Design and Implementation of Distance Education Mobile Terminal Learning System based on Android

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Abstract
In order to improve the efficiency of interactive learning, the paper researched on the Design and implementation of distance education mobile terminal learning system based on Android. According to the demand of mobile learning, the main functional modules of the system are designed, and the main steps and code of the system are given. Finally, the system is tested and user feedback is realized. The innovation of this paper is to provide a more complete system according to the laws of cognition, increase intelligence test, feedback mechanism to enhance listening training, help to improve the learning level, provide strong support for the exploration and practice of personalized learning, to create a good learning environment for listening. This paper analyses the detailed design process of the mobile learning system based on Android platform, including the matching behaviour and learning environment and learning resources, learning content development process module, learning adaptive tracking feedback system, database design, mobile learning experience experiment. This study takes English listening learning as an example, based on Android platform, according to learners' behaviour and learning environment, to develop appropriate learning content and track learning process, and use intelligent mobile learning system as adaptive feedback.

Keywords: Design and implementation, Distance education, Mobile terminal learning system, Android

1. Introduction

There is such a rule in Distance Education Research: "technology itself is not suitable for teaching, but distance education is successful, but more common technology has been published", which leads to the upsurge of mobile learning. Today, the rapid development of information technology, coupled with the people "learn", "lifelong learning" concept has been strengthened, so the traditional education interview cannot meet people's needs, they want a no time, as long as you want to learn can become a learning tool. Therefore, mobile learning emerges as the times require (Kaya, 2015). With the rapid development of mobile Internet, smart phones, tablet computers and other digital devices have been widely applied. With the popularity of mobile electronic devices, the upsurge of mobile learning brings us a new learning mode. These electronic products not only bring convenience to life, shortens the distance between people and provides a convenient search function, more convenient for life and learning, so in today's social background and technology is more perfect today and actively carry out research is particularly important in mobile learning software. In the west, especially in the United States, IOS based mobile learning software has developed rapidly, and iTunes Store has played a role that cannot be ignored. However, due to the high terminal deployment cost of mobile devices iPhone / iPod Touch / iPad on IOS platform, it is difficult for China to develop at present. It has become one of the important reasons. Closing IOS and API platform also leads to the application layer cannot carry two times according to the need of development work (Carlqvis, 2015; Russell, 2017).

Faced with these challenges, let our eyes continue to move to Android. Android mobile terminals have the following two advantages: engineers do not hesitate to choose the right price and the essence of open source. The price of Android is often an acceptable time interval, while Android has an open source feature, which enables engineers to make bold demands from the highly customized bottom line for the two developments. At the present stage, the application software of mobile learning is widely applied in language learning. It focuses on community, and provides corresponding content locations according to learners, such as English learners in software, and suggests oral communication in bank system. These user friendly software services have also been greatly welcomed. However, at present, the ranking of mobile applications and the research of software have not caused more extensive applications, and there is still a lot of space for development. And all kinds of software are basically in the form of media, it is difficult to adapt to the changes in the environment and lead to the compulsory interruption of learning. Most of the learning content is scattered and unorganized, the curriculum system is complete and lack of feedback. With the continuous development of the mobile phone market, the popularity of smartphones has made it an ideal learning platform. College students are smart phone users. According to the characteristics and nature of college courses, it has become a trend to use smart phones to learn self - learning. The use of intelligent mobile phone mobile learning, so that students can contact with the subject, which not only avoids the strange and forget you whenever and wherever possible knowledge, and students in the process of using imperceptibly gradually cultivate good study habits, this adaptation for their lifelong learning
learning society also has a great advantage (Dunn, 2016; Arif, 2017). A schematic diagram of the mobile learning platform is shown in Figure 1.

![Figure 1. Schematic diagram of mobile learning platform](image1)

2. Android technology and key model

Android is a free and open source operation system based on Linux. It is mainly used for mobile devices, such as smart phones and tablet computers, led by Google, and Open Handset Alliance. There is no unified name in China, and more people in mainland China use "Android" or "an". The Android operating system was originally developed by Andy Rubin, which mainly supports mobile phones. Before you download the Android source, install its build tool, Repo, to initialize the source code. Repo is a tool for Android to help Git work. Service is a component of Android system. It is similar to Activity level, but it can't run on its own, it can only run in the background, and it can interact with other components. Service is not the interface of long life cycle code. Service is a program that can run for a long time, but there is no user interface. It's really boring to see an example. Open a music player program, this time online, and then open the Android browser, although this time has entered the browser program, but the song has not stopped, but continues in the background of a song, and then play a song. In fact, the broadcast is played by the music service control. Of course, the music service can also be stopped, for example, when the song playlist ends, or the user presses the shortcut key to stop the music play and so on. The service can be used in applications and more applications, such as multimedia playback when the user at this time to start another program, continue to play in the background, such as change detection in the SD card file, or in the geographic information change under the background of records, the total service is always hidden behind. In terms of advantages, the Android platform is the first of its development, and its development platform allows any mobile terminal vendors to join the Android alliance. Important openness allows more developers to grow as users and applications grow, and a new platform will soon become mature. In view of the development and development of Android, it is beneficial to the accumulation of popularity, the popularity of consumers and manufacturers. For consumers, the biggest advantage is abundant software resources. The open platform will bring more competition, allowing consumers to buy a favorite mobile phone at a lower price. The schematic diagram of the Android structure is shown in Figure 2.

![Android structure](image2)

Android is based on Linux operation system kernel. It has Linux kernel service, and realizes core functions such as hardware device driver, process and memory management, network protocol stack, power management, wireless communication and so on. The Android4.0 version is based on the Linux2.6 kernel, and the 4 and updated versions use the updated Linux3.X kernel, and the two open source projects begin to be interoperable. The Linux3.3 kernel formally contains a number of Android codes that can be directly imported into Android. Linux3.4 will add more functionality, such as power management, to increase compatibility with Android hardware and enable Android to support more devices. The Android kernel enhanced the Linux kernel, adding some functions to mobile computing. For example, low memory manager LMK (Low Memory Keller), anonymous shared memory (Ashmem), and lightweight inter process communication Binder mechanism, etc. The enhancement of these cores makes it possible for Android to inherit the security mechanism of the Linux kernel, and to further enhance memory management and to intervene in the communication security.

As scholars at home and abroad have different understanding of mobile learning, there is no unified definition of mobile learning. Alexander Day (Alexander Dye) proposed that mobile learning is the use of mobile devices, which can effectively present learning contents and establish two-way communication between students and teachers everywhere. Chabra and Figueiredo believe that mobile learning can assist in learning at anytime and anywhere. This is based on the relationship between mobile learning and digital learning, and the
definition of mobile learning is relatively extensive based on the idea of distance education. Georgiev and others understand mobile learning from the perspective of combination of data learning and distance learning, and believe that mobile learning is a new stage for the development of the two. Clark Quinn and Paul Harris have defined the mobile learning from a technical point of view, emphasizing mobile devices and mobile communication technology to help mobile learning anywhere and anytime. In general, mobile learning is a wireless mobile communication device, such as personal digital assistant PDA, mobile phone, Pocket PC, etc., to acquire new forms of learning and educational resources, educational information and educational services, and wireless mobile communication network technology. Due to the need for face-to-face teaching, the time and place of the traditional classroom teaching is limited. Mobile learning provides anytime, anywhere learning environment, which makes up for the shortage of traditional teaching and can be separated from the main body of collective learning in teaching. Mobile learning is a mobile assisted wireless communication function. In the process of mobile and completion, learners can learn mobility in their spare time; get rid of the constraints of learning laws or the specific time and place of rules. In the learning process, the learning needs are different, from the people-oriented, providing personalized learning content for learners, mainly according to the learning ability and interest demand, customized to fit the contents of the current state of learning, mobile learning platform to support learners personalized learning. Mobile learning integrates the Internet, wireless communications, geographic information, multimedia, human-computer interaction and other technologies to provide comprehensive technical support for learning. Under the new technology condition, interactive learning environment has brought unique learning experience to learners, including interaction, teacher-student interaction, teacher-student interaction, teacher-student interaction and so on (Farshchi, 2015; Irēna, 2015).

![Figure 2](image-url)

Figure 2. Schematic diagram of Android operating system

Mobile learning, with the help of mobile wireless communication networks, can achieve more efficient, simple and efficient learning interaction. In the process of mobile learning, teachers and students can interact with real time or non-real time with the help of portable mobile devices, learn and interact with each other anytime, anywhere, such as guessing riddles, discussing, testing and other interactive activities. Learners sometimes need to get specific knowledge immediately to solve practical problems. Traditional teaching is not enough to accomplish such a task. The learner can obtain the corresponding information through the portable mobile device and learn in time. With the development of computer network technology, the information age pays more attention to individualization and independence. Therefore, adaptive learning has become a great leap in today's education. The adaptive learning system of adaptive hypermedia system is characterized by the development of intelligent tutoring system, which is far beyond the technical ability of the past network learning system. It has become an important trend in the development of distance education in the future. According to the characteristics of learners, adaptive learning system can use adaptive navigation technology to provide learners with personalized learning paths, learning resources, learning content, providing learning strategies and learning diagnosis. The adaptive learning model makes the presentation of the learning content and the interaction in the learning process more suitable for the characteristics and needs of individual learners. The schematic diagram of a mobile learning system is shown in Figure 3.

SQLite, a lightweight database, is a ACID relational database management system, which is included in a relatively small C library. This is a public domain project established by Richard Heap (D.RichardHipp). Its design goal is embedded, and has been used in many embedded products, which takes up very low resources. In embedded devices, it may only need hundreds of K of memory. It can support the mainstream Windows / Linux / Unix operation system, etc., compared with the world famous Mysql database management system...
PostgreSQL, it can be combined with many programming languages, such as Tcl, C, PHP, Java and ODBC interface, which combine two sources faster. The first version of the SQLite Alpha was born in May 2000. It has been 15 years since 2015, and SQLite has also ushered in a version of the SQLite 3 that has been released. Unlike the normal client server paradigm, the SQLite engine is not an independent process to communicate with the program, but is connected to the main part of the program. So the main communication protocol is the direct API call in the programming language. This has a positive impact on total consumption, delay time and overall simplicity. The entire database (definitions, tables, indexes, and data itself) is stored in a single file in a host file. Its simple design is done by locking the entire data file at the beginning of the transaction. It also supports transaction processing functions, and so on. Some people say it’s like Microsoft’s Access, and sometimes it feels a bit like it, but it’s really different. For example, SQLite supports cross platform, easy to operate, and can create databases directly in many languages, unlike the need for Office to support Access. If you are a small application, or if you want to do embedded development, there is no appropriate database system, then you can consider using SQLite.

As of October 17, 2013, the latest version was 3.8.1. You can get the source code and the document above. At the same time, because of the simple structure of the database, the system source code is not much, and it is also true for the professionals who want to study the development of the database system. First of all, you will encounter a noun that surprises you: no type (no type). SQLite! There is no type. This means that you can store any type of data, regardless of what the data type is declared (only in one case). There is no specified type of SQLite on a field that is completely valid. If you feel that any restriction affects your application, you should consider using a perfect DBMS. If you can delete these restrictions and be interested in the fast and flexible embedded open source database engine, you should consider using SQLite. Some areas that really represent SQLite excellence are sites that use SQLite to manage application data, rapid application prototyping, and training tools. Because of its advantages of small footprint, good performance and zero cost management, the embedded database provides high performance for the application of backend database which can not provide data persistence before. It is not necessary to use text files to implement persistent storage. The ease of use of embedded databases such as SQLite can accelerate application development and enable small applications to fully support complex SQL. This is especially important for the space application of small equipment. Embedded databases are also important for speeding up application development, especially in the database abstraction layer (such as PEAR: DB or ezSQL). Finally, SQLite is developing actively, and there will be new features in the future, which will be more useful for the open source community. The SQLite schematic diagram, as shown in Figure 4, the core startup code is shown below.

```php
if ($db = sqlite_open('mysqlitedb', 0666, $sqliteerror)) {
    $result = sqlite_array_query($db, 'select * from sqlite_master;');
    foreach ($result as $ Sentry ) {
        echo 'table name='.$ Sentry ['name'].'
        echo 'sql='.$ Sentry ['sql'].'
        sqlite_query($db, "INSERT INTO user VALUES('user".$i."',".$i."@ hichina.com")");
        sqlite_query($db, "delete from user where user='user99'")
    }
}
```

Figure 3. Schematic diagram of mobile learning platform
3. System analysis

We will combine human cognitive psychology to analyze mobile learning software from learner, learning environment, learning content and so on. Finally, we introduce the interface design that is more suitable for mobile learning software. Because mobile learners use “scattered” time to learn “mobile”, their attention is far below the silence in the classroom. If the knowledge of mobile learning software is presented or its own interface is not mature enough, the learners will have a strong adaptability. Because different disciplines involve the teaching of mathematics course and the way of learning in different disciplines, the better results will be achieved at the same time. How to consider the characteristics of the discipline itself and abuse the mobile learning mode will not produce good learning effect, but also may make the learners' mental exhaustion, inefficiency and even boredom and other negative problems. In this case, it is more convenient for mobile learning. It helps learners to make full use of discrete ordinary time, knowledge and experience of learning.

The overall design is an important stage of mobile learning in the process of software development, this chapter takes the mobile learning and mobile learning content customization operation mechanism for the adaptive feature, proposes a software content customization adaptive mobile learning framework and relationship factors, interaction framework, principle, function and work process. Finally, the design and implementation of the software database are introduced. Mobile Learning: in the application layer of mobile learning app, learning content is displayed on the data transmission layer of the client, and the learners can learn the display layer of the client interface based on the interface, and this layer is also learning and interacting with the system. Learning content data transmission layer: this layer is logical communication between feedback layer and application layer. Data management layer and application layer provide processing process. When the feedback layer responds, this layer will feedback learning content to application layer after responding to data transmission layer. When the learner is learning, it is necessary to pass the data management layer of the learning content data to the application layer through this layer. Mobile learning adaptive feedback layer: this layer is the key to realize customization layer adaptive learning content, according to the learners in the learning data management data management during the recording, provide feedback information for learners at the same time, the system according to the corresponding feedback information, providing learners with more focused learning content, make learning more personalized. Data management layer of mobile learning: learners record and store learners' learning trajectories in learning process, learn content data, establish interface connection with feedback layer, environment perception layer and customized logic layer. This layer stores the environmental information and corresponding learning contents provided by the environmental awareness layer to the logical analysis data of learners' learning and tracking data. The data layer is transferred to the feedback.
logic layer, the feedback information layer provides learners with adaptation, while the storage layer adjusts learning content according to feedback information, so that it can learn content and data storage as adaptive response. Adaptive learning content custom logic layer: this layer is mainly based on feedback feedback, tracking to determine the learning state through the data storage management study, then the feedback layer logical analysis through data management, logic analysis, in order to make the appropriate response to feedback. Sensors call applications to get external environment of mobile devices, such as voice, light and speed, etc., to provide environment and learner behavior information for mobile learning software. Software environment: the operating system is the Android system, it introduces the reasons and advantages of this system, the Android system has its own unique core control, security software is the most basic, in between hardware abstraction layer and software stack, providing core services as the basic software, such as memory management, network, security mechanism, process management, hardware etc.. The overall architecture of the system is shown in Figure 5.

![Figure 5. Overall system architecture diagram](image)

The mobile learning environment is complex, and the attention in the learning environment will be highly dispersed. So the learning content of single media improves the learning efficiency in various data in the form of project, so it has a better learning experience. Mobile learning is different from traditional teaching mode. It can help learning anytime, anywhere, on mobile phones, tablet computers and other mobile devices. It is convenient, flexible, and flexible in time and space. But the mobile learning environment is complex, the learners in mobile learning, may at any time by outside interference, such as receiving SMS or email, telephone calls, resulting in learners' attention is not a long time the highly centralized system, learning content is divided into many parts, the system cannot learners consistently learning knowledge. The traditional classroom learning and network learning has great ability of learning resources, because of mobile learning and continuous time interval, so these learning resources cannot play its true role, if the use of traditional learning resources and large capacity, is likely to lead to the learning environment to lose confidence in learning, shorten the learning time and learning effect. This topic in the design of learning resources, fully considering the characteristics of mobile learning, learning content will be in accordance with the length of time is divided into several corresponding learning fragments, mainly divided into 5 minutes, 10 minutes, 20 minutes, so that the software has better learning mobile learning experience, a better understanding of learning content. The three aspects of the mobile learning platform and the limitation of mobile learning and the complexity of the environment are the main factors to be taken into account by the system. In order to solve the software adaptability, learning behavior and learning environment, in the menu add sub menu "environment and behavior", adding the content to the environment and behavior is divided into the following: weak light noise, light and no noise of constant speed, weak light, light quiet, moderate speed, strong light, silent, quiet strong light. The response event is then set to match the learning type with the environmental behavior features. If the learner chooses the environment features suitable for text type learning, pop up the dialog box and choose what you need to learn. The software needs to display the read files stored in the inside, and then use the file input stream to read the contents of the file; it will be displayed on the client interface. The interface of the system monitor module is shown in Figure 6, and the core code list is listed below.
5. Conclusion

The paper researches on the design and implementation of distance education mobile terminal learning system based on Android. In the process of mobile learning, teachers and students can interact with real time or non-real time with the help of portable mobile devices, learn and interact with each other anytime, anywhere, such as guessing riddles, discussing, testing and other interactive activities. Learners sometimes need to get specific knowledge immediately to solve practical problems. Traditional teaching is not enough to accomplish such a task. The experiment result shows the proposed method is effective.

References


