

Cross-platform Tech University Courses Teaching in a Heterogeneous Data Environment

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Abstract. After analyzing the pros and cons of existing online education platforms, we find that the disaggregation between multiple supplementary education platforms has many inconveniences for technical course teaching. We propose and design a multiway collaboration model in a heterogeneous data environment to make the multi-platform teaching approach more convenient. This model helps to address the limitations of the multi-platform teaching and learning approach.

Keywords: cross-platform teaching, education assistant system, heterogeneous data environment.

1. Introduction

Modern times are an information age, and polytechnic universities will be in line with the times in educating students by using a variety of education platforms. These educational platforms greatly facilitate teachers and students. The network can provide students with abundant multimedia materials, which are large in number and multi-vision, multi-level, and multiformat [1-2]. But teachers face a problem when the teaching and learning data between these decoupled platforms. Instead of performing manual data transfer, teachers can achieve data interoperability automatically, dramatically facilitating their teaching activities. Therefore, using multiple platforms when data is interoperable without performing manual data transfer and coupling these systems is worth researching. We take the major of Electronic Engineering (EE) at Ningbo Tech University as an example to examine this problem. By virtually integrating multiple popular online education platforms in China, such as Chaoxing (XuexiTong in Chinese), Students Academic Affairs System of NTU, Achievement Evaluation System for Engineering Certification, and Chinese Universities MOOC, the data of these platforms become interoperable and coupled. In this work, we propose a multiway collaborative education assistant architecture under a multi-heterogeneous data environment for assisting the teaching of electronic information engineering majors.

2. Analysis And Design

2.1 Pedagogical analysis of multiplexed collaborative teaching assistance

In teaching EE courses without integrated support systems, teachers need to log in to multiple platforms to finish their work, including posting teaching resources and publishing course materials, videos, assignments, and tests to students. And they also need to log in to different platforms to make changes and corrections when modifying or correcting assignments. Teachers should log in to other platforms for students' comments and questions posted on various platforms to check and respond. At the end of the teaching period, teachers need to export these scores and then change them according to the data format required by the achievement evaluation system and upload them to calculate the relevant data. After calculating the relevant data, teachers have to transfer these data to universities' academic affairs system for public display and archive. These processes are tedious and complicated, which will consume teachers a lot of time, and probably make some mistakes in the process, which significantly affect the teaching work and the quality of communication with students. In the heterogeneous network environment, the multiway collaborative education assistance system facilitates the teacher's operation, improves the quality and efficiency of teaching, and gives full play

to teacher education. We designed and implemented a web-based multiplexed collaborative education assistance system in a heterogeneous data environment.

2.2 Design of a collaborative education assistants system

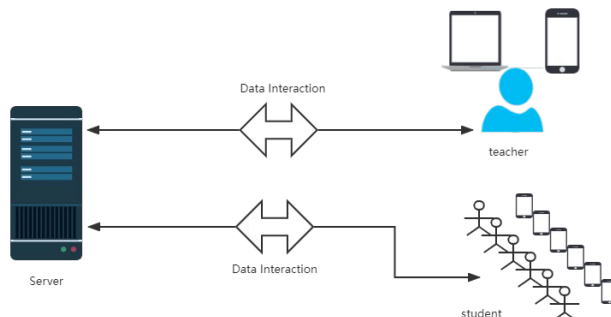


Figure 1 schematic diagram of the co-teaching assistant system

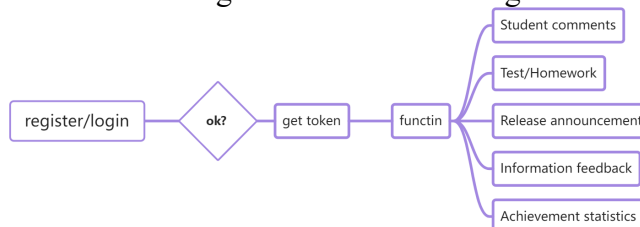


Figure 2 network architecture of the co-teaching support system

Database: Uid, is automatically generated by the system when registering the platform, and it is a unique value. The unique value consists of 5 parts, that is, the MAC address hash value of the current machine, which consists of 7 bytes; The process ID of the current machine, consisting of 4 bytes; The current nanosecond timestamp consists of 12 bytes; The sequence number indicating the concurrency safety of the current process, consisting of 3 bytes; A sequence number that is concurrent and safe with the current process and consists of 3 bytes. The data in multiple tables are accessed through UIDs to locate the data. At the same time, UIDs also greatly facilitate the operation of linked lists, speed up the request processing, and speed up the server processing in the case of high concurrency.

Teacher information table: it includes the teacher's login account, school, password and the account and password of the teacher's multiple platforms, but there will be an unchanging uid in these tables.

Registration: first, a user registers our multi-channel collaborative teaching assistance system, and then configures the account and password of his own teaching platform. This configuration information will be saved in the teacher information table.

Question and answer table: as shown in Fig. 3, it is a question and answers information storage table, which is composed of course name, question, ID and answers. Answers are similar to a list, in which path, image and info are combined in the same form. ID is the ID card of the problem. It is unique and similar to uid.

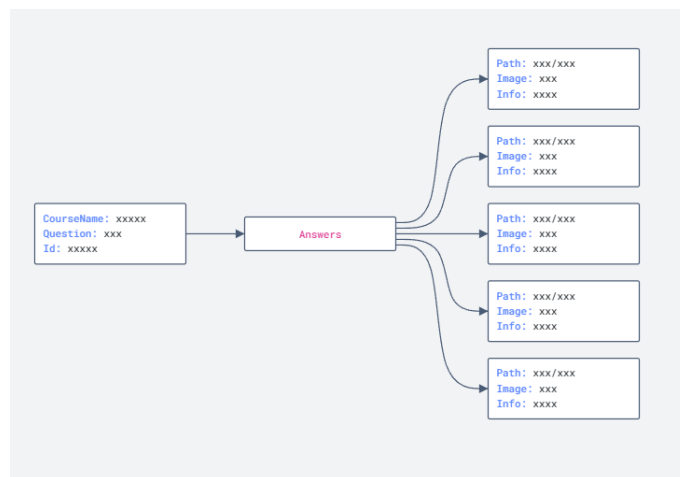


Figure 3 structure of question and answer table

2.3 Module introduction

Token based login authentication: after the user logs in to the multi-channel collaborative teaching assistant system, the server will distribute the token, and the token will be transmitted to the client. Submitting the request again will attach the token to the request header and submit it to the server to complete identity authentication. This avoids the problems caused by cookies. After the user logs in successfully, the system will automatically monitor the availability of cookies for the current user's multi-platform account. If a platform cookie fails, the system will automatically log in to the platform cookie. The user's multi-platform cookie is stored in the redis database and automatically maintained by the system. Each time, the tokens distributed by the server will be automatically stored in redis. Through redis, we cache the tokens. Through redis, we control the number of devices that can log in. The server will automatically clean up and replace the invalid cookies when the cookies become invalid. Of course, this operation is passive. The cookies will be replaced only when the user logs in. The server will not take the initiative to replace them. This is to prevent competition with the server user for account use rights; Simultaneously, the server will replace the token that is about to expire. This trigger mechanism is triggered only when the user makes a request within a period of time when the token is about to expire, which greatly facilitates the user. The server-side token is generated based on [2]jwt. The traditional server session mode permission verification process requires a specific server verification status and has a high degree of coupling. The role permission access control design based on restful design ideas and the improved JWT verification method can more succinctly and effectively implement resource based API permission verification. Release announcement: When teachers want to release an announcement to inform students, teachers just need to select the function page of the announcement on the front page of the system, enter the statement within and click OK; the announcement information will be transmitted to the server and distributed by the system to different education platforms, of course, you can also choose the platform to release the announcement, the default is to release all education platforms.

Analog login verification code solution: after teachers or students have configured many platform accounts, some of these platforms involve the verification of alphanumeric verification codes. This is certainly not convenient for teachers or students to copy cookies to the multi-channel collaborative auxiliary teaching system for management after logging in to the platform. Because cookies are invalid, they must be copied every time they fail, and it is very troublesome for multiple platforms, Therefore, we use machine learning to collect the verification codes of various platforms, and then generate similar verification codes locally. Then we train the verification codes through paddepaddle, and finally test and cut the models obtained from the training models, and deploy them to the server. In this way, we can not worry about the failure of cookies, and it is more convenient for students' learning and teachers' teaching.

Release announcement: When teachers want to release a notification to inform students, teachers just need to select the function page of the announcement on the front page of the system, enter the statement within and click OK; the announcement information will be transmitted to the server and distributed by the system to different education platforms, of course, you can also choose the platform to release the announcement, the default is to release all education platforms.

Release homework or test: When teachers want to release an assignment or quiz, teachers just need to select the homework page on the front page of the system, upload the test questions, select the time and end time of release, and then click to confirm, through the release announcement as well, the system will automatically release the test questions to the education platform, by default, it is released to all platforms.

View Student Comments: When a teacher wants to view student comments, the teacher just needs to select the feature page of comments on the front page of the system, under which the teacher can view the comments of different education platforms and reply the student comments to help students' learning. At the same time, the page will automatically analyze the students' comments with the help of AI. It will display the critical information in the corresponding platform and also the page to help the teacher's teaching improvement and explain different emphasis to the students in the classroom.

Feedback: When a teacher posts an assignment or student comments on it, our system will track the number of completed assignments and monitor the students' comments. This information will be fed back to the teacher through WeChat and visible when the teacher logs into the system.

Score statistics: At the end of the teaching period, teachers just need to select this function page on the front page of the system and click on scores statistics. The system will automatically collect students' scores across multiple platforms, and through the attainment system processing, the data will be displayed on the page. Teachers can view, check and edit the data. After teachers check and click on submit, the system will automatically submit students' scores to the education system. At the same time, the system will analyze students' scores, and the results will be displayed on the teacher interface for teachers' teaching reference. In addition, students' scores data will be backed up to our MySQL database in case of emergency.

Official account push: [4] WeChat users account for a large proportion of young and highly educated people, and the diffusion and dissemination of "WeChat content" is increasingly recognized through the increasingly powerful network. Wechat has been integrated into the daily life of college students, bringing new ways for college students to obtain information. Paying attention to various official accounts has also become the primary way to get information. Therefore, we can make good use of this to build an interactive WeChat public platform for auxiliary teaching, and combine the advantages of traditional teaching methods with the benefits of mobile learning, which is also in line with the trend of educational development. Students can configure their own multi-platform accounts through the WeChat official account. After the teacher publishes homework, comments and other operations, they will timely notify students of relevant content on the official account. At the same time, teachers can also publish some teaching information in the collaborative teaching assistant system, post videos and articles, and solve students' problems more conveniently through the official account. At the same time, the official account supports messages; students can communicate with teachers and classmates below. At the same time, our collaborative teaching assistant system integrates the management of official accounts, on which teachers can publish articles, videos, etc. These will be automatically pushed to the students of the class corresponding to the teacher.

2.4 Algorithm flow

Login algorithm: first, the user (the default user has completed the registration and configuration of personal information) logs in on the login page. After the login is successful, the service distributes the token generated by JWT to the user and stores the token in redis. Redis is stored here to control the number of user login devices and prevent malicious operations on tokens not distributed by the server. At the same time, when the user logs in, The server will automatically verify the validity of local multi platform cookies. If a platform cookie fails, it will automatically log in to the platform and

save the cookie in redis for cookie update. After the user logs in, the user can publish information, correct homework, view students' learning progress and other operations. Of course, suppose the cookie happens to be invalid when the teacher operates a teaching platform. In that case, the server will automatically record it and log in again to rerun the operation.

Timing algorithm: at the same time, the teaching assistant system also supports timing tasks, which is not through the timing task interface of each teaching platform, because some teaching platforms do not support timing task arrangement, so we develop a timing task interface in the teaching assistant platform, so teachers can assign one or more tasks at one time, The timing algorithm of the system is based on the [5]goframe framework of go language.

Question answering algorithm: Simultaneously, the teaching aid system will also analyze the students' comments to see if they are asking. If the students are asking questions, they will automatically find similar answers from the interfaces of some academic platforms for teachers to choose when answering students' questions. At the same time, the teaching aid system will also change the questions and answers to be stored in the database after teachers' selection, and will also analyze the interaction of students, If you are answering questions and solving puzzles, the system will automatically store them in the database.

2.5 Collaborative teaching assistances in teaching and learning

The front end of our system is written in open-source software, through Vue, running with web pages and applets, and the back end is built with Golang for extremely fast processing [3-4]. Figure 3 is the page for teachers to post announcements, a Markdown edit page that supports teachers in publishing a wide variety of information. Figure 4 shows the interface for students to receive information.

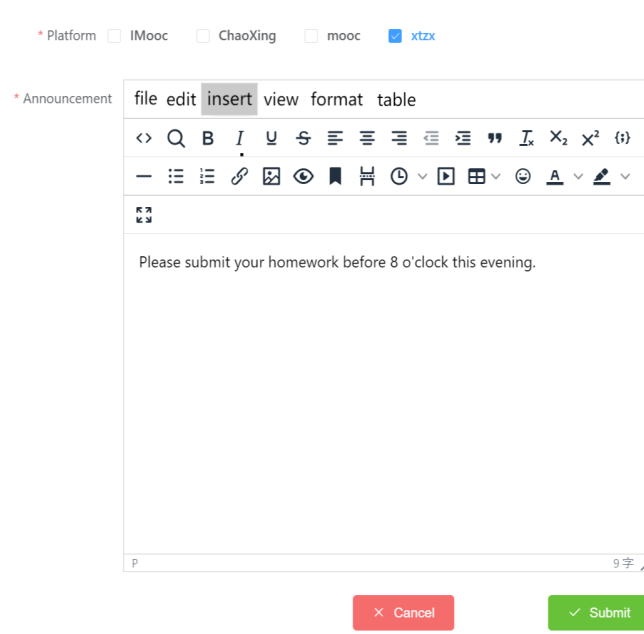


Figure 4 Interface for teachers to post notification

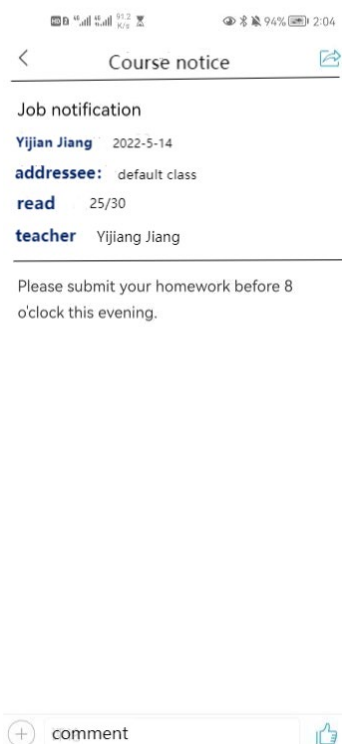


Figure 5 GUI of students receiving announcements

Teachers only need to log into the collaborative education assistance system in teachers' daily use. They can make announcements and create or test operations. It dramatically facilitates teachers' teaching, improves efficiency, and can help the teachers to track students' learning progress.

3. Conclusion

In summary, we have analyzed that the traditional education assistance system is untimely and inconvenient to operate for teachers and their comprehension of students' information. We have proposed and designed a multiway collaborative education system in a heterogeneous data environment. The tight coupling of multiple systems also allows teachers to access information quickly, count grades, understand students' learning status, and through data analysis, let teachers know which part should focus on in the classroom. We expect that the multiplexed collaborative education system in a heterogeneous data environment can play an essential role in facilitating and improving the teaching and learning of electrical courses.

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