness and practical applicability of the system designed in this article through simulation experiments, which makes up the shortcomings of the traditional system and lay a certain foundation for dance education services.

#### Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

#### Conflicts of Interest

The author declares that there are no conflicts of interest.

#### References

- [1] W. Liu and J. Zhang, "Application of improved collaborative filtering algorithm in movie recommendation system," *Modern trade industry*, vol. 17, pp. 59–62, 2018.
- [2] J. Li, Z. Xing, and A. Sun, "LinkLive: discovering Web learning resources for developers from Q&A discussions," *World Wide Web*, vol. 22, no. 4, pp. 1699–1725, 2019.

- [3] X. Yin, "Stimulation and maintenance in the construction of digital learning resources: a study of online learners' learning interests," *Open Access Library Journal*, vol. 8, no. 7, pp. 1–13, 2021.
- [4] H. Zhu, F. Tian, K. Wu et al., "A multi-constraint learning path recommendation algorithm based on knowledge map," *Knowledge-Based Systems*, vol. 143, no. MAR.1, pp. 102–114, 2018.
- [5] C. Zheng and J. You, "Graph-based collaborative filtering algorithm in movie recommendation system," *Computer and Modernization*, vol. 11, pp. 38–43+48, 2019.
- [6] Q. Ming, "Analysis and design of a video teaching recommendation system for micro-course based on personalization," *Microcomputer application*, vol. 35, no. 9, pp. 33–36, 2019.
- [7] J. Ding and H. Liu, "Accurate recommendation of learning resources based on multidimensional association analysis in a big data environment," *Audio-visual Education Research*, vol. 39, no. 2, pp. 53–59, 2018.
- [8] S. A. Seraphine, J. J. O. K. Jacob, and K. K. Joash, "Influence of instructional resources in learning agriculture in secondary school on employment creation in Vihiga County, Kenya," *International Journal of Educational Administration and Policy Studies*, vol. 10, no. 1, pp. 1–9, 2018.
- [9] K. R. Robinson, K. Jones, J. Balmbra, K. Robertson, J. Horne, and P. A. Logan, "Developing the React to Falls resources to support care home staff in managing falls," *Journal of frailty, sarcopenia and falls*, vol. 4, no. 1, pp. 1–10, 2019.
- [10] Q. Wang and F. Zhao, "Design and analysis of library resource recommendation model based on "user portrait"," *Modern intelligence*, vol. 3, pp. 105–109, 2018.
- [11] J. Ye and H. Xiong, "Research on personalized recommendation of cross-domain resources based on tags," *Data analysis and knowledge discovery*, vol. 2, pp. 21–32, 2019.
- [12] Z. Liu, H. Li, W. Song et al., "Research on the method of mixed recommendation of learning resources based on bipartite graph," *Audio-visual Education Research*, vol. 39, no. 8, pp. 85–90, 2018.
- [13] G. Liu and X. Qian, "Unpopular resource recommendation algorithm based on weighted network structure," *Computer Engineering and Science*, vol. 40, no. 5, pp. 916–923, 2018.
- [14] C. Lu, H. Yang, and Y. Li, "An online learning resource recommendation technology based on ontology and recurrent neural network," *Information Theory and Practice*, vol. 42, no. 12, pp. 150–155, 2019.
- [15] Y. Li and Z. Wu, "Personalized English learning video recommendation system," *TANET2018 Taiwan Internet Seminar*, vol. 6, pp. 2294–2297, 2018.
- [16] W. Fu, S. Liu, and J. Dai, "E-learning, e-education, and online training," in *Proceedings of the 7th EAI international conference, eLEOT 2021*, Xixiang, China, June 2021, <https://link.springer.com/book/10.1007%2F978-3-030-84383-0>.
- [17] Y. Han, Z. Han, J. Wu et al., "Artificial intelligence recommendation system of cancer rehabilitation scheme based on IoT technology," *IEEE Access*, vol. 8, pp. 44924–44935, 2020.
- [18] Y. Ge, H. Li, and A. Tuzhilin, "Route recommendations for intelligent transportation services," *IEEE Transactions on Knowledge and Data Engineering*, vol. 33, pp. 1169–1182, 2019.