Design of Computer-Aided Course Teaching Control System Based on Supervised Learning Algorithm

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Abstract. With the development and maturity of computer and multimedia technology, computer-aided instruction represents advanced teaching ideas and methods. Based on this, the design of computer-aided course teaching control system based on supervised learning algorithm is proposed. The hardware composition and software design of the system design are introduced. Through the main modules: login and registration module, learning mode selection module, learning content selection module, test module operation. Relying on the constraints of multiple identities in the teaching process by the logical structure of the database, the teaching management platform can control and supervise student learning. In order to better test the effectiveness of the system designed in this paper, a comparative experiment of system control learning and free learning is performed. The results prove that compared with free learning, the learning of computer-assisted curriculum teaching control system can better urge students to learn, and the learning effect is better. The teaching control system is superior to the traditional teaching system in improving students ‘interest and motivating students’ learning enthusiasm.

Keywords: Supervised learning · Computer aided · Course teaching · Control system

1 Introduction

With the rapid development of information technology today, modern information technology has penetrated into all walks of life and has been widely used, and has played an important role in the daily work of various industries [1]. In recent years, with the continuous deepening and extensive development of national education and teaching reform, the role of information technology in teaching reform has become increasingly prominent. The application of information technology has made teaching reform more efficient, the use and sharing of resources more convenient, and has greatly promoted teaching the process of reform.

The core of the course teaching assistant system is multimedia computer technology and network technology. It has the diversity of teaching information carriers, the digital
nature of teaching information processing, the hypertext nature of teaching information organization, the interactive nature of teaching information performance, and the diagnosis of the teaching process. Sex and other characteristics. The introduction of it has caused a more profound change in the traditional teaching method. It has a great advantage compared to the traditional teaching method. It can optimize the classroom teaching structure. Use the curriculum teaching auxiliary system. The teaching information load is large and the teaching content is rich, which is conducive to motivating students to learn. Interest, improve the teaching environment, and optimize the structure of classroom teaching [2]. It is conducive to highlighting teaching points and breaking through difficult points to guide and demonstrate important teaching content and experimental phenomena in more ways, so that students are more impressed with this part of the content.

Regarding supervised learning algorithms, this paper uses conditional probability to calculate the similarity between two bodies, that is, the similarity in the extracted data structure [3]. First select any body arbitrarily, regard it as a class (this class contains several observations), and record it as A; The observations of other individuals belong to one category, and each category contains only one observation. Calculating the probability between class A and other observations, we get the similarity between class A and other observations.

2 Hardware Composition of Computer-Aided Course Teaching Control System Based on Supervised Learning Algorithm

When designing the hardware scheme of this system, according to the feasibility, applicability and scalability of the network technology, the hardware environment uses the now very mature shared 10 BASE-T Ethernet Ethernet. Its bandwidth of 10 Mbps can basically meet the needs of high-speed transmission such as video data streams. The shared 10 Mbps Ethernet media has grown from the original thick and thin coaxial cable to the current double-stranded cable. Its technology is quite mature and its performance is very stable. In particular, 10 BASE-T uses a hub to centrally manage the network connections of each computer, which greatly reduces the failure rate, and a single connection will not affect the connection of the remaining network cables. This overcomes the shortcomings that affect the overall situation when using coaxial cables to connect, and the network operation is more reliable. Considering the future expansion situation, the network of this system has some room for expansion. It can be smoothly upgraded to 10 MbSP bandwidth Ethernet, and segment management of the network segment can be realized. This can be used as a second step-by-step implementation. The system server is Digital Equipment Corporation’s CelebrisXJ5100 small workgroup server [4]. Configured as dual Pentium 100 CPU, 32 MECC memory, dual GB-level SCSI interface hard disk, high-speed CPI socket network card, has strong self-care ability and sufficient expansion capacity.

The workstations are two EP int ml 20 multimedia workstations and several 486-level PCs with different configurations. Both multimedia workstations use PCI network cards, and the remaining models are ISA network cards.
3 Software Design of Computer-Aided Course Teaching Control System Based on Supervised Learning Algorithm

3.1 Functional Design of Main Modules

Login and registration module. The main task of this module is to collect the basic information of the students, but also to let the students estimate their interest and cognitive ability in this course [5]. It should be noted that the interest value, cognitive ability value, and student grade value at this time are preliminary evaluations. The system will continuously adjust this according to the student’s learning situation in the subsequent learning process, and gradually approach the actual situation of the student. To build a more realistic student model. As shown in Figs. 1 and 2.

![Login module](image)

**Fig. 1.** Login module

In the registration module, in addition to the interest value and cognitive ability value estimated by students during registration, in addition to being represented by a number between 0 and 100, other methods can be used, such as: interest can be divided into interested, general and uninterested The three levels divide cognitive ability into three levels: strong, normal, and weak.

Learning mode selection module. The task of this module is to ➀ evaluate the student’s grade according to their cognitive ability and learning interest [6]. The specific method of evaluation is described above; ➁ Let students choose the learning method. There are two ways of learning: one is to learn under the control of the system, and the other is to learn freely without the participation of the system. If the student chooses the system control mode to learn, the system will choose the learning content for the student according to his grade. Test module. Students will be tested after each knowledge point is completed. The forms of the test questions are multiple-choice questions, blank questions, and yes/no questions.
3.2 Constraints on the Logical Structure of a Database

Based on the analysis of entities and their relationships in the above conceptual structure, data tables and constraints are established in the database, as detailed below.

The administrator table is used to store administrator information and administrator authentication without association with other tables [7]. The administrator table is defined as shown in the table (Table 1).

| Name       | Data type and length | Restrain               | Describe                      |
|------------|----------------------|------------------------|-------------------------------|
| Admin ID   | Nvarchar(20)         | Major key              | Administrator no.             |
| Admin name | Nvarchar(20)         | Non-empty, Unique key  | Administrator username        |
| Admin Pwd  | Nvarchar(20)         | Non-empty              | Administrator’s password      |

The teacher table is used to store teacher information and teacher identification, and its data comes from the basic information data of teachers outside the system, and the user name and password, mailbox and so on of the course teaching assistant system are added on the basis of the basic data. All teacher activity record data in the system depend on this table (Table 2).
### Table 2. Teacher tables

| Name     | Data type and length | Restrain          | Describe                        |
|----------|----------------------|-------------------|---------------------------------|
| T-ID     | Nvarchar(6)          | Major key         | Teacher number                  |
| T-name   | Nvarchar(50)         | Non-empty         | Name of teacher                 |
| T-uname  | Nvarchar(20)         | Allow empty, Unique key | Teacher registered user name    |
| T-uPwd   | Nvarchar(20)         | Non-empty         | Teacher’s code                  |
| T-Sex    | Nvarchar(2)          |                   | Gender of teachers              |
| T-Dept   | Nvarchar(50)         |                   | Department of teachers          |
| T-Birth  | Date                |                   | Teacher’s birthday              |
| T-Email  | Nvarchar(50)         | Unique key        | Teachers’ mail box              |

The teacher table is shown in the table. The student table is used to store student information and student identity identification. Its data comes from the basic information data of students outside the system [8], and the user name and password, mailbox and so on of the course teaching assistant system are added on the basis of the basic data. Student activity record data in the system are dependent on this table. The student table is shown in the table (Table 3).

### Table 3. Student tables

| Name     | Data type and length | Restrain          | Describe                        |
|----------|----------------------|-------------------|---------------------------------|
| S-TD     | Nvarchar(20)         | Major key         | Student ID                       |
| S-name   | Nvarchar(50)         | Non-empty         | Student names                    |
| S-uname  | Nvarchar(20)         | Allow empty, Unique key | Student registration username |
| S-uPwd   | Nvarchar(20)         | Non-empty         | Student code                     |
| S-Sex    | Nvarchar(2)          |                   | Student gender                   |
| S-Dept   | Nvarchar(50)         |                   | Student Department               |
| S-Class  | Nvarchar(50)         |                   | Student classes                  |
| S-Birth  | Date                |                   | Student’s birthday               |
| S-Email  | Nvarchar(50)         | Unique key        | Student mailbox                  |

The resource category table is used to store the classification of course resources in the system. Because the level of the classification can not be determined, the foreign key is set to point to the primary key of this table. The resource category table is shown in Table 4.
Table 4. Resource categories

| Name       | Data type and length | Restrain      | Describe                                           |
|------------|----------------------|---------------|----------------------------------------------------|
| R-ID       | Int                  | Major key     | Resource category number                          |
| R-type     | Nvarchar(50)         | Non-empty     | Name of resource category                         |
| R-Parent ID| Int                  | External keys | Category number of resource category              |

The course resource table is used to store various types of resource document information in each course, such as syllabus, lecture notes, etc. This table only holds the information related to the resource document, such as the file name, path and so on of the specific resource document. The resource category in this table refers to the resource category table; the resource class refers to the lecture task table, and the reference relationship here is implemented by trigger [9]; The resource publisher refers to the teacher table, see the teacher number of the table, the resource release time takes the current system date time as the default value, the number of resource views takes the default value, and the resource title is used to display the resource list. The course resource table is shown in the table (Table 5).

Table 5. Course resource table

| Name       | Data type and length | Restrain      | Describe                                           |
|------------|----------------------|---------------|----------------------------------------------------|
| R-ID       | Int                  | Major key     | Resource no.                                       |
| R-path     | Nvarchar(50)         | Non-empty     | Resource file name and storage path                |
| R-type     | Int                  | Non-empty, external keys | Category of resources |
| R-course   | Nvarchar(50)         | Non-empty, external keys | Resource-owned courses |
| R-puber    | Nvarchar(6)          | Non-empty, external keys | Resource publishing teacher                        |
| R-up time  | Date time            | Windows default | Resource release time                               |
| T-Read times | Int                 | Windows default | Number of resource views                           |
| T-Explain  | Nvarchar(50)         | Non-empty     | Resource heading                                   |

The teaching task table is used to store the teacher’s teaching task information, and as the basis of authority inspection when the teacher operates, so that only the teaching teacher can carry out the operation of course resource management and so on [10]. Among them, the teacher refers to the teacher table, and there is a check constraint in the teaching term to ensure that the value can only be sum. The lecture task table is shown in the table (Table 6).
Table 6. Teaching assignments

| Name     | Data type and length | Restraine | Describe                      |
|----------|----------------------|-----------|-------------------------------|
| M-ID     | Int                  | Major key | Lecture task no.              |
| M-Class  | Nvarchar(50)         | Non-empty | Classes                       |
| M-dept   | Nvarchar(50)         | Non-empty | Student registration username |
| M-teacher| Nvarchar(6)          | Non-empty, external keys | Instructor                    |
| M-course | Nvarchar(50)         | Non-empty | Course title                  |
| M-Semester| tinyint             | Non-empty | School term                   |
| M-Year   | Nvarchar(20)         | Non-empty | School year                   |

The question-and-answer sheet is used to store information about student questions that interact with teachers and students, where the course to which the question belongs refers to the course name in the lecture schedule, a constraint implemented by a trigger; the questioner refers to the student table; and whether the typical question and whether the correct answer are available take default values. The answer sheet is shown in the table (Table 7).

Table 7. Questionnaires

| Name     | Data type and length | Restraine | Describe                      |
|----------|----------------------|-----------|-------------------------------|
| Q-ID     | Int                  | Major key | Question no.                  |
| Q-Title  | Nvarchar(100)        | Non-empty | Title of question             |
| Q-Course | Nvarchar(50)         | Non-empty, external keys | Question-based courses        |
| Q-Puber  | Nvarchar(50)         | Non-empty, external keys | Question vector               |
| Q-Pub time| Date time           | Non-empty | Question time                  |
| Q-Content| Nvarchar(MAX)        | Non-empty | Specific questions             |
| Q-is Typical| Bit                |           | Typical questions             |
| Q-is Answered| Bit              |           | Is there a correct answer     |

The Q & A question response form is used to store the information of the students’ responses after the student-teacher interaction, in which the question belongs to the Q & A question table (see the question number in the table); Student ID, and when the respondent is a teacher, the respondent refers to the teacher table. See the teacher’s work ID in the table. This reference is implemented through triggers. The default is whether the responder is a teacher and the answer is correct. The table is shown in Table 8.
Table 8. Replies to questions

| Name              | Data type and length | Restrain                        | Describe                                           |
|-------------------|----------------------|---------------------------------|---------------------------------------------------|
| A-ID              | Int                  | Major key                       | Reply no.                                         |
| A-Question ID     | Int                  | Non-empty, external keys        | Reply to question number                          |
| A-Content         | Nvarchar(MAX)        | Non-empty                       | Reply                                             |
| A-Puber           | Nvarchar(20)         | Non-empty, external keys        | Respondents                                       |
| A-Pub time        | Date time            | Non-empty                       | Recovery time                                     |
| A-is Teacher      | Bit                  |                                 | Whether the respondent is a teacher             |
| A-is Correct      | Bit                  |                                 | Is the answer correct                             |

The course assignment table is used to store the assignment information assigned by the teacher during the course of the lecture, where the assignment belongs to the course reference task table, see the course name in the table, this constraint is implemented by the trigger; the assignment publisher refers to the teacher table, see the teacher number in the table: the assignment release time defaults to the current system date time. The course assignment sheet is shown in the table (Table 9).

Table 9. Course assignment tables

| Name    | Data type and length | Restrain                        | Describe                           |
|---------|----------------------|---------------------------------|------------------------------------|
| H-ID    | Int                  | Major key                       | Operation no.                      |
| H-Detail| Nvarchar(MAX)        | Non-empty                       | Job content                        |
| H-Course| Nvarchar(50)         | Non-empty, external keys        | Courses of assignment              |
| H-Puber | Nvarchar(20)         | Non-empty, external keys        | promulgator                        |
| H-Pub time| Date time           | Windows default                 | Time of release                    |
| H-Deadline| Date time           | Non-empty                       | Submission deadline                |

The student assignment table is used to store the information of the assignment file submitted by the student after completing the assignment assigned by the teacher. The course assignment number to which the submitted assignment refers to the course assignment table, see the assignment number in the table; the submitter refers to the student form, see the table the student ID of the student; the assignment submission time defaults to the current system date and time. The student worksheet is shown in the table (Table 10).
### Table 10. Student homework tables

| Name      | Data type and length | Restrain            | Describe                              |
|-----------|----------------------|----------------------|---------------------------------------|
| H-ID      | Int                  | Major key            | Student assignment no.                |
| H-Parent ID | Int                | Non-empty, external keys | Course assignment no.                  |
| H-Puber   | Nvarchar(20)         | Non-empty, external keys | Submitted student number               |
| H-Pub time| Date time            | Windows default      | Submission time                        |
| H-Path    | Nvarchar(100)        | Non-empty            | Submission of job file path and file name |
| H-Score   | Tinyint              |                      | Student homework score                 |

#### 3.3 Control and Supervision of Teaching Management Platform

The individualized teaching management platform mainly includes: managing the individualized teaching process, the teacher uses this function to realize the customized, modified, updated, deleted, backup and other operations of the individualized teaching process. The definition of the individualized teaching process is the basis of the normal operation of the system and the main data object of the platform; Monitoring students’ learning process, which provides teachers with the function of statistics and analysis of students’ learning data, and presents the results of the analysis to teachers, so that teachers can fully grasp the students’ learning of their own courses taught; Intelligent assisted individualized teaching, mainly from the goal of reducing teachers’ individualized teaching pressure and improving the efficiency of individualized teaching, carries on the intelligent processing to the student’s question and so on, realizes the automatic ranking according to the problem heat; To formulate learning strategies, teachers mainly make rules for the running process of learning flow, and combine with individual teaching process examples to monitor and control the students’ learning process together.

#### 4 Experiment and Analysis

##### 4.1 Experimental Subject

Because one of the purposes of evaluation is to compare the advantages and disadvantages of individualized network teaching with traditional teaching, we should set up a control group with traditional network teaching for the experimental group with individualized network teaching, and use how much the effect of individualized network teaching is improved compared with traditional network teaching as the evaluation standard.

The method of selecting the subjects is to distribute the questionnaire randomly among the students majoring in computer science in our college. The main content of the survey is the estimated value of the entrance grade and their cognitive ability and their interest in the course of computer programming and operation. from which six students are drawn according to their admission scores and numbered, in which the situation of odd number students and even number is similar. the so-called situation approximation refers to the students’ entrance scores and interest in this course are close, so that the
odd number group can be used as the experimental group and the even number group as the control group, as shown in Table 11.

| Number | Enrolment achievement | Students initially estimated cognitive ability | Initial estimated interest of the student | Student levels for systematic evaluation |
|--------|-----------------------|-------------------------------------------------|------------------------------------------|------------------------------------------|
| 1      | 511                   | 90                                              | 90                                       | B                                        |
| 2      | 506                   | 93                                              | 95                                       |                                          |
| 3      | 523                   | 100                                             | 100                                      | A                                        |
| 4      | 487                   | 90                                              | 90                                       |                                          |
| 5      | 463                   | 80                                              | 80                                       | C                                        |
| 6      | 457                   | 75                                              | 75                                       |                                          |
| 7      | 423                   | 60                                              | 61                                       | D                                        |

### 4.2 Experimental Methods and Results
The system provides two ways of learning: system control learning and free learning. When studying under the system control mode, the system will first evaluate the students’ grade according to the students’ initial estimated cognitive ability value and interest value, then select the corresponding learning content for the students, and provide the test questions for the students after each learning point (or section, unit). Therefore, the comprehensive grades are used to adjust students’ learning ability and grade. The use of free learning is exactly the same as the use of traditional online teaching systems (Table 12).

| Number | Capacity values given by the system | Final interest values | Student levels given by the system | Written test results |
|--------|-------------------------------------|-----------------------|------------------------------------|----------------------|
| 1      | 89.8                                | 90                    | 90                                 | 94                   |
| 2      |                                     | 95                    | 95                                 | 95                   |
| 3      | 96.6                                | 100                   | 100                                | 96                   |
| 4      |                                     | 85                    | 90                                 | 82                   |
| 5      | 78.5                                | 85                    | 80                                 | 78                   |
| 6      |                                     | 75                    | 75                                 | 68                   |
4.3 Analysis of Results

The results of both groups were basically normal distribution, among which: the average score of odd group was 69.0, and the pass rate was 70%. The average score of even groups was 60.2 and the pass rate was 60%. Therefore, through learning, both groups basically meet the requirements of the syllabus, but the effect of learning odd groups by systematic control is better than that of even groups by free learning. For the odd group middle school students, the value of learning ability given by the system is basically consistent with the final test results, which shows that the student model established by the system is basically reasonable. For the odd group middle school students, the value of learning ability given by the system is basically consistent with the final test results, which shows that the student model established by the system is basically reasonable.

5 Conclusion

A computer aided course teaching control system based on supervised learning algorithm is proposed. Firstly, the system architecture, development environment and the key technologies used are introduced, then the experimental situation of the system is introduced, including the experimental object, experimental method and experimental results, and the experimental results are analyzed. At the same time, the experimental results show that the interest of students in even group has not changed, while the interest of students in odd group has increased. It can be seen that the teaching control system is superior to the traditional teaching system in improving students’ interest and arousing students’ learning enthusiasm.

Students make comprehensive evaluation and diagnosis, and provide the basis for the formulation of teaching strategies on the basis of supervised learning algorithms.

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