Design and Implementation of Android-based Data Structure Mobile Learning Platform

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ABSTRACT
Taking the data structure as demonstration reform course, this paper has studied the key technology of constructing mobile learning platform, and designed a mobile learning platform based on Android. This learning platform has provided a new learning method for learners of data structure by applying the mobile internet, web application, C/S pattern structure and three-layer architecture. The interaction design of mobile learning platform has been designed through homepages push pattern pattern, exercise and test pattern, forum interaction pattern and activity release. Students cannot only acquire the latest knowledge of data structure, but also implement the in-class exercises, self-reviewing, technology communication and knowledge sharing, etc.

KEYWORDS: Android, Mobile Learning, Learning Pattern, Data Structure

INTRODUCTION
In recent years, with the rapid development of the mobile web and smartphone, the traditional teaching methods and concepts have confronted with many new challenges. The information technology has extended the teaching space from traditional classroom teaching to mobile classroom teaching and created positive teaching interaction effect by changing the classroom teaching structure.

Mobile learning is a form of learning, which means learning for learners happens anytime, anywhere and on demand [1]. In the recent years, for the rapid development of mobile terminal devices, it is impossible for learners to implement the mobile learning. And the mobile learning is becoming an increasingly popular learning method [2].
Taking Data Structure as example, this paper discusses teaching mode of classroom interaction. It also discusses the key technologies of constructing the mobile learning platform, completes the detailed design of the mobile learning platform, and accomplishes the mobile learning platform based on Android. The mobile learning platform has provided a new learning method for learners of data structure by applying the mobile internet, web application, C/S mode structure and three-layer architecture[3].

FEASIBILITY OF MOBILE LEARNING

Features of Smartphones. Among the various hand-held mobile devices, smartphone is the most wide mobile device, it is something every student can have. Smartphone cannot complete the call and message, but also handle with the audio, video, and image data. In addition, smartphone can also provide some services of internet browsing, instant messaging and e-business for users. These functions provide technical support for implementing the mobile learning. On the hand, students entirely on smartphone, on the other hand, many students play games and browse the webpage with smartphone, it will interfere with the normal teaching order. Therefore, teachers should make the best use of the situation and inspire the learning interest of students, make the smartphone become the class learning aid.

Technical Advantages of Android System. Android is open source operating system based on Linux. It is mainly used to the mobile devices and developed by Google company and open handset alliance member[4]. Firstly, one of its advantages is open. It is allow that anyone mobile manufacturers join Android alliance. Many supporters cannot also increase the popularity of the Android, but also constantly promote its development and progress. Secondly, with the new producers’ join, the market is full with all kinds of fully functional new products. It can bring a change in user experience. Thirdly, the android system integrated seamlessly Google services, such as map, email and search, etc. These services have become a bond linking the users and internet.

Learning Requirement of Data Structure. Data structure is an important and basic technical lesson of the computer department. It not only can improve students’ practice capability, but also train their ability to deal with problems. For teaching contents of data structure, knowledge of theory and algorithm analysis lectures have been taught at the blackboard, because traditional lectures have advantages in knowledge instruction and interactivity. Algorithm implementation and program design need to be taught through experiment and curriculum design, so as to develop students’ programming techniques. According to the teachers’ guidance, practice and interaction with members can greatly enhance students’ practice ability, teamwork and innovation spirit. The mobile learning can effectively implement course learning, provide instant information and resources for students. Therefore, we expect to deepen and consolidate basic knowledge through the mobile learning platform.

OVERALL DESIGN OF SYSTEM PLATFORM

The mobile learning platform is based on Android and C/S mode. The C/S mode makes full use of hardware environment advantages, and can reasonably assign tasks to client and server.

System Architecture. The system architecture of mobile learning platform is shown in Fig 1. As you can see in Fig.1, a client sends access request to server, can acquire industry news, course learning resources, activity contents and forum topic by accessing the Web service, and return the process result to the client.
Business Process Flow. The server of mobile learning based on android use the traditional three-layer B/S mode[6]: JSP and JS are recognized as view layer, Java Bean is abstracted to model layer. When the control is transferred to the Servlet, the Servlet will take HttpServletReques and HttpServletResponse object on as parameters, and pass Java Bean to continue processing. Soon the Java Bean will put the processing result in HttpServletResponse object. When the Servlet is given control, it can implements web page rendering and return text to Android client. The data access layer can define implementation class by using the DAO design mode. This mode not only can completely separates front-end technology from back-end technologies, but also ensure the neat source code and an object oriented fashion. The system process flow is shown in Fig.2.

The system database used is a MySQL5.4. MySQL is a relating database management system. MySQL usually stores data in in different tables rather than a huge warehouse, so as to increase the processing speed and flexibility.

FUNCTION ANALYSIS AND IMPLEMENT

The platform takes Eclipse and MyEclipse as development tools. For the mobile learning system, client can access the web server by Socket HTTP protocol. Then it can access the MySQL database and acquire the relative resource when the web server receives the request. The web server runs on Tomcat 7.0 server, and the client runs on the android 4.0.3.

Interaction Design of Learning Content. According to the feature of mobile learning and mobile teaching activity based on the smartphone, there are four main patterns used in the interaction design of learning content:

(1) Homepages Push Pattern. For anyone interested in achieving the long in the field of data structure, it is crucial for them to trace the data structure-related technologies. Therefore, data structure knowledge needs to be updated periodically in order to make the students know clearly the development trend.

(2) Exercise and Testing Pattern. For those who are eager to in-class exercises and self-reviewing, they can choose exercise and testing pattern. The related knowledge of the same topic is organized into the same unit.
(3) Forum Interaction Pattern. For the written examination and classic interview questions, students can choose the forum interaction pattern. Forum usually includes examination forum, activity forum, collection forum and personal forum. The examination forum will be taught in written tests and interviews. Sponsor can push his own points of view in accordance with a certain topic. Participants can review and collect some related information. The core of forum is to implement technology communication and knowledge sharing. Forum plays an indispensable in computer and software engineering industries.

(4) Activity Publishing Pattern. In order to facilitate students understand the newest and hot-spot topic, we designs activity publishing pattern. The intramural activities mainly include the coaching and training of session and programmer competition. Outside activities mainly focus on hold various recruitment activities and training.

The Major Techniques of Implementation. A few of key technologies are presented below.

(1) Loading the Data Asynchronously. After android 4.0, request an HTTP service has been restricted, and it has been allowed on the main thread, so other thread also requires a reboot to implement it.

(2) Data-storage Mechanism. The android system has offered several ways to restore persistent application data. In addition to remotely access the MySQL database, the system sets up access interface of share preferences and external storage (SD Card). Share preferences is a kind of lightweight mechanism, it is intended for storing key-value of simple data type.

(3) Defining Abstract Tool Classes. In ordered to reduce the code redundancy and follow the principle of high cohesion of object-orientation design, you will abstract the common methods to tool classes. This will ensure that the client is visible to server request.

Testing and Interface Display. Every modules of mobile learning platform cannot complete testing through JUnit test framework, but also implement system testing based on simulator and smartphone. Four interactive patterns are shown in Fig.3.

Figure 3. Four Interactive Pattern.

SUMMARY

Mobile learning is the future of learn, it will certainly make good contribution to promote the scale and individuation of education. After two years of exploring and practice, the software engineer major has already formed curriculum group of data structure. It is important for the traditional classroom teaching to explore the mobile learning platform. In the future, we will pay attention to interactive design and content design of the mobile learning resources, so as to reduce students’ burden and provide a better use experience.
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