

Design of Mobile Learning System Client Based on OK6410

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Abstract. For the rapid spread and development of the intelligent mobile phones and other mobile terminals, a suitable mobile learning system designed to learn anytime, anywhere in the intelligent terminal. And based on advanced technology of the ARM architecture, Linux and Qtopenia embedded software OK6410 development board implements a simple client mobile learning system. The system has been measured, which achieve better results. It verify the effectiveness of the program.

. INTRODUCTION

With the development of information technology, especially the rapid grow up of internet of things and cloud service. People desire to learn more flexible without time and place limited, meanwhile, mobile learning comply with people's this study demand. So to do mobile learning though mobile intelligent terminal anytime and anywhere must be an inevitable trend. This article use mobile learning as basic to design a workable solution of mobile learning system, especially aimed at the quick popularity and development of intelligent mobile phone terminal, which given an much suitable learning any time and where design solution on mobile intelligent terminal Also base on the advanced ARM technology frame to finish a simple mobile study system on OK6410 development board and achieve a good result^[1].

MOBILE LEARNING THEORY AND ITS APPLICATION MODE

Mobile learning is a new type learning method grow from remote education, which learner via kinds of mobile device, streaming media technology and mobile communication network technology according their study acquirement to get learning resources in suitable time and place, then to study, communicate and discuss with other learner as well as teacher. In information society, the fundamental method to train social need high-quality talent is to develop modern education technique and to explore new type education mode^[2]. Thus, designing a set of customer end system base on mobile learning, no matter upon of problem study or upon of team project development study can give full play of learner's subjective initiative and creative. At the same time the mobile learning customer system which design from the guide of constructivism theory can better to stimulate the learner's study interest and increase study efficiency. It is the deep integration of curriculum and information technology, thereby to provide a new learning mode to learner^[3].

CONSTRUCTION OF SYSTEM PLATFORM

A. Construction of Hardware Platform

Mobile learning is a new type learning method grow from remote education, which learner via kinds of mobile device, streaming media technology. The mobile learning system customer-end design is based on OK6410 develop board. OK6410 develop board is developed by forlinx technology company which base on a development board of S3C6410 processor. The processor core is ARM11 architecture's 16/32 bit RISC micro processor, with aim to offer a low power consumption, high performance, and low cost application solution. Besides, OK6410 development board also has lot's H/W accelerators. On display control, S3C6410 processor includes TFT LCD interface, which has image enhancement of TV (NTSC/PAL) video codec, video post processor etc. On about multimedia speed up features, S3C6410 processor includes JPEG decoder, multi-standards decoder (MSC), camera interface etc. On audio interface, S3C6410 processor includes IIS bus stereo DAC interface, PCM serial audio interface, AC97 audio codec interface etc. Because of OK6410 development board has powerful multi-media codec and display function, so

the system choose OK6410 development board as H/W develop platform of mobile learning system client.

B. The Construction of the Software Platform

Hardware for mobile learning system client is based on OK6410 demo board of ARM11 kernel. For Linux and Qtopia, it can be operated only when the software is transformed well.

1) The Transformation of the Kernel of Linux

Since Linux is an open source code, anybody can download the kernel source code from the official website and decode it so as to make it operate smoothly on the ARM11 kernel platform. And other sub-folders within the umbrella of folder of 'arch' can be cut before decoding. Details are as follows:

- Clean the intermediate files, temporary files as well as profiles, e.g: # make clean.
- Ensure the issues of hardware for the system and set-up, e.g: network protocol and the type of CPU available.
- Setting up the kernel with menuconfig, drive module needed should be added as well.
- Decode the kernel, e.g: #make zImage. After decoding, operating file, i.e, zImage will be available within the folder of /arch/arm/boot based on OK6410 demo board.
- Develop image files for the kernel: Serial port of OK6410, power cord as well as USB cord should be linked and u-boot command line should be available via super terminal operator. Input #dnw 50008000 in u-boot command line and download kernel the image file, i.e, zImage to the memory of OK6410 demo board. Delete Nandflash of the demo board via #nand erase 100000 300000 command. Develop the kernel image file to Nandflash via # nand write.e 50008000 100000 300000 command.

2) The Transformation of the Qtopia Image Interface

Qtopia is the development platform for complex apps based on LINUX system in terms of Consumer electronics devices by Trolltech Company. After setting up and decoding of the Qtopia software downloaded for the official website, the graphic interaction system, Qtopia2.2.0 out of OK6410 demo board can be operated. The followings are the specific steps for transforming Qtopia2.2.0 to OK6410:

- linux6410_touch.cramfs, mkcramfs as well as cramfsck should be copied to Ubuntu system.
- The command, #sudo ./cramfsck -x Qtopia linux6410_touch.cramfs, should be operated. Unzip linux6410_touch.cramfs to Qtopia folder.
- The well-decoded files in the Qtopia folder should be added into Qtopia2.2.0 folder.
- The command, #sudo ./mkcramfs Qtopia /Qtopia.cramfs, should be operated as well. Compress Qtopia files and name it, Qtopia.cramfs.
- Qtopia.cramfs image file should be input by #dnw 50008000 in the u-boot command line. Then, delete the sector which mtblock locates by the command, #nand erase 400000 5000000. Lastly, Qtopia.cramfs image file should be added to Nandflash by the command, #nand write.e 50008000 400000 5000000.

The hardware and software platform will be ready-made now.

THE CATEGORIES AND RELEVANT TECHNIQUES OF MOBILE LEARNINGSYSTEM

Research on mobile learning system is still on initial stage presently. It needs to be standardized and regulated. And there're many kinds of mobile learning system based on mobile learning theories, see Figure 1 for the basic categorization of traditional mobile learning system.

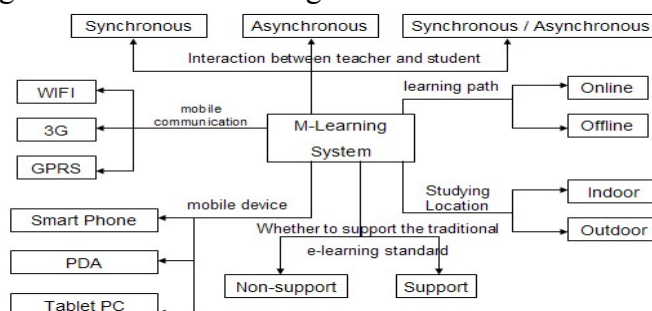


Figure 1. The categories of mobile learning system

- Online and Offline: Two modes of the mobile learning system, online and offline, are available on condition whether the instrument has linked the remote server.
- The Standard of e-Learning and m-Learning ^[4]: Mobile learning system can be divided into e-Learning and m-Learning according to the different structure and format of database.
- Asynchrony and Synchrony: Mobile learning system can be divided into asynchronous and synchronous types according to whether instant communications between learners and teacher are available.
- Mobile Instrument: It's the cline that learners can use when learning. It can satisfy the demands of all kinds for the learners with the development of embedded technology.
- Mobile Communications: It serves as the safeguard for learners to learn any time, they are WIFI、3G、GPRS etc.
- Site: It can be divided into indoor and outdoor mobile learning system according to the difference of the learners' site.

Traditional mobile learning system is realized by B/S framework, namely, users can learn by logging in remote server. The key demerit of B/S framework is that, learners fail to communicate with teachers since they can only surf the internet for information needed. However, interactive study can be possible by C/S framework in terms of mobile learning system, this paper, given this, seeks to provide the users with the optimal way to log in the server with varying sites.

MOBILE LEARNING SYSTEM CLIENT DESIGN

A. Client System Design Thinking

At present, mobile learning is still in infancy status. Mobile learning theory also stay in theoretic foundation level. How to combine mobile learning theory and existing mobile information technology, streaming media technology, embedded technology, and make mobile learning not only study in theoretic level but also let it become reality from technology, thus to be public learn habit. It's the hot topic for present researchers both domestic and oversea to research hard. Below parts is some thinking of this customer system during the design process.

- It has a relatively perfect mobile learning function module and can meet personalized learning needs of different people. Major module including user registration login, mobile course learning, extracurricular homework support, mobile learning blog, learning question for help, educational information announcement, mobile learning game, mobile learning evaluation and so on.
- Each function module should be clear logical, simplify brief, operating easy, thus not to make learner appear logical confusion because of too much hierarchy.

B. Client Overall Architecture

According to the design requirement above, use QT language to compile client browser which support WAP protocol on OK6410 development board, and can make data transmission between client and server through WIFI. Client application program frame adopt design thinking of MVC (Model-View-Controller), among them, Model means the business which mobile learning can provide. View means the business logic each module represent how to show on the display. Controller is use to control transmission between management view and client.

Figure 2 shows the overall architecture of mobile learning client interview. User log into main interview can see some different function module. Each module contain given sub-function learning module. User can do selectivity study base on their truly situation. Main module's function explain as below.

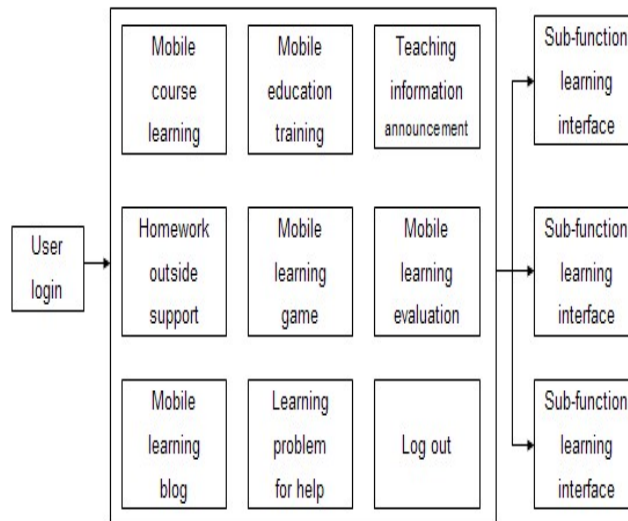


Figure 2. Client overall architecture

1) *Mobile course learning*: Mobile course learning is the core of mobile learning system. Mobile learning course resource mainly including WAP course, digital lesson plans, little knowledge, electronic dictionary, e-book etc. Detail design as Figure 3.

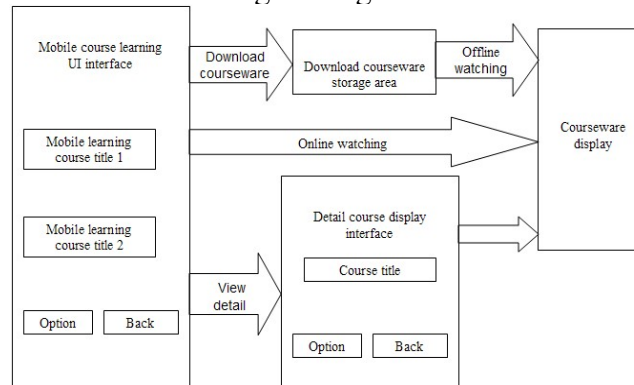


Figure 3. Mobile course learning module design

2) *Mobile education training*: Mobile education training module is design on the basis of behaviorism theory. Mainly to provide some small test and practice, record study process information, and comes out student's results and feedback information.

3) *Teaching information announcement*: Mainly to announce present mobile learning system teaching information, teaching plan arrangement, teaching goal etc.

4) *Homework outside support*: With the development of embedded technology, the function of mobile device is more and more perfect, which has function such as shoot, position, data communication. Take advantage of those function of mobile device, the system design homework outside module, it is suitable for learners or archaeologists to collect sample in wild environment.

5) *Mobile learning game*^[5]: Learner understand and master knowledge, fulfill mobile learning task during the game playing process.

6) *Mobile learning evaluation*: It provide mobile learner with online mobile learning evaluate service, and let learner know study result conveniently.

7) *Mobile learning blog*: Mobile learning blog is a convenient and easy use individuation knowledge management system. Learner can timely publish study notes, emergency issue, inspiration etc. that happen in learning, work, and daily life to the mobile learning blog. It is convenience to communicate and share with other learners.

8) *Learning problem for help*: Learner raise the problem during learning via this module, and teacher put together to answer the problems students arise through this module.

C. The Designing Result and Testing

The client application of mobile learning system is written by QT language. The abovementioned client application software is downloaded to the OK6410 developed board, which is set of environmental variables necessary for the running of the software. At last it is carried out at the developed board. The functioned result is as the diagram blow (Figure 4).

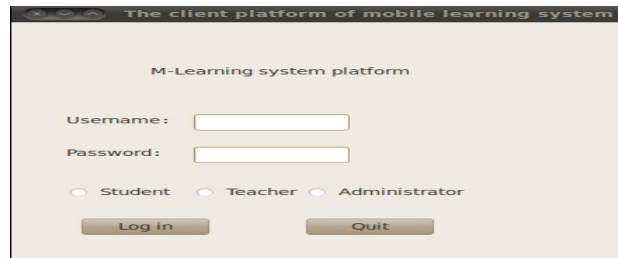


Figure 4. Mobile learning system client platform login screen

The client platform of mobile learning system is divided to three kinds of authorities, they are administrators, teachers, and students. Figure 5 displays the main client interface after the student's login. If you start mobile curriculum learning module (Figure 6), click on the embedded Linux applied class. It display applied program list to be opened, including checking the details of curriculum, watching curriculum resource online and offline. When clicking on watching



Figure 5. Mobile learning system client main screen

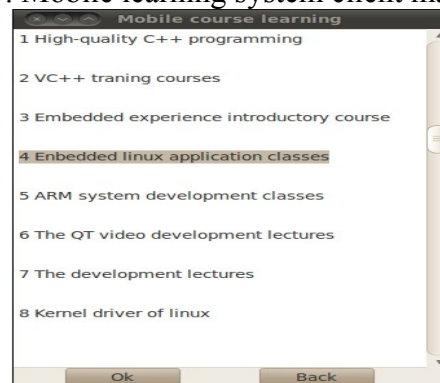


Figure 6. Mobile learning course modules

offline item, the client will judge whether there is curriculum resource to be watched locally. If not the client will change into online mode from offline mode, and find the necessary curriculum resource to watch by researching tools, Figure 7 provides the effect of embedded Linux developed curriculum played in OK6410.

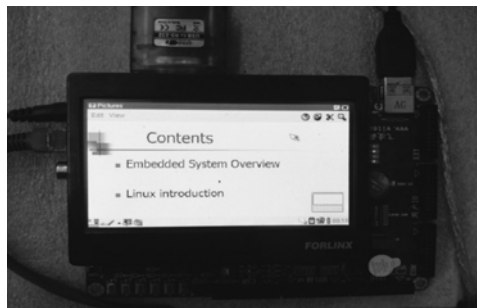


Figure 7. OK6410 development board video playback

CONCLUSION

This article introduces the theory of mobile learning firstly, illuminate the application of constructing theory in mobile learning and the frame of mobile learning system, bring forward the designing thought of mobile learning system client, based on these theories and designing thoughts, construct the platform of hardware and software in use of OK6410 developed board which is the client platform for mobile learning system, so fulfill a mobile learning system client based on

OK6410 developed board. This system contains the characteristics of improved function, convenient operation, strong flexibility, and low cost, so it is worth practically to some extent.

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