

Analysis and Design of Personalized Recommendation System for University Physical Education

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Abstract—How to provide students with personalized physical education (P.E) course has become particularly urgent with the development of information technology in teaching of P.E and the increasing personalized demands of contemporary college students. This paper starts with the analysis of college students' demands for P.E classes, introducing ideas and technology about personalized recommendation, analyzes the functions and processes of the personalized recommendation system for P.E course at universities. Then, this paper designs the system application architecture.

Keywords- informatization of the college physical education ; personalized recommendation system; analysis and design of system

I. INTRODUCTION

In a network environment, people can take advantage of the rich information resources of the internet by powerful search engines and other means of fast transmission, so that information gathering and access has become very easy. However, due to the explosive growth in the amount of information, as well as the diversity of individual needs, it was found that accurate and quick finding of the needed information is increasingly difficult. Therefore, in order to meet the needs of individual customers, people began to seek outside helps to deal with the information overloading problem. In the early 1990s, recommendation system came into being a new tool.

Personalized recommendation technology was first used in e-commerce, and now has expanded to digital libraries, news, online communities and other fields. Broadly speaking, personalized recommendation system is based on users' known information (registration information, historical access records, scoring records and orders, etc.), making use of the related information filtering techniques and algorithms to recommend products, contents and information for users that meet their current interests (movies, music, books, news, pictures, web pages and friends on line, etc.). The word personalized stresses that provide differentiated services for each individual user [1-3].

This paper introduces the ideas and technology about personalized recommendation, and proposes design concept of the personalized recommendation system for physical education course in universities, in order to help physical education to be more effective for each students.

II. SYSTEM REQUIREMENTS ANALYSIS

In the field of physical education in colleges and universities, the information technology has been more popular and developed rapidly. At present, the university sports elective process is summarized in the following steps: First, the students log on elective system, view all the physical education courses offered by the school, and then the remaining capacity of interest and course, select the course. However, such a way that students in choosing elective PE courses has been largely restricted, students tend to be more focused on the completion of the corresponding physical education credits, it does not help students to truly understand their own physical condition, finding a suitable form of exercise, it does not facilitate student through the physical education course to enhance their physical fitness, neither develop their own favorite sports. As there are the big individual differences between students' needs of sports, such as the differences among their own physical conditions, interest preferences, exercise habits and etc, if the P.E information platform could meet the individual needs with a smart recommendation feature, it would be more helpful on raising students' interest in physical fitness and achieving the teaching goals.

The participants in physical education activities are students and teachers, and therefore, the personalized recommendation system mainly has three characters of users: students, teachers and system administrators. Students can use it to input personal information, and then send recommendation requests. The system will dynamically analyze the students' given information and provide them with personalized recommendation of course programs, as well as the recommended course-related information about teachers, venues and etc. According to the relevant permissions, teachers can manage the information about the physical indicators of students, courses and venues. They can also add, delete, modify or query all the content. System administrators will need to maintain users' basic information and their permissions.

In addition to these functional needs, due to a larger number of users, during the period of course election the visit will be more concentrated. So, when select the recommendation algorithm, it is necessary to consider making the system can handle large amounts of data in parallel, and a faster response speed.

III. SYSTEM DESIGN

Conceptually, the personalized recommendation system for university physical education course provides a "students' demands-based" service model [4]. That is to say, based on the information given by the students, it focuses on recommending students courses that may be required for physical fitness through the analysis of their personality, preferences and habits. To put it simply, it provides services or advices about training personality and guiding demands. Its fundamental purpose is to respect the needs of students' individual development, choose for them more appropriate physical education course, training programs or movement suggestions that point to their own characteristics.

This system takes advantage of the ideas about personalized recommendation system, but there are some differences between it and the system in the field of e-commerce [5]. The latter may analyze the users' historical access or purchase records, while the systems of this study just analyzes the information of individual students' inherent properties, it does not involve in any historical data which is formed when the students take the initiative to choose certain P.E class. There exists a link between the information of individual students' inherent properties and some specific course, and the system's recommending course is just on the basis of this link. Therefore, what students' attribute information is needed and how to link it to the course is important content to be studied for the design and implementation of the system.

A. System Function

The system function can be divided into four parts: input module, personalized processing module, output module, and user management module, in which the personalized processing module is the core of the whole system.

Input module is mainly responsible for the collection and update of users' information. Students log in to the system through the Student ID and the default password, and then they are expected to input basic information and personal preference information. The basic information shows the natural conditions such as gender, height, weight and so on. And the personal preference information refers to the preferences of students in sports, including the degree of endurance, preference of skill, space and number of participants etc. After teachers access to the system, they can input or update students' physical indicators (i.e. the test results of running, long jump, grip strength, vital capability and other physical tests), courses information and venues information. There are three types of courses: physical classes, special classes and experienced classes. The contents of physical classes and physical tests are the same; the special classes are offered to supply students with targeted learning and teaching resources at the basis of physical classes, such as basketball, volleyball, etc; the last type of classes is to meet students' interests and hobbies giving them additional experience, such as hip-hop, bowling and so on.

Personalized processing module is the critical part of the system, which directly determines the performance of the system, it includes the following functional parts : confirm the identity of students in order to provide different students

with different recommendations; collect students' personal preference about sports and their physical information; after the students pass the certification, the system obtains their records about personal preference and physical test; generate recommended program of physical education course according to the preference information combined with the physical conditions and the main training objectives of various courses. The physical classes are recommended to enhance students' weak physical items; when the system gives the alternative special classes, it will analyze users' preference as well as their physical conditions; while the experienced classes are primarily recommended due to the preference information.

Output module should display various types of course programs recommended to the users. The programs include recommended courses, recommended reasons, the relevant venues information, other similar courses, other sports proposals. User management module for system administrators is to manage the basic information for students and teachers' permissions.

B. System Process

The implementation process of the system is shown in Figure 1: students log in to the system (student permission) and input basic information and personal preference information, thereby the two forms named the basic information table and the preference information table can be made; the relevant teachers from the Department of P.E (teacher permission) input students' physical test information to generate physical information table, then all the three tables will be handled by personalized processing module to get the students needs of sports; teachers log in to the system (teacher permission), input the information of course and venue resources which will be stored and constitute the recommended program resource database; the personalized processing module changes students' personal information into the standardization of weights to be calculated, combines the individual needs of students in sports and the recommend program resource database for the corresponding data processing, then gets the final recommended program about the P.E course, and returns it to the students as the reference to choose P.E classes.

C. System Application Architecture

The application architecture of personalized recommendation system of university physical education course can be divided into 3 layers as shown in Figure 2: the data layer, the business layer and the presentation layer.

Data layer includes the raw data pre-processing module and the data management module, it is responsible for the integrated treatment of a variety of data which the system requires, and it can effectively achieve the separation between the recommendation system and transaction processing.

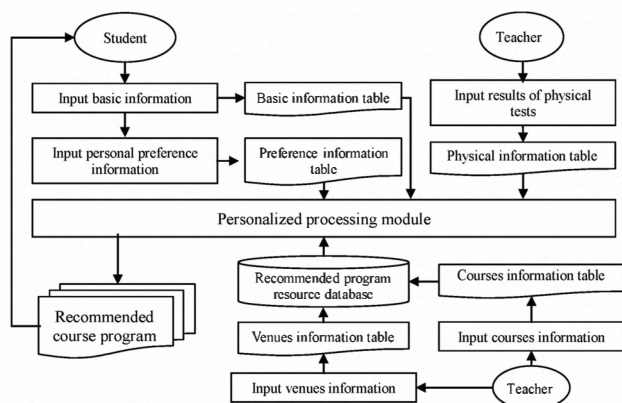


Figure 1. System Process diagram

Business layer is the core of the system. The user interface is used for receiving the request information which Web pages send, and will return the produced results page. Recommendation engine accepts the recommendation request of users, running the strategy to produce the results recommended. Recommended program management module selects the recommended strategy for the recommendation engine, will connect the recommendation system database and recommended program resource database through the relevant algorithms, thus provides the recommended program, which is the core of the recommendation system [6]. In this paper, the recommendation system may apply the feature-based Collaborative Filtering Recommendation Model (FCFM), using Pearson correlation algorithm [7], calculates the correlation of the students' personal information with the students' type stored in the recommendation system database, and thus provides the recommended appropriate program. Recommended system database management module stores data which the recommend program needs. The data usually does not need real-time updates. It is a relatively static data, such as students' type information, the relationships between the type and course results. They can be obtained by clustering algorithm. First, collect students' information, access to students' basic information and physical fitness, preferences and other information, processing the information structurally into a unified structured data, that is, storing the information which is input when the students log on the system in a structured data format. And it will take a clustering research on students according to a large number of students' personal information. Then generalize and analyze the clustering results, sum up the key features, and summarize the characteristics of each type of student. Combine course objectives, course requirements for every index of students and so on to define course options for each category of students, in order to establish a relatively static relationship between the student types between the course options. Of course, this relationship can also be drawn by the way of analyzing the nature of the course its own, defining the scope of the indicators which are appropriate to a variety of courses, and then comparing the students' individual indicators with the standard indicators scope.

After the users send a recommendation request, the recommendation engine will carry out the recommended strategy selected by recommended program management module, achieving the recommended tasks, interacting with the user through the presentation layer.

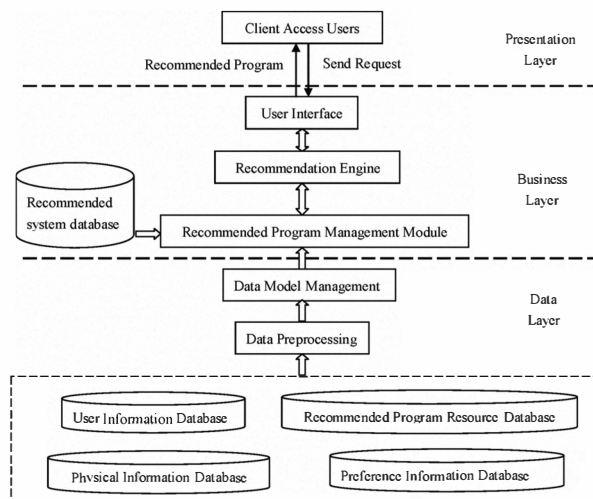


Figure 2. System application architecture diagram.

IV. CONCLUSION

The research and design of the personalized recommendation system of university physical education course could satisfy the individual requirement of the contemporary college students in physical education, and offer a detailed theoretical basis for informatization of the college physical education with high value of application and research. Personalized teaching has become an inevitable trend in the education development process, but also with the realization of the objective conditions.

The recommended process in the system designed in this paper is unidirectional. Results of the analysis will be recommended to students, students can view the recommendation of the different results by changing the personal information input, but they do not have two-way interaction with the system through students' giving feedback and system's modification. This feature could learn from methods of analysis of users' ratings in the e-commerce personalized recommendation system and be realized, which would be the research direction of upgrading and improvement of this system in the future.

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