Practice and Exploration of Completely Online Network Teaching with ID3 Algorithm

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Abstract. Using big data information technology can extract rules from massive data. Through the information collation, collation and analysis of the massive data of online teaching, it can provide effective decision-making reference, as well as the education industry. Introducing information technology into network teaching platform can effectively improve students' learning effect and teaching management level. Using information technology to explore the inherent law of online teaching can provide reference for the decision-making level of education and teaching, and can also provide guidance for the overall teaching task and teaching plan.

Keywords: Big data · Data mining · Association rules · Clustering algorithm · Personalized education

1 Introduction

In recent years, China has vigorously promoted educational reform and the application of educational technology. The application of computer technology, information technology, network technology and other new technologies has made the prospect of higher education more positive development. Through the survey, it is found that the application of most university network platform is relatively simple, and most of the network platform has become the educational administration platform or network library platform of each university, and the teaching task is not satisfactory. From the current technical point of view and teaching task requirements, it is not feasible to completely use the internet teaching platform to replace manual teaching, but it is feasible to use the internet teaching platform as an auxiliary means of artificial teaching or even as an elective course teaching platform. After observing the network teaching system of several colleges and universities, it is found that the current network teaching platform is the carrier of students' course selection, score inquiry, registration information and other functions. From the perspective of functionality, the network teaching platform is more inclined to the educational administration system [1]. Many students' learning information, student status information, course selection information, grades and other contents are not related to each other, but in fact, the connotation law information has not been used.

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2 Integration, Optimization and Quantity Construction of Existing Resources

2.1 Further Enrich and Improve All Aspects of Resources, Optimize the Existing Courseware

Although there is a complete set of teaching software in the teaching resource library of the drawing course, and there are more than 1000 test questions stored in the computer system, and the content covers the existing content of the whole course, in practice, we try our best to make more dynamic renderings, so as to make the two-dimensional image into a vivid three-dimensional effect, and make the students understand the knowledge of the textbook more intuitive and easier, At the same time, the teacher guides the students to do it by themselves, enriches the online resources, and selectively puts the students' exercises into the resource database, so that the later students can have more resources to read, draw and test constantly, so that the students can consolidate their knowledge in a very relaxed environment. The objectives of teaching reform are as follows: (1) based on the advantages of network resources, students can quickly establish more abstract spatial thinking and spatial imagination ability, integrate information technology and graphics organically, and promote students from passive and abstract learning thinking to actively watch realistic objects on the network, so as to build a three-dimensional world to two-dimensional plane.

2.2 Use the Existing Network Platform to Build a Comprehensive Network Teaching System

In order to give full play to the advantages of network resources, our school selects "hero Shuangyi" as the teacher resource database, and builds it on this platform. We have made five modules, They are: (1) the specific content of the online course content module has been described earlier; (2) the content of the student learning guidance module includes the syllabus, experimental syllabus, teaching schedule and learning objectives of each chapter; and (3) the tutoring and answering module, which mainly provides online discussion, topic forum, and so on, Questions and answers 16 edification, etc.: Practical Exploration of drawing teaching reform based on network resources (4) learning evaluation module can check the answers of exercise questions online, test online, submit homework, query scores, etc. The module also provides thinking questions, noun explanation, judgment questions, multiple-choice questions, and blank filling questions related to the learning content. (5) The related resource module provides students with links to similar and related courses, as well as references and additional learning materials, the latest scientific research achievements of engineering graphics, and the latest CAD software, so as to expand students' horizons and understand the most cutting-edge technology of graphics science and technology.

3 Making Full Use of the Existing Multimedia Courseware and Question Bank to Carry Out Online Teaching

3.1 Master Feedback Information and Develop Skills

As early as 2001, computer multimedia teaching has been implemented in the drawing course of our school. Then the school encouraged teachers to carry out the teaching reform of network course. We moved the original multimedia courseware of drawing to the Internet by categories. According to the key and difficult points of the course, we integrated the courseware into three parts (descriptive geometry, mechanical drawing, computer drawing) to make use of the image and vivid animation effect of network resources, Reappear the content explained in class, help students to establish the ability of spatial thinking and spatial imagination, and solve the contradiction of less class hours and more learning content. Organize students to study creatively in the network environment, enhance students' information inquiry ability, self-study ability and speculative ability. At the same time, use the existing question bank, let students evaluate their study on the Internet, master the feedback information in time, and finally cultivate their own skills.

3.2 Teaching Method

Based on the established network teaching system, the teaching reform of drawing teaching based on the utilization of online resources is carried out. In the three major modules of teaching, there are 60 class hours to arrange classroom situation teaching, 30 class hours to carry out personalized online autonomous learning, and 20 class hours to combine classroom situation teaching with personalized autonomous learning. Based on the classroom situation teaching: each module in the beginning of the process is in the multimedia network classroom situation teaching, the teaching requirements of this module, the teaching progress, the focus of this section, the difficulties and the problems to be discussed, the questions to be answered to the students a comprehensive introduction. According to the difficulty of the teaching content and the students' acceptance ability, the teacher makes the more abstract and difficult content concrete, which makes the students easy to accept and disperse the difficulties in the cognitive process. The teaching time of each module is about 3/4 of the class hours of the content, and 2/5 of the time is for the students to browse the content of the module online.

4 Decision Tree Analysis Algorithm

4.1 Basic Algorithm of Decision Tree

Decision tree is a common and important data mining method. The implementation of the algorithm is to use the top-down greedy algorithm to sum up the given data samples, extract classification rules from the unordered data tuples, and recursively generate a tree structure from the top root node. Each branch node of the tree structure represents test or selection results, Through the reasonable classification of each selection result, the process continues until all the attributes are traversed, and finally the decision tree

is generated. Decision tree algorithm mainly includes two processes: constructing tree and pruning decision tree. The former means that the input training data is taken as the function value of the established algorithm, the output different attribute values are generated into each branch, and each branch continues to carry out recursive operation to the lower level, and finally forms the decision tree; for the newly established decision tree, a considerable number of branch nodes are generated because the input training sample data contains abnormal content, This is why the decision tree must be pruned. The whole decision tree process is shown in Fig. 1. At present, the typical decision tree algorithms are cart, ID3, CHAID and so on [2].

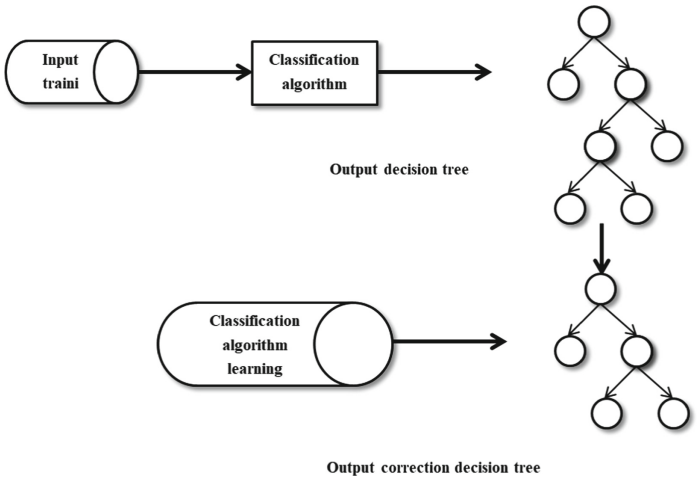

Fig. 1. Decision tree generation process

4.2 ID3 Algorithm

Among many decision tree algorithms, D3 is a basic algorithm formed earlier. It is a greedy algorithm, which uses the top-down recursive classification structure to generate the decision tree. The model generation method of the algorithm is relatively simple and robust, and the classification accuracy is high. It has good classification and statistical ability for the non incremental data sample set in the process of network learning, which is more suitable for application in the field of educational data mining [3]. The following is a simple discussion of ID3 algorithm.

ID3 uses the information gain as the measurement unit when selecting the branch node attributes. For data set s, the expected sample information is as follows:

$$I(n_1, n_2, \cdots, n_m) = \sum_{i=1}^{m} P(y_i) \log_2 P(y_i) \tag{1}$$

In the formula of information gain, we need to weighted average the information quantity of system samples, and the parameter obtained is information entropy. The

entropy of data set s divided by description attribute d is as follows:

$$E(D_f) = \sum_{s=1}^{q} \frac{n_{1s} + \cdots + n_{ms}}{cout} I(n_{1s}, \cdots, n_{ms}) \tag{2}$$

Among them:

$$I(n_{1s}, \cdots, n_{ms}) = -\sum_{i=1}^{m} p_{is} \log_2(p_{is}) \tag{3}$$

By calculating the information gain of all the attributes, D3 algorithm forms the test attribute in the data sample set s with the largest gain, and then generates the branch node. The branch node is also marked as index attribute and classified into the given sample set.

5 Exploration of Teaching Methods

5.1 Pay Attention to Combine with Practice

Secondly, due to the concentration of teaching in different engineering master's class, students are prone to fatigue and inattention in the process of continuous listening. Therefore, how to ensure the quality of students' listening and stimulate students' interest in class is the main content of teaching method exploration. For example, when teaching the chat program based on wins α K, first ask the students to think about the basic functions of the client-side and server-side programs, the functions to be called, and the call process, and encourage the students to demonstrate in class, On the basis of the students' program, the teacher points out the mistakes or improvements; (2) pay attention to the combination with the reality of life, and try to use simple language to express the theoretical principles. Improving teaching quality.

Most of the part-time software engineering postgraduates are on-the-job students. In order to make students apply what they have learned, improve their learning initiative and ability to solve practical problems independently. The course group encourages students to put forward the problems and needs encountered in the actual work and discuss with teachers, and independently design their own comprehensive experiments. For example, the students working in the hospital designed and implemented the medical information management system according to the medical treatment process; the students working in the telecom designed and implemented the WAP Portal background management system according to their own work needs; the students working in the website designed and implemented the streaming media live broadcast system based on mode according to the customer needs [4–6]. The course group first constructs the advanced content system from the perspective of network software design and development; then designs the online experimental platform in strict accordance with the software development specifications; finally provides rich teaching resources and communication environment to students from all over the world through the resource sharing platform. In addition, some teaching methods such as "basic teaching links", "interactive teaching mechanism" and "students' participation in the course construction" are put forward to ensure the teaching quality of the course and improve students' interest in learning.

6 Pay Attention to Combine with Practice

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7 The Importance of Summary

In addition to the construction of hardware resources, the course team also explored the teaching methods of this course in combination with the characteristics of software engineering postgraduates, including determining the basic teaching links, ensuring the teaching quality, using heuristic, interactive and other teaching methods to stimulate students' interest in the classroom, The first step is to determine the basic teaching links. The course group divides the teaching content into seven relatively independent lectures. Each lecture includes such basic links as "review of the previous lecture content, introduction of learning objectives and learning methods, introduction of main contents and examples, and summary of the lecture content".

8 The Practice of MOOC Teaching in the Internet Age

According to the exploration and practice of programming class, we find that the effect of MOOC teaching is closely related to the perfection of online platform. In order to better realize MOOC teaching, the following characteristics should be provided. First, it can provide learning resources and realize online real-time interactive communication. This platform needs not only complete learning resources, but also the communication between teachers and students and teachers in the same school. On the basis of school internal communication, we can further realize cross school communication and foreign school communication. Teachers and students have different permissions of the system, teachers can push the outline of the class, homework layout and correction, while students mainly submit homework. Students first learn micro video resources online and complete relevant exercises. Any problems they encounter can be published on the platform. Classmates and teachers can answer them. In addition to supporting web browsing, they can also learn through the corresponding mobile app. In the Internet age, the use of smart

phones has been very common, and the common characteristics of smart phones are large screen, fast running and convenient networking. In modern society, many functions of field brain have been replaced by portable smart phones to a certain extent. Therefore, compared with computers, learning through smart phones is a more popular way for students. Students' timetable is usually full and time is tight. Using mobile app can make students' learning and homework time more flexible.

9 Simulation Analysis for Course Recommendation

9.1 Overview of Recommendation System Based on Clustering Collaborative Filtering

Clustering is a method to classify objects with physical form or abstract form according to some characteristics, which is very suitable for personalized course recommendation. Because through the above data mining, we can get some inherent problems of students' learning rules. After finding the clusters of students' groups, similar cluster matching is carried out, and then Personalized Course recommendation is made for students.

The basic process of personalized recommendation system based on clustering collaborative filtering is as follows: firstly, the interaction process between students and the course system is determined and information is accumulated; secondly, the database is established by using the accumulated information; secondly, the information data in the database is preprocessed; thirdly, users are clustered according to the processing results; thirdly, similar matching is performed for different clusters after clustering; thirdly, curriculum recommendation is made according to the matching results. In short, the process of recommendation is formed by processing the relevant information learned by students in the network teaching platform (or network educational administration system), which is the basic principle of clustering collaborative filtering personalized recommendation system.

9.2 Data Acquisition

The first step is to get personalized courses and students' preferences. Before operation, the core meaning of data acquisition must be clear, and the students' preference for some courses can be determined through the interaction between students and online course system. The background of the network teaching system can query the students' course subscription, and the degree of students' interest in the course can be found by observing the subscription frequency of some courses; in addition, for some necessary courses, the degree of students' preference for the courses can be determined according to the students' learning frequency, access frequency, review frequency after learning and other information. In addition, the network teaching system is also embedded in the curriculum evaluation system, through the students' subjective and objective evaluation of the course, the students' satisfaction degree feedback can be determined. As the feedback of the adoption criteria, it can be determined by objective scoring, and the subjective evaluation is used as the reference for curriculum improvement and curriculum arrangement. Before and after the course selection, the students will conduct an objective

questionnaire survey. The questionnaire includes the students' interests, professional course quality, infrastructure literacy and other information, as well as the satisfaction degree of the course, class arrangement and content arrangement. The comprehensive mapping is carried out through implicit data and image data [7].

The standard differential evolution algorithm is a random search algorithm. The basic idea of the algorithm is to calculate the vector difference of two individuals in different populations from a random initial population, and then sum with the third individual according to some specific rules to generate a new individual, and compare the new individual with the single individual determined at present, If the fitness of the new individual is better than that of the determined one, the new individual will be replaced [8–11]; otherwise, the new individual will be deleted, which is similar to the elimination algorithm of survival of the fittest, which gradually guides the search process to the most favorable result. In addition, the convergence rate of the algorithm will be greatly affected by the convergence rate of the algorithm in the later stage, and even the convergence rate of the algorithm will be improved. By introducing a more reasonable shrinkage factor and cross probability parameter, the algorithm is adaptively adjusted, and the termination condition of the original algorithm is improved, because the termination condition required by the calculation is not the optimal solution in the standard algorithm.

We know that some recommended courses are not willing to be learned by students, but they are compulsory, as shown in Fig. 2. From Fig. 1, we can see that the willingness of teachers is very high, but the willingness of students is very low. As a result, students sometimes do not learn through the courses recommended by teachers, which is also the reason for students' low learning efficiency.

From Fig. 3, we can also see that if it is a compulsory recommended course, students' willingness to learn will reach the peak. After the peak, students' willingness to learn will decline rapidly.

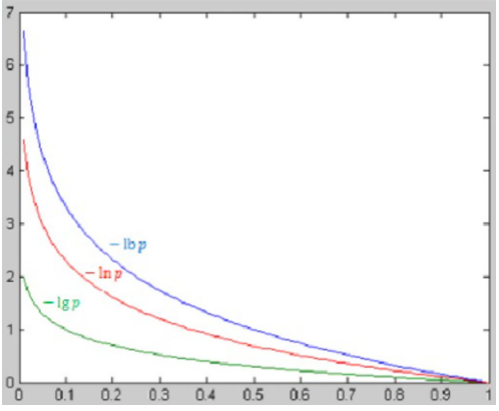

Fig. 2. Decesion Algorithm for Course recommendation

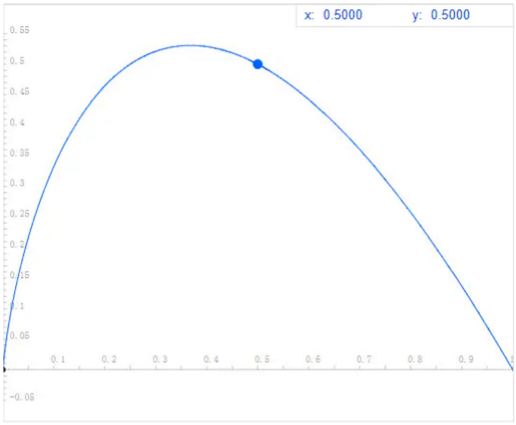

Fig. 3. Course recommendation rate

10 Conclusion

Network teaching requires teachers to extract reliable and useful learning feedback information from a large number of redundant and complicated teaching process data, and timely update and adjust teaching strategies, methods and contents on this basis, so as to solve the problem that online teaching can't carry out on-site interaction, realize personalized guidance for individual teaching, truly teach students in accordance with their aptitude, and improve the effect of online learning. Therefore, educational data mining technology plays an important role in online learning environment. Among many data mining technologies, ID3 decision tree algorithm is especially suitable for large-scale online learning because of its strong learning ability and easy implementation. In addition, the generated decision tree can express the classification rules corresponding to different branches vividly, and the algorithm is easy to read and use, especially suitable for the technical tool of educational data mining (EDM). With the rapid development of Internet technology and the popularity of big data technology and cloud technology in recent years, it has triggered a series of changes in university teaching. The introduction of MOOC teaching is a very obvious performance.

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