Research on Interactive Mobile Learning Platform Based on Android

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Abstract: In view of the shortcomings of single learning mode and weak interaction power in current mobile learning platforms, this paper uses mobile Internet technology and Android system as development platform, adopts B/S+three-tier architecture+MVC mode, studies an interactive mobile learning platform, analyses and designs the demand function, structure framework and function module, and focuses on the screen, the realization of sharing technology and B/S communication technology.

1. Introduction

With the wide application of Internet technology and mobile communication technology in education and teaching, mobile learning, as a new online learning mode, has been welcomed by more and more learners. In the traditional learning mode, learners can only passively receive specific teaching content at a specific time and place, with little initiative and selectivity in learning. In mobile learning environment, learners can choose learning time, place and content independently, and teachers can interact with students anytime and anywhere and give guidance and answer questions. At present, most of the existing mobile client online learning platforms have a single learning mode. The interaction between teaching and learning is only through message boards or forums. Students can not communicate with teachers in real time and visually. Therefore, researching a mobile learning platform with rich learning modes and strong interaction can greatly improve students'enthusiasm and learning efficiency.

Android is an open source mobile information device application development platform based on Linux [2], which is widely used in smartphones, Tablets and other mobile devices.The interactive mobile learning platform based on Android is studied in this paper. The system architecture of C/S+B/S is adopted. Eclipse is used as the development tool, Android SDK is used as the development tool, Java is chosen as the development language, MySQL is used as the database management system software on the server side, and lightweight SQLite is used for data storage on the client side.The platform can realize the functions of course search, students'course selection, live learning, on-demand learning, online examination and learning exchange.

2. Requirement Analysis and Function Design of Mobile Learning Platform

2.1 Platform Requirement Analysis

From the current business scope and business process of mobile learning platform, the main objects of the platform include: system administrators, teachers and students. According to the needs of these three roles, the functions of different privileges are designed for each role.

(1) The system administrator is the user of the platform. The functions required are user management, maintenance and operation of the system platform, permission allocation of different users, audit of data, etc.

(2) Teachers are mainly responsible for the input of curriculum resources and the provision of teaching services for students. The functions required are: curriculum management, upload and management of teaching resources, student management, achievement management, interactive communication with students, counseling and answering questions, etc.

(3) Students access the mobile learning platform through the Internet and carry out selective learning. The required functions are: course search, course collection, online course selection, online learning, online examination, learning exchange, etc.

2.2 Platform Function Design

According to the needs of users with different roles, the interactive functions of the platform are mainly designed. The functional modules of the mobile learning platform are mainly divided into seven modules: user management module, course management module, online learning module, examination center module, after-class communication module, resource sharing module and evaluation module, as shown in Figure 1.
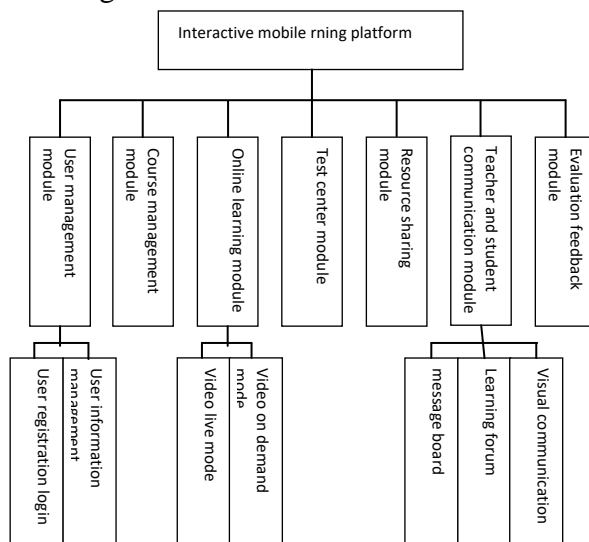

Figure 1 Mobile learning platform function module structure diagram

The interactive function of the platform is mainly embodied in online learning module and after-class communication module. Online learning module is divided into live video mode and VOD mode. Under the mode of live video broadcast, teachers publish live broadcast time in the bulletin board in advance, upload courseware and classroom test questions before class, and the database will link the related resources to the corresponding courses. When the live time comes, students and teachers will enter the virtual classroom. The system reads the courseware from the database and displays it to the mobile terminal. Teachers play the courseware synchronously and annotate the courseware through tools such as brushes, shapes and erasers in the toolbar. Students and teachers can share the courseware on the screen. In the live classroom, students can raise their hands to speak, and students'videos can be displayed on the client terminal of teachers and students. Shared display. When the live course is over, videos will be generated and saved on the server. Students can play back and watch at any time. Video-on-demand mode means that teachers upload pre-recorded teaching videos to the server and link them to database-related courses and chapters; students start learning after video-on-demand, and in the process of learning, there will be bullet curtain questions pop up, and they can continue learning by answering the right questions.

The teacher-student communication module includes message board, learning forum and visual communication. Message board communication means that students leave messages on the message board in the learning area of this chapter, and teachers or other teachers and students answer them; Learning Forum communication means that teachers set topic discussion content and students make discussion speeches; visual communication means include one-to-one mode and one-to-many mode. Students send video invitations to online teachers, while inviting other students to join video communication group.

3. System Architecture of Mobile Learning Platform

The mobile learning platform adopts B/S+three-tier architecture+MVC mode. B/S is Browser/ServER. Users run clients directly on WEB browser. The browser interacts with database through Web Server. The core part of system function realization is centralized on the server, which simplifies the development, maintenance and use of the system.

Based on the design concept of "high cohesion and low coupling", the mobile learning platform adopts a three-layer structure in programming implementation, which divides the whole business application from bottom to top: DAL (Data Access Layer) and business logic layer (BLL, Business Logic Layer, UI (User Interface): The function of the data access layer is mainly responsible for accessing data, such as adding, deleting, updating, querying, etc. for the course or user database; the business logic layer is specific to The business function operates on the data layer and communicates with the presentation layer, such as searching for related courses based on certain keywords, enabling screen sharing operations in the virtual classroom, etc.; the presentation layer is used to display data and receive user input data. Provide users with an interactive interface, such as entering the name of the course, displaying the course list, etc. in the mobile terminal.

In order to better fit the software platform of the Android platform OS-Libraries/RunTime-Application Framework-Application and better reflect the interactivity of the page, the platform also uses the MVC architecture, which is divided into: model, view based on the page. (view), controller (controller). Model refers to data and application logic, but does not include data reading, such as reading the required fields from the user data Table or curriculum to convert the attribute values of the entity class into a data model; View refers to the view of the Model , that is, the user interface; the Controller is designed to handle the logic of user interaction. It can be seen that the UI layer can be divided into View and Controller. Finally, the architecture of the platform is divided into several levels: View, Controller, BLL (Business Logic Layer), DAL (Data Access Layer), and Entity (Entity). The overall architecture of the platform is shown in Figure 2.
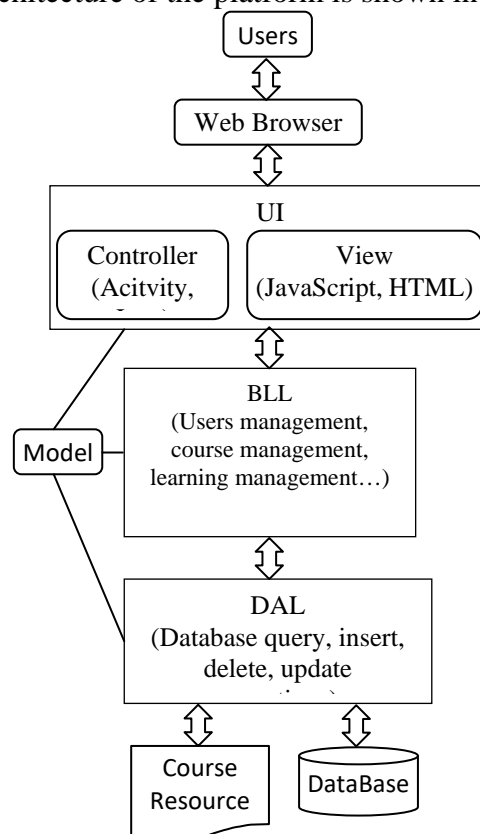

Figure 2 Platform B / S + three-tier structure + MVC overall architecture

4. Platform key technology implementation

4.1 Client and server communication technology implementation

The workflow of the Android platform client APP and the web server data communication is: using the Activity class provided by the Android API to create and submit an HttpPost object, encoding the client data, and then submitting it to the web application server through the web network, and packaging it into a In the HttpRespnose object, after receiving the client data, the server uses the Servlet data port to submit to the server processing unit, encapsulates, processes, and computes the data, and returns the operation result to the client browser for parsing and display. The client data package of the mobile learning platform includes user information class, course information class, test data class, course material class, and communication data class.

In the process of data transfer, data analysis is needed through XML. This platform uses the DOM4J parsing method. DOM4J parsing converts an XML format file into a tree structure, and obtains a node and its lower node objects through the Document object, and accesses the tags, attributes, texts, comments, and the like of the XML document through the node object. The DOM4J is characterized by excellent performance, flexibility and ease of use.

4.2 Implementation of screen sharing technology

The key technology of the live broadcast mode of the online learning module of the platform is the screen sharing technology, which is also the final technology in the interactive function, that is, the content of the teacher's Android client screen is transmitted to the student Android client in real time. The main process of screen sharing technology is to first collect the current image data of the screen, and then capture the hotspot of the image update area, then compress the content captured by the hot spot and transmit it by using the relevant network protocol [3], and finally reach the student client. The image is decompressed and displayed. The specific techniques used are as follows:

(1) Implementation of screen acquisition technology

The screen capture function reads the screen image cache data by calling the underlying driver of the Android system, first obtains the root authority, and then uses the JNI technology of the JAVA language to call the Linux mmap system to read the fb0 file and obtain the screen image data in the framebuffer.

(2) Implementation of hotspot capture technology

First, the collected screen image is divided into several small fast, placed in an array; then the adjacent two blocks of the same coordinate of the block image are compared, the change is greater than a certain value of the score The block image is placed in the transport group; finally the corresponding image is placed in the correct position of the Canvas using the draw Bitmap( ) method.

(3) Implementation of image compression and decompression techniques

The compression and decompression techniques of the screen image in this system adopt the JPEG coding standard [4], and the image compression coding is performed using SKBitmap.cpp of the Android SKIA library.

(4) Implementation of image transmission technology

In the one-to-one image sharing mode, UDP messages are sent directly to the client IP address in unicast mode, and a secret command is sent for pairing. After the pairing is successful, the TCP protocol is used for one-to-one transmission. In the one-to-many image sharing mode, the multicast mode is adopted, and the server determines a multicast address, and the client chooses to join, and uses the UDP protocol multicast technology to send the screen image data packet.

4.3 Implementation of platform UI technology

The user interface (UI) is an operation interface for human-machine interaction. The UI layer of the platform is composed of a view and a controller. The view uses JavaScript+HTML+CSS technology for layout, and the Controller passes each Activity. Classes work with JAVA to manipulate interactive data. The related user interface classes of the platform include: user login interface class, user registration interface class, course information class, question bank page class,

test page class, and the like.

5. Conclusion

This paper combines the needs of current mobile learning users and the characteristics of mobile learning, and designs an interactive learning mobile learning platform based on Android. Through a period of testing and application, the platform works well, providing a good learning environment for students to carry out independent learning activities anytime and anywhere, and also provides a practical reference for the development of mobile learning exploration and research.

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