Design and Implementation of the Home-School-Community Synergy Online Education Platform based on Mobile Information Technology

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Abstract
In this paper, we design and implement the home-school-community synergy online education platform based on the mobile information technology. To enhance feasibility of the traditional online education services, we propose the P2P based mode. As a major impact on the network technology, the P2P and cloud computing has its own characteristics. Firstly, we introduce the mobile information technology to serve as basis. We propose that fourth generation mobile communication that can be in the different fixed and the wireless platforms and across different frequency band for the wireless service in the network. Later, we analyze the cross-platform communication of information, robust software development and the enhanced revised online education platform, respectively. The revised paradigm for development of mobilized multi-platform is proposed. In the final part, we show the user interface and systematic description of the system that feasibility is verified. Conclusion and future research orientation are summarized at the end.

Keyword: information technology, mobile system, online education, P2P communication, software development.

1. INTRODUCTION

Modern distance education is different from traditional TV university education mode form of a new type of the distance education and it is based on basic computer communication technology and network technology that adopts the two-way interactive multimedia teaching means, to realize the education across time and the space transfer process. Compared with traditional education, and modern distance education has the characteristics of the school open, and it breaks the traditional, closed school-running mode, implementation can at any time, any place, learning any good teacher to open such a teaching mode, and will help to establish a kind of education guarantee system that could satisfy the requirement of lifelong learning.

Students in the learning process will produce large amounts of data, especially in general cloud computing, mobile Internet technology and the extensive learning, mobile learning became popular such as education big data naturally become the new things in the field of education. Education career development inner logic, education phenomenon, content, and basic law of cascade, the high correlation between are required to apply the thought and method of large data in-depth analysis and mining.

According to different research perspectives and emphases, current research online learning platform oriented education data analysis mainly includes education and the education data mining analysis of two research areas. These two areas have a lot in common that also has its focus on the problem(Rao,2012; Audet,2014).

Figure1. The Current Condition of the Online Education
Education is the main goal of the data mining in learning software, the online learning website, improve learning model, improve the learning effect, learning and the education analysis will be more focus on the research results to guide teachers and students to improve the teaching method, learning method (Koeher, 2014). Education field of data mining focused on online education study on the method of the data mining analysis, the analysis method mainly includes the following: prediction, structure mining, mining, such as model is found (Lewis, 2013). (1) Relationships in the data mining is used to find the relationship between the different variables, including the association rule mining, the correlation analysis, the sequential pattern mining and causal research direction of basic data mining, etc. (2) Model found research mainly refers to the knowledge to build a model from the education data mining, so as to guide other education data mining research. Common models found that the research method is by learning to build step by step in accordance with specific problems learning model (Neuhofener, 2014; Keller, 2014). (3) Forecast, pertaining to data mining in online education gets about a variable model, so as to forecast the variable trend of the future, such as data trend prediction, etc. At present the commonly used prediction method including classification, regression, and evaluation of potential knowledge, etc. (4) Hope in large-scale data structure mining the structure of automatic mining valuable knowledge, common analytical methods including clustering analysis, factor analysis, social network analysis area structure found.

To enhance the performance of the traditional online based education paradigm with the integration of the information and Internet based technology, we propose the implementation way of home-school-community synergy online education platform based on mobile information technology. In the section 2, we introduce the primary techniques of mobile communication that will be adopted by our system. In the section 3, we show the proposed methodology that is consist of the analysis of the cross-platform communication of information, robust software development and enhanced revised online education platform, respectively. In the section 4, we show the designed system with the general verification. In the section 5, we summarize our work with final conclusion.

2. MOBILE COMMUNICATION TECHNOLOGY

As the basic supporting technology of mobile based online education system, communication techniques should be firstly discussed. Communication impact on our lives so deep, so it's hard to imagine if there were no wireless communication technology of information and social connections, freedom and flexibility, our life will be more difficult. From the perspective of network and mobile devices, we briefly discuss evolution of wireless communication so far (Ertmer, 2012; Collier, 2013).

Fourth generation mobile communication that can be in the different fixed and the wireless platforms and across different frequency band for wireless service in the network, can be in any place of broadband access to Internet, including satellite communications and the stratosphere communication as can provide positioning timing, the data acquisition, remote control and the other comprehensive functions. The core of the fourth generation communication technology specific as follows. (1) MIMO technology. MIMO technology to a certain extent, can take advantage of the spread of multipath components, that is to say, MIMO can resistance to multipath fading, but for deep frequency selective fading and the MIMO technology is still powerless. The solutions of the frequency selective fading MIMO technology can combine general OFDM technology, converting frequency selective fading subcarrier in flat fading. (2) Smart antenna. Smart antenna can inhibit general signal interference, automatic tracking and the digital beam control functions such as the intelligence, its basic working principle is based on the direction of the signal wave adaptively adjust direction figure, strong tracking signal, reduce or the offset interference signal. (3) Software radio technology. Software radio is standardized and the modular hardware functional unit through a general hardware platform, software loading method is used to realize all kinds of radio communication system of a kind of new technology with open structure. By downloading different software program, on the hardware platform which can realize different function, to realize in different systems of the single terminal roaming, it is to solve the key technology of mobile terminals in different systems work. (4) Multicarrier technology. Orthogonal signal can be separated by using the related technologies on the receiving work, so that we can reduce the mutual interference between the sub-channels. Each channel on signal bandwidth is less than channel bandwidth, so every child can be as a flat fading channel, which can eliminate inter-symbol interference (Anderson, 2012).

3. THE PROPOSED METHODOLOGY

In this section, we will propose our novel methodology from the perspectives of the cross-platform communication of information, robust software development and novel enhanced revised online education platform, respectively.

3.1. Cross-Platform Communication

A primary task of the construction of information sharing platform is select data organization mode, current mainstream data organization model of "centralized" and "distributed" two kinds. "Centralized" has the advantage
of easy management and maintenance, the drawback is easy to produce bottleneck central processing ability, communication ability; "Distributed" has the advantage of autonomy, each department has the good reliability and high availability, communication expense is low, small investment, is beneficial to protection of investment, a single point of failure can be isolated, the disadvantage is that system management and maintenance is difficult, especially it is difficult to guarantee the data consistency and integrity of all nodes. The figure two shows the mentioned concepts.

A significant number of application resources in different platforms, conversion program face the cross-platform and the conversion efficiency. Model as a platform of abstraction, from the bondage of the platform, at the same time in the code generation with high efficiency, can well solve the problem of cross-platform and basic efficiency. Mentioned here is closely associated with the model of the two concepts: model-driven development and reverse engineering.

Find the correspondency of reverse engineering and model-driven development, namely sharing model, can be used to the application of open source from source abstract model, then the model generated code, realize the application of cross-platform conversion, has realized the rapid development of the platform software. In the general known source of the software reverse engineering and it is from an existing source code to generate a class diagram, etc., to use as the code analysis or the document. Model-driven development tool is usually defined itself as a model, the user first visualization tools platform to complete the modeling work then the model is converted into code, the code generation shown in the figure three.
used in the equipment specification and the whole life cycle information framework and testing process of resource information, test description information and a series of the standards and these standards due to its content of target platform and the testing process for specific no difference that can effectively support the needs of the comprehensive test to ensure.

3.2. Robust Software Development

With the rise of iOS and Android mobile phone operating system, powerful development platform for mobile application development easier, the application and update interval time greatly shorten the development cycle, the core function of the creative than the simple application functions instead of the application of more in line with the requirements of users on the mobile terminal (Lee, 2015).

To and PC client and Server side Java distinguish, Java for embedded systems is called Java 2 Micro Edition, hereinafter referred to as the J2ME. It together with the J2SE and the J2EE constitute the whole of the JAVA 2 platform. It has different from other Java platform, it is a highly optimized Java running environment and also have Java "has nothing to do with the platform" features, can be found in a variety of small electronic devices supporting the Java transplant, make mobile wireless devices to be shared between applications. Accordingly, in the figure 4, we show the general paradigm.

![Figure 4. The Robust Software Development Paradigm](image)

We can understand the level of the J2ME like this: the Java virtual machine is the core of the J2ME technology, but the configuration and description provides the special environment of application program interface. Configuration is the smallest of a common set of equipment used in the Java platform, while the description into a series of the specific equipment or special application's ability to provide more specific.

Cross-platform web application development can solve the multi-platform development problems, it as a Web for running environment, applications HTML5 techniques for development that can run on different underlying operating system. Native applications and Web applications have different features will co-exist for a long time, Web applications cannot be instead of native applications use which kinds of the technology, need to undertake choosing according to business requirements. As a general principle, the need to use system underlying function, directly on the system platform, programming, and application of requires a good user experience, suitable for use native way; Ability to focus on the content, mainly depends on the clouds, especially for the original desktop is extended in the field of mobile business, suitable for using the Web, it is depends on the actual application on system depth-first or the breadth first choice to the customer, ability is dependent on the terminal or the cloud of choice (Boticki, 2013). Correspondingly, we illustrate the architecture of the Android system in figure 5.

This layer is to define the configuration layer and it mainly provides a layer of configuration of function to support a specific device. These features include the UI and the support for persistent storage, such as its pertinence is stronger than configuration layer. If the configuration is for one type of equipment, the layer of description is for the equipment in the scope of a smaller part of the equipment (Lawrence, 2013).
Each device has its own user interface and the data storage method, input mechanism, these aren’t the configuration layer range can meet the minimum requirements, and that is why we exist, describe layer it for special applications to provide more specific functions. At present, the JAVA J2ME with its unique advantages, become more common in all kinds of mobile development technology of a technology. First of all, because of the popularity of JAVA technology, in the light of the books and documents of the JAVA development quite rich and very detailed, JAVA version of the many other development ideas can be directly applied to the development of J2ME, so good to fit for developers, is easy improve. Second, many experienced JAVA programming procedure and the code is open, so we can use without having to repeat to write directly.

### 3.3. Online Education Platform

To enhance feasibility of the traditional online education services, we propose the P2P based mode. As a major impact on the network technology, the P2P and cloud computing has its own characteristics, the characteristics of P2P technology is embodied in the following respects. (1) Decentralization: the network resources and services distributed on all nodes, the realization of information transmission and service directly between the nodes that can be without the intervention of the intermediate links and servers, to avoid the possible bottleneck. (2) Robustness: as the service between dispersed in each node, some nodes or network have little impact on other parts of the damage. P2P architectures are naturally possesses advantages of resistance to attack, high fault tolerance. (3) Adaptability: in P2P network, the system will with the user's entry into and exit, on the whole topology and the resource and service ability for dynamic adjustment, to adapt to the system change. (4) Cost-effective: performance advantage is an important reason for P2P is widely attention. Used in the P2P architecture can effectively use Internet to spread a large number of common nodes, to store the data distribution computing tasks or to all nodes, achieve the goal of high performance computing and the massive storage.

Network education service platform is the inheritance and development of traditional education mode, and a beneficial supplement of traditional education mode, at the same time, it is different from the traditional education mode. The platform consists of the following function modules. (1) In the P2P network resources are shared. Resource owners will obtain first related resources uploaded to the server, peer node according to the requirements, choose the resources required to download, use at the same time to be shared with the other nodes. When a peer node in the system need related resources, in the first place in the P2P network search, search after the connection is established, when can't find the available resource nodes, it from the download of server resources. (2) In our platform, we design the online examination module and the module mainly includes the database, exam answer parsing of two parts. Exam is saved in the teachers here are nodes and servers, through to

![Diagram of the Android Mobile Environment](image-url)

**Figure 5.** The Architecture and Organization of the Android Mobile Environment
the account permissions settings allow the students unable to download the test question to the machine, and can only be completed online. (3) Peers node in peer-to-peer networks for available resources query, first send query requests to the server, the server returns the list of available resources, peer node according to return a list of resources and the related nodes connection is established, inquiry and course resources.

4. VERIFICATION

![Figure 6. The Systematic Verification of the Proposed Platform](image)

5. SUMMARY AND CONCLUSION

In this paper, we design and implement the home-school-community synergy online education platform based on mobile information technology. Compared with traditional education, and modern distance education has the characteristics of the school open, and it breaks the traditional, and closed school-running mode, implementation can at any time, any place. We combine the mobile information technology and the enhanced software development pattern to achieve better performance that is meaningful for the further development of P2P based online education services. In the future, we will cast our basic attention on the mobile communication optimization to achieve better user experience.

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