Android Client Development based on Moodle Platform

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Abstract

As an excellent open online source management system, Moodle platform designed with a free modular structure, hens, has a strong compatibility and easy to use, it provide a variety of functions with convenient features like curriculum management, job submission, discussion chat, online quizzes and so on. Due to its excellent performance, it has been widely used as online learning platform by many universities around the world. But most functions of Moodle cannot friendly run on mobile terminal, how to solve this problem becomes an urgent issue in the age of mobile Internet. Considering the popularity of the Android system, we have developed an Android client for Moodle. This client supports remote login, course information display, online learning and other functions. It can help students realize mobile learning using fragments of time effectively.

Keywords: Moodle; Android Client; Online Learning; Mobile Learning

1. Introduction

With the rapid growth of computer and network technologies, web-based learning and education management platforms gradually attract more and more people's attention. Under this circumstance, information technologies have become an important pillar of modern education. Based on online courses platform, any teacher, school or institution can design their own curriculums, organize teaching activities and implement teaching or training. Today, there are several famous online education and course management platforms adopted by multimillion education users around the world, such as Dokes, Moodle, Atutor and LMS OLAT [1-2]. Among these platforms, Moodle is a relative excellent one with arrangement, management, security and friendly user interface [3-4]. Moodle is designed using freedom modular structure, hens, it has a strong compatibility and easy to use, and it enables educators to create their own private website filled with dynamic courses to extend learning, anytime, anywhere.

Mobile learning is another hot topic in the field of modern education, which provides an effective way to help learner do extensive study [5]. In the past few years, mobile learning developed slowly due to the restriction of hardware and software technologies of mobile terminal. But now, the rapid emergence of mobile Internet makes it possible to implement effectively. Benefit from the greatly enhanced performance and markedly dropped price of mobile terminals, such as smart phones and tablet computers, the deployments of mobile learning become feasible and easy.

Considering the popularity of Android system, we have developed a mobile learning client for Moodle based on Android. This client solves the problem of how to get learning resources from Moodle in mobile environment. It expands the usage scope of Moodle. Good interactive ability is an outstanding feature of our mobile client. It can effectively help user access curriculum resources anytime, and well present curriculum resources on a limited size screen. For the limitation of development time, this client only includes some basic functions at present. Many high elements, such as online vote, online test, online video teaching, *etc.*, will add soon. In the future, we will further explore

collaborative learning and build social learning relationship based on Moodle and this mobile client.

2. Software Design

2.1. Design Ideas

Moodle is developed by PHP, and it uses Mysql as its background database. As a web application system, students, teachers and curriculum creators visit Moodle through Web browser. So, the basic design idea of mobile client is to realize web interaction functions in mobile devices. In addition, considering that the mobile client will get a large amount of data from Moodle server during the interact process, it's impractical to display all return data in a limited screen. So, how to extract main data and display in formatted form on mobile device is another core problem in design.

2.2. System Architecture of the Software

Figure 1 is the structure of the client developed by us. Considering mobile devices have limited screen size and users are accustomed to use a full touch operation, we improved the information display method through integrating message and notification function. The home page of the software is consisted of three parts: the top part is a module contain six main function, the middle part is a calendar which marks important days (like recent event, job submission deadline, test, *etc.*), and the bottom part is a notification area, with which you can view messages and coming soon activities.
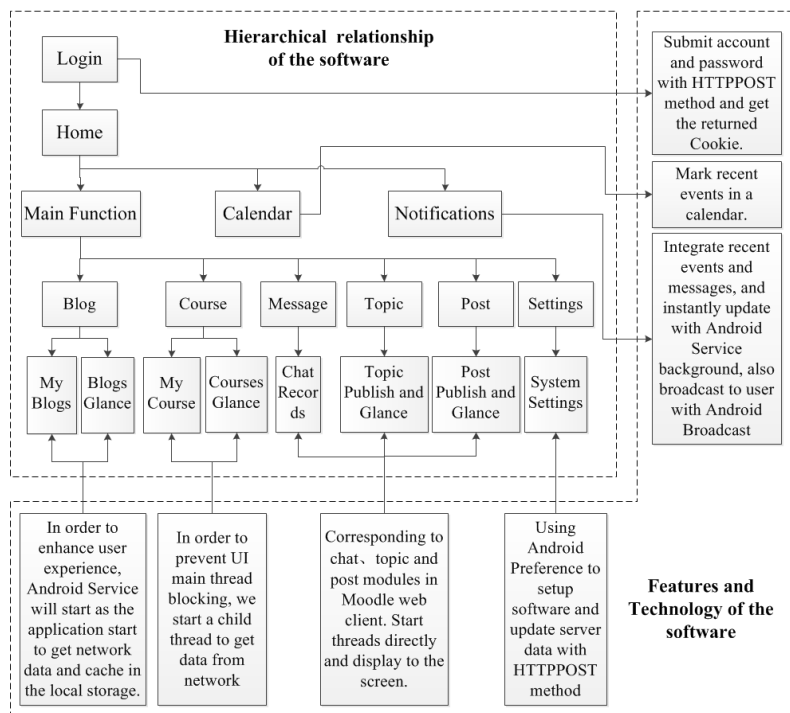

Figure 1. The Structure of Client

2.3. Main Technologies

Http interaction is the important technology in our software design. Through HTTP protocol, web browser can get resources from remote Moodle server. So we adopt HTTP protocol to realize the interaction between mobile client and Moodle server. Using this way, the return data in mobile devices is the same as PC, these data can't display in

mobile devices directly due to the limited screen size. Naturally, to solve the problem, we need to filter and extract the core data to fit the screen. Considering the plain text with a HTML format, regular expression may be a good way to process data.

(1)Use HTTP protocol to get data

The software uses HTTP protocol to get data. HTTP (Hypertext Transfer Protocol) is a kind of protocol to transfer web document via Internet, which provides a detailed rule for the communication between web browser and Web server. HTTP protocol uses URL (Uniform Resource Locator) to access remote resources, and requests for resources with seven methods: GET, POST, PUT, DELETE, TRACE, CONNECT, OPTIONS, different methods will return different status code according to responding status. Common status like following:

- 200 (OK): Means get resource correctly.
- 304 (NOT MODIFIED): The requested resource is not modified before last request, usually used for browser cache.
- 404 (NOT FOUND): The requested resource not exist.

GET and POST are the most common methods to get resources in HTTP protocol. GET method is not safe, it displays the address and related parameters of requested resources in the address field of web browser, you can see the resources and parameters you submit. Unlike the GET method, POST method encapsulated its requested address of resources and related parameters into HTTP package, you can't see it directly. Moodle uses the latter one, and it also needs to carry a Cookie to identify users. Corresponding to different resource requests, there are three methods to access the resources in Moodle:
- When login Moodle, web browser uses POST method to submit account and password and get a return Cookie.
- When request for some resource with invisible address and parameters, only POST method can access resources.
- When request for some resource not required for invisibility, both GET and POST methods can carry Cookie to get resources.

The corresponding flow chart:
- Submit account and password with POST method ⟶ Return status code 200 (OK) and Cookie
- Submit related parameters with POST method and carry Cookie ⟶ Return resources (HTML or pictures)
- Directly request resources via URL with Cookie ⟶ Return resources

(2)Extract data with regular expression:

Regular Expression [6] describes or matches a series of strings in accordance with rules of grammar with a single string, it is widely used to search and replace text (such as '.' match any single letter in 'abc34'). That is to say, it is so easy to extract words from plain text with regular expression. As the data which returned by Moodle server are plain text, regular expression is very appropriate for handling the data. Here is a universal function for extract word from strings:

```
public static List<String[]> getResult(String str, String patternStr) {
    //str is string data, patternStr is a pattern string with regular expression
    Pattern pattern2 = Pattern.compile(patternStr);  //Generate pattern from patternStr
    Matcher matcher = pattern2.matcher(str);          //Search matched string from str
    int groupLength = matcher.groupCount()+1;
    List<String[]> groupList = new ArrayList<String[]>();
    for (int i = 0; matcher.find(); i++) {
        String[] m = new String[groupLength];
        for (int j = 0; j < groupLength; j++) {
            m[j] = matcher.group(j);
        }
        groupList.add(i, m);
    }
    return groupList != null ? groupList : null;
}
```

3. System Test

After initially completed this Android mobile client, we build a Moodle server for testing the interaction and basic functions of our client. According to the test, this mobile client can effectively help student access curriculum resources at anytime, and display curriculum information in the screen with limited size effectively. Now, the client can realize the following functions:

A. Login Moodle server;
B. Get curriculum information and display formatted;
C. Update client data at real time to synchronize with the server.

But the stability still needs to be improved. And many other modules also need to be added. Figure 2-6 are some screenshots of our client.
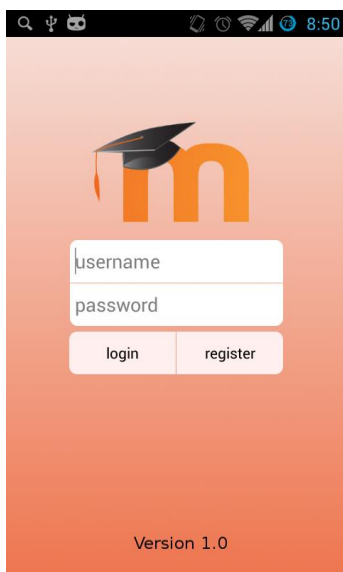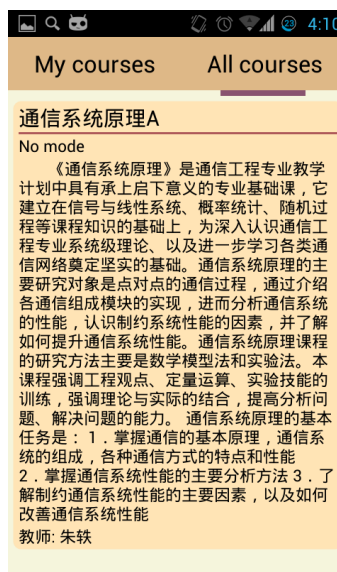
Figure 2. Login Page   **Figure 3. Home Page**   **Figure 4. Introduction Page**
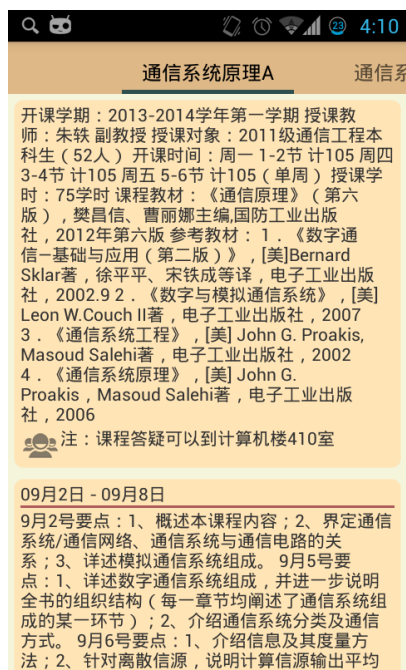
Figure 5. Courses Details Page   **Figure 6. Posts Glance Page**

4. Conclusions

The rapid development of mobile Internet changes the information access way to mobile platform. With the features of flexible, open, easy to share resources, online courses show huge advantages in high education, vocational education and continuing education. The expansion of online courses in mobile environment will provide more convenience to access curriculum resources. The development of Moodle mobile client can effectively help people use leisure time to study. This Moodle client doesn't need any interface provided by Moodle server, so the software can running on any Moodle platform in theory, namely, developers can do nothing with Moodle. We hope our development of Moodle mobile client will bring benefit for mobile learning, and help online course platforms popularize in China.

Acknowledgments

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