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English Teaching Resource Recommendation Algorithm Based on Collaborative Filtering Technology

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Abstract: Aiming at the problems of “lost” and “wasted” of English teaching resources, in order to further increase the utilization value of different English teaching resources, a resource management system based on improved collaborative recommendation algorithm is proposed. In order to realize the system, first, the use cases of the system are analyzed. On the basis of the use cases analysis, the functions and overall architecture of the system are designed respectively, and the collaborative recommendation module is mainly designed. In order to improve the accuracy of recommendation, combining the professional attributes and other attributes of the old users, a hybrid recommendation algorithm is used to recommend the learning resources, and finally, a partially implemented interface is given. People can use collaborative filtering, interpersonal association algorithm and other technologies to classify the recommended content of the system according to the grade factors such as topic and difficulty of the topic. Systematically recommend personalized learning content according to students' learning background, English awareness, interest, etc., so as to be tailored to each individual and teach students in accordance with their aptitude. In addition, the design of the system takes into account the needs of students' autonomous learning, interactive learning, group activities, etc., and realizes the interactive learning function, so that teachers, students and students can communicate instantly.

1. Introduction

With the more and more extensive application of computer technology and technology in the education industry, network-based learning is becoming more and more popular [1]. Nowadays, many universities have begun to use various open-source teaching platforms or develop their own online teaching platforms to assist university teachers' teaching and college students' learning. For example, the popularity of online teaching platforms can well prove that the current education has been inseparable from the network [2]. The network provides convenience for learners, and learners can learn anytime and anywhere by using the network. The arrival of digital age and online education has indeed provided convenience for learners. According to the guidance of learning results, classification of educational objectives and learning styles, the learner's ability model and vocabulary memory-learning style model are constructed, which provide theoretical support for user modeling of intelligent recommendation system and improve the accuracy of recommendation [3].

Based on the demand investigation and previous literature research, the process design, database design and interface design of each functional module of the software are completed. Finally, the application of machine learning algorithm in personalized intelligent recommendation function of memorizing software is explored. For English educational institutions, how to recommend these resources to different learners, so that learners can combine their own needs and improve the application value of different teaching resources, is the focus of the relevant departments of English educational institutions [4]. At the same time, the problems of “resource overload” and “resource lost” have seriously troubled educational institutions. Therefore, it is urgent to introduce modern intelligent recommendation algorithm to complete personalized recommendation of different English teaching resources according to the actual situation of English learners' interests, so as to improve the efficiency of English teaching resources. The proposed vocabulary learning intelligent recommendation system can accurately recommend resources for users with different needs, different interest characteristics and different starting abilities, and improve the efficiency of future learners in reciting words by software [5].

2. Analysis of Main Business Processes of English Teaching System

2.1 Overview of Collaborative Filtering Algorithms

Before designing the system, it is necessary to analyze the business involved, so as to analyze its main functional requirements according to its business and provide the basis for the subsequent design [6]. In this regard, this paper combines the information source of the auxiliary teaching system, the destination of information flow and other data [7]. That is to say, according to the scores of similar users, active households make personalized recommendations for the scores of similar projects, which is a typical collective wisdom method. For example, when people want to see a movie, they usually consult people around them and ask people with similar interests and preferences to make recommendations. Its composition structure is shown in the figure. The algorithm consists of three parts: input, prediction and output. Here, the prediction engine is regarded as a “black box”. Its input is mainly the user's preference information, and it can also contain other information such as user attributes and item metadata. The forecasting engine generates the forecast according to the input information, outputs the forecast result and returns it to the user [8]. Personalized recommendation means that merchants find users' interest points by analyzing their behaviors, and recommend information and commodities that they may be interested in to users [9]. As opposed to personalized recommendation, personalized recommendation is non-personalized, such as the list of the most popular products and the latest products on e-commerce websites. It only makes statistical summary of product information according to factors such as users' rating, shelf time and click-through rate, etc., and realizes the “distribution” of simple information. The information obtained by all users is consistent, which is not a real personalized recommendation and cannot meet the needs of different users [10]. Personalized recommendation is to fully consider users' preferences and behavior habits, and actively recommend different products to different users to meet the changing needs of users. The implementation of personalized recommendation includes three processes: information input, recommendation method and output. Figure 1.

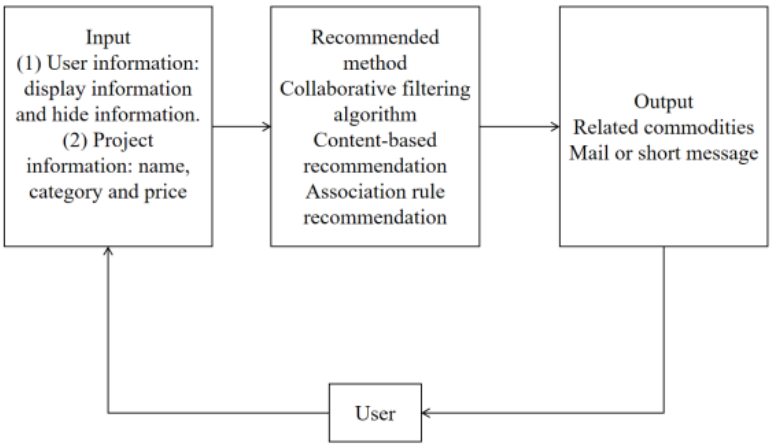

Fig.1 The Process of Personalized Recommendation

Web-based collaborative filtering algorithm is based on the assumption that users with similar interests are likely to be interested in the same project. The basic principle is: according to the preference information (score) of all households, find the neighboring households with similar interests to the current active users, and then make personalized recommendations for the current active households based on the preference records of neighboring households. The collaborative filtering algorithm of base users is shown in Figure 2.

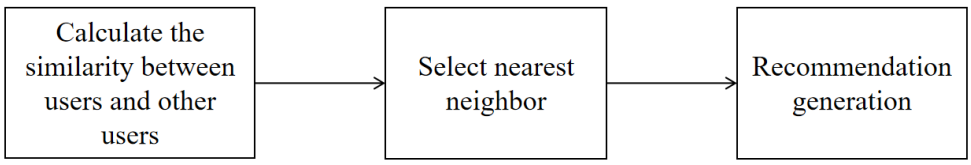

Fig.2 User-Based Collaborative Filtering Algorithm

Comparison of UBCF-IBCF prediction accuracy between item-based collaborative filtering algorithm and content-based collaborative filtering algorithm on data set is shown in Figure 3.

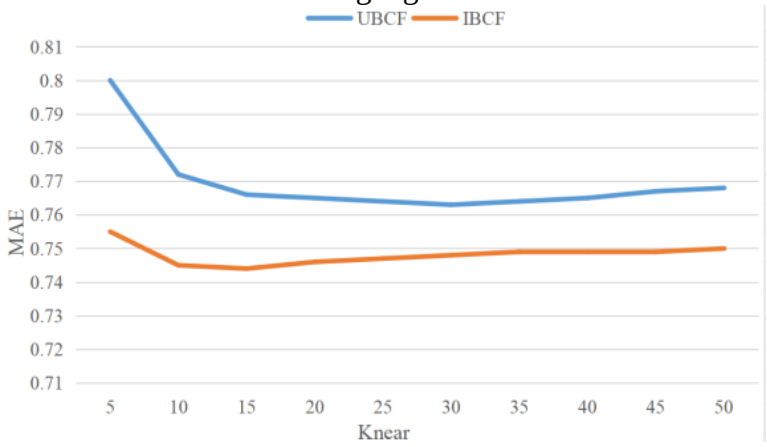

Fig.3 Comparison of Prediction Accuracy between Ubcf and Ibcf

2.2 System Use Case Analysis

The intelligent recommendation system of English teaching resources constructed in this paper is mainly for English learners. English learners can not only learn English resources, but also download them through the resource recommendation system. The resource uploader uploads

relevant English teaching resources through the system, including English courseware, English videos, images, English songs, etc. Therefore, according to the different roles mentioned above, the overall use case diagram as shown in Figure 4 can be drawn.

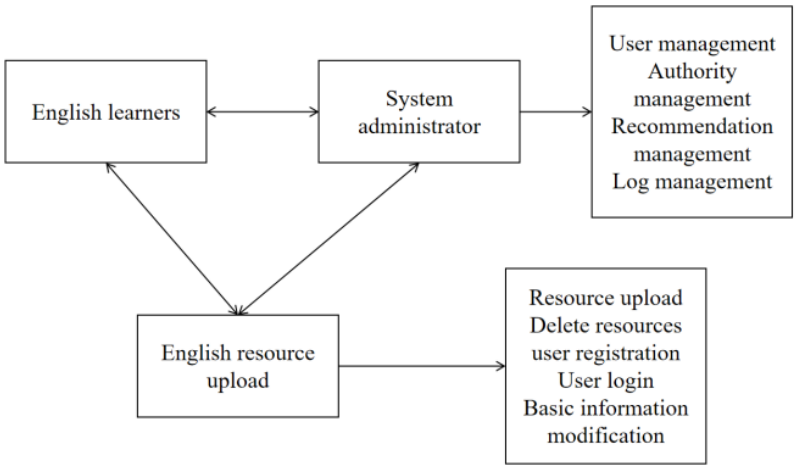

Fig.4 System Use Case Analysis

After obtaining the user's learning style feature vector, we can use clustering algorithm to divide the data points with “similar” features in the data set into unified categories, and finally generate a variety of learning styles. This process will be repeated until a certain termination condition is met- when no objects are redistributed to different clusters, or the cluster center without clusters changes again, the sum of error squares is locally minimum. Make its loss function:

$$E = \sum_{i=1}^{k} \sum_{x \in c_i} \quad (1)$$

Among them, the center point:

$$\mu_1 \frac{1}{|c_1|} \sum_{x \in c_i} x \quad (2)$$

In the traditional similarity calculation process, in the user-item scoring matrix, the unrated items are usually replaced by 0. There will be a problem with this filling method. If the items evaluated by users do not exceed 1%, the items that are not scored will exceed 99%, and the similarity between them will exceed 98%. This result obviously cannot explain the similarity between quantitative users. In this regard, in order to prevent all these problems from appearing, it will affect the final recommendation result. In this regard, for the projects that have not scored the teaching resource projects, it is predicted through the similarity of other users, and then Pearson similarity calculation method is adopted:

$$sim(i,m) = \frac{\sum_{u \in U} (R_{u,i} - r_i)(R_{u,m} - r)}{\sqrt{\sum_{(u \in U)} (R_{u,i} - R_i)}} \quad (3)$$

3. Design of Personalized Learning Recommendation System

3.1 Personalized Learning Recommendation Based on Students' Awareness and Interest

Every month, students have to take an English listening test based on ETS platform. The test questions cover all the questions on ETS, and the questions are divided into different grades according to their difficulty. In this way, students' grades represent and demarcate their English

learning cognition level (junior, middle and senior levels), which is also equivalent to the difficulty level of the questions in the test question bank. Enter the English awareness level of each student on the platform into the system and set it as the default value. Every time students log in to the system, PLRS will recommend learning resources suitable for students' own level according to their cognition, so that students can quickly and accurately find and obtain the learning information they need from a large number of resources on the platform. The system will recommend resources with similar difficulty to students with the same cognitive level, and the content will be randomly selected from the test question bank. One month later, the student union will take the exam again. In this way, PLRS will be able to judge the change of learning cognition according to the change of students' grades and grasp the individualized information needs of different students. Of course, being called a “good learning resource” by a learner must be “good” on the one hand, that is to say, a “good learning resource” is correct in content and can increase people's knowledge; But on the other hand, it should be more suitable for the learner. The design “good learning resource” is not suitable for every learner. Because teaching resources can only be called high-quality learning resources if they are really useful to learners. This view is consistent with the requirements of personalized learning for learning resources. Individualized learning requires that the teaching resources should be “human-oriented” and dynamic, that is to say, the learning resources suitable for individualized education will dynamically change the presentation sequence and form of the same knowledge according to different learners, so as to serve different types of learners. In the traditional face-to-face education, teachers usually have frequent contact with students and know learners well, so that they can directly serve learners according to their own knowledge of learners. Even so, it is unrealistic for teachers to consider every student. Moreover, in online education, due to the separation between teachers and students, teachers can't fully understand learners, and then they can't select appropriate learning resources for learners. How to intelligently push suitable learning materials to learners who are suitable for it has become one of the major problems that computers need to solve. The effectiveness evaluation of personalized educational resource recommendation system is more difficult to implement than the feasibility evaluation, and its main purpose is to verify the accuracy of the recommendation results of the recommendation system. From the feasibility evaluation, we conclude that the recommendation system can recommend learning resources that are satisfactory to learners, but such verification is not accurate enough. Whether the learning resources recommended to learners are suitable or not needs to be compared with the learning resources listed in the general system. In order to verify the accuracy of the recommendation effect, this evaluation adopts the form of learning resources recommended by the mixed recommendation system and other learning resources for learners to choose, so as to judge whether the push effect dyeing is effective or not. Then the controller assigns different business functions to different applications, and finally completes the interaction with data through DAO interface, and directly transmits the results to the view interface to show the user. Through this deployment mode, it has two advantages: First, it is easy to access, and users can access the system by clicking on the page without updating and installing; Second, the system runs stably. Through the logical processing of MVC, the whole auxiliary learning system runs more stably.

3.2 Recommend Ideas

English teaching resource recommendation system mainly includes two important roles: English teachers and students. From the perspective of teaching resources, it contains many types, such as images, audio and video. Therefore, if the traditional association rule algorithm is used to recommend these English teaching contents, it is difficult to make cross-domain recommendations. Therefore, the collaborative recommendation model is selected in the recommendation algorithm.

In addition, English teaching resources usually consist of attributes such as professional name, resource type, content brief introduction, author brief introduction, uploading time, etc., while students mainly include attributes such as student number, professional code and education type. In the process of recommendation, it is also considered that students may be interested in teaching resources of other majors besides their major. Therefore, the recommendation of teaching resources is divided into professional and non-professional. At the same time, considering the difference in scoring between new registered users and old registered users, different methods are used to recommend different users. To sum up, a teaching resource management system with collaborative recommendation function is the key to solve the problem of excessive accumulation of teaching resources and low efficiency. By introducing collaborative recommendation algorithm into the teaching resource management system, this paper aims to recommend different types of teaching resources to applicable users. The collaborative recommendation teaching resource management system is composed of personal space management, resource management, recommendation module and system management, which can meet the different functional requirements of users with different roles, so as to improve the sharing and utilization rate of teaching resources.

4. Conclusion

Collaborative filtering algorithm does not need to analyze the content of information resources, but shares other people's scoring experience, and uses collective wisdom to filter out those messy and irrelevant information. Therefore, collaborative filtering algorithm has high recommendation quality, and it can also be found that users themselves have no potential interest. From the perspective of artificial intelligence, this paper proposes an intelligent recommendation model for memorizing and learning English words. Taking adaptive learning as the main idea, this paper constructs the learner's ability model, and designs and develops the memorizing software that meets the user's needs. The purpose of this paper is to solve the defects of traditional memorizing software, such as outdated language materials, low accuracy of personalized recommended words and low sense of social participation, etc., to assist users in professional language learning, to rapidly expand their vocabulary, and more importantly, to learn professional related practical vocabulary, so that users can apply what they have learned. In traditional digital teaching, teachers guide students to complete exercises, and students still learn passively. The personalized learning recommendation system in this paper provides interactive learning, stimulates students' interest in learning, transforms traditional passive learning into active learning, and solves the problem from the source. Its personalized recommendation service improves learners' efficiency, greatly shortens the time to obtain required learning resources, and meets students' needs, thus making learning more organized and targeted.

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