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Design and Implementation of Campus Maintenance and System Repair with Integration of Mobile Technology for E-commerce

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Abstract: The Android mobile application terminal operating system is constantly updated and developed, as well as the continuous optimization, promotion and application of Android smart phones and continuous updating of software technology, coupled with the continuous promotion of digital information engineering construction in various industries, the widespread use of smart phones, Android has gradually been hailed as a mobile application terminal and operating system with the largest number of users in the world. This system studies the design and implementation of the campus maintenance and system repair based on mobile technology. The purpose is to help the schools manage better and it allows students to participate more actively in the construction of the campus, and at the same time it provides teachers and students with a relaxed and happy lifestyle on campus. This article describes UI design and operations that can be used to maintain and repair Android phones on campus, including implementing the main interface, using controls, program operation, and resolving abnormal situations. The development of this system can bring more enthusiasm and good experience to users.

Keywords: Campus Maintenance and Repair System; Android; MySQL.

1. Introduction

1.1. Research Background and Purpose and Significance

In recent years, the rapid development of Internet trains has brought great convenience to people's lives, and mobile phones have become a very common tool for our daily use. Our country has entered a new era of information technology. The construction of digital information engineering has also been continuously promoted in various industries and fields, and it is ubiquitous in all aspects of our life and learning [1]. The use of computers to manage the maintenance and repair of the campus is more advantageous than the traditional method. The application of the information management method provides great convenience, and also affects the transformation of our way of thinking. However, the information collection, classification, accident and practice methods of current students have not been improved, and there are still storage problems in campus maintenance and repair management [2]. Therefore, it is necessary to develop maintenance management systems for these campuses.

This system is an Android-based campus maintenance and system repair. The system divides the operating users into demand personnel and maintenance personnel. The maintenance personnel can issue maintenance information, and the maintenance personnel can display the maintenance information and execute the maintenance information in sequence at the same time. After accepting the maintenance order, the maintenance personnel arrive at the designated maintenance location. After the maintenance is complete, the requirements representative can confirm that the maintenance has been completed. At the same time, feedback is sent to maintainers. Users and maintenance personnel can be managed through the server, and the order status can also be viewed.

The development of this system facilitates the release of maintenance information for students, and also makes it easier for maintenance personnel to take orders. Users can evaluate the maintenance personnel according to the timeliness after the maintenance through this system, which can also facilitate later users to choose a more cost-effective service team to serve themselves. At the same time, this evaluation also greatly improves the efficiency of maintenance personnel. What's more, this evaluation also greatly improves the efficiency of maintenance.

1.2. Research Status at Home and Abroad

Android was originally researched and produced by Andy Rubin et al. It was originally designed and developed a series of operating systems for intelligent digital cameras. With the rapid growth of the smartphone market, Android has become a mobile operating system for smartphones. According to statistics, Android operating system has surpassed Nokia's Symbian system, it has occupied a dominant position for more than ten years, and it has been in the first place in the smart phone operating system for a long time.

With the rapid change of information in our country, the amount of information that schools and teachers contact is increasing, which makes it difficult for people to effectively obtain the information they need. As a result, domestic researchers have conducted extensive research on this, which involves a new research content, namely, the maintenance and management system of the university, which has become a hot topic in the field of management information at home and abroad.

1.3. The Main Content of System Development

Traditional books and paper means are widely used in information processing, while the extensive use of modern

network technology can only play an auxiliary role. In terms of the recognition of campus maintenance and repair management software, the traditional office software is still widely used, but people cannot accept relatively comprehensive and specialized campus maintenance and management software. The purpose of this research is to provide maintenance content confirmation, maintenance status, rapid data collection, and content sharing functions such as tag classification management to achieve systematic management of campus maintenance and repairs, so as to achieve the purpose of campus maintenance and repair management systems.

1.4. Summary of this Chapter

This chapter describes the platform built by the project, the development content and the background database to be used. In this chapter, the background and purpose of the research on campus maintenance and repair system based on mobile technology are mainly explained. At the same time, the article introduces the characteristics of the project, the basic functions and goals to be completed.

2. Demand Analysis

2.1. Feasibility Analysis

2.1.1. Technical Feasibility

(1) Hardware feasibility analysis

This system does not have special hardware functions, and only uses the traditional conventional hardware configuration method. But only to make the system work normally and efficiently. For typical PC configurations currently used, these are very easy to achieve the desired results [3]. Therefore, from the hardware point of view, it is feasible to develop the system from the hardware approach.

(2) Software feasibility analysis

The use of the java language allows us to achieve modularity and repository storage better. What's more, code reuse can be better expressed. The system chooses Android as the main research object. Through the above analysis, it is ensured that a system software is completed and other aspects of the design and implementation.

Therefore, we have conducted feasibility investigations in these two areas, and it concluded that there don't have any problems during development in the designed software and system.

2.1.2. Economic Feasibility

The application system of this paper is the platform application of digital Android, and it is also the first platform to adopt apeclipsed. Therefore, this management system does not have high requirements for product development, management of human resources, finance and other aspects, and it needs to have a certain theoretical and economic level of development.

2.1.3. Operational Feasibility

The system uses the Android operating terminal. Users can download the software from the Android application store and use it directly. The concise system page makes the operation simple and easy to understand. Users who have simple contact with smart mobile devices can get started.

The system is extremely easy to use and operate, and has an easy-to-manage, well-interactive function developed in this system.

2.1.4. Feasibility of Social Factors

From a software use period perspective: China is still in the growth phase of the Internet, so most netizens are undoubtedly enthusiastically seeking real-time tools such as communication and interactive income. In addition, the operation and development of the software project is not too difficult, we can directly export the json files to share-232 on the mobile phone through the tools developed by ourselves, and place them directly on the mobile phone or the user's mobile device superior. System deployment does not require advanced software or hardware. User interaction users do not need to spend a lot of time on the phone, they can choose to use such software for professional training to improve efficiency and ensure the accuracy of various data to better integrate with the current development environment.

2.2. Project Design Goals and Principles

The focus of the system structure design reflects the feedback of the user's operation between the interfaces of the modules of the whole system, which is very important to ensure data scalability and security during the actual execution of the system. In the later stage, only when all kinds of information systems designed and developed by ourselves have achieved this goal, it will we have more expansion and play a role to smoothly adapt to the future of the company.

In the overall system design, the system must meet the following requirements:

(1) Data security
(2) Ease of use
(3) Softness
(4) Scalability

2.3. Summary of this Chapter

The second chapter mainly analyzes the system requirements, the feasibility of the system is stated here, and the goals and principles of the project are analyzed at the same time.

3. Introduction to Related Technologies

3.1. Overview of JAVA Technology

Java was developed by the James Gosling team of Sun Systems, and Internet application development is very suitable for today's Internet environment. The original purpose of Java was to research and develop a distributed code management system perfectly suited for various household appliances. Java is free and has many advantages such as simplicity, cross-platform and object-oriented, making it an acquired programming language and widely accepted and used in the industry [4].

3.2. Android Technology

Android consists of linux + java. The system structure of the mobile terminal is extremely simple, you can make the best use of all hardware and resources, the open-source code in it greatly reduces the cost of developing and running the mobile terminal in the enterprise, and makes Android the most portable [5]. Compared with other platforms developed by mobile devices, Android has more advantages and competitiveness. Because of its free and open-source performance, Android can also ensure that the price of Android smart phones is not too expensive, so that users can easily obtain all kinds of information they need [6]. Based on

this, this topic uses the Android mobile platform to design a mobile application system suitable for personal information management for customers.

3.3. MYSQL

The software development project system uses a variety of database management technology applications to collect, store and process a large amount of important data in real time, so as to ensure the real-time independence and consistency of all its data, and real-time security of data information [7]. It provides an effective data solution method for the entire software system to store and process a large amount of important data information in real time, and greatly saves software system development programmers' time for basic writing of software applications and system development.

The database established by using MySQL is not only helpful for operations such as merging and processing of early data, but also for expanding data in subsequent development [8]. MySQL can be said to be very competent for processing limited level data. The architecture of the ODBC database application system is depicted in Figure 1 as follows.

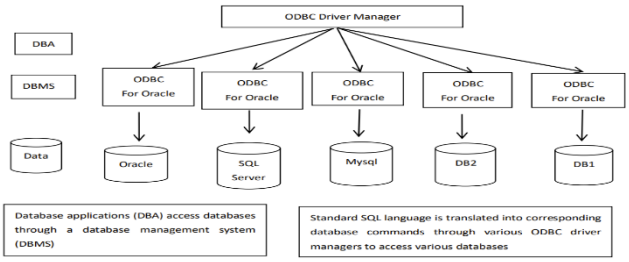


Figure 1. Principles of database management systems and interfaces

3.4. APK

APK is the English abbreviation of Android installation package androgenic. APK is a file format similar to symbiosis sis or sisx. It is able to run it by directly transferring json file to Android emulator or Android mobile device on Android emulator. The APK file is the same as sis [9]. After unzipping, the Dec file will be displayed. Dec is the English abbreviation of vidal execute, that is, the Android vidal execute application. But vidal bytecode is different from pe file in windows mobile, Android can first decompress when starting to run the application, and then decompress directly with Symbiosis.

3.5. MD5 Encryption Algorithm

(1) Implementation of MD5

MD5, also known as Message-Digest-Algorithm5, which is a hash algorithm that ensures the integrity of information during transmission. This is the most adopted by computers [10]. The MD5 message digest algorithm belongs to the hash algorithm category. The MD5 implementation diagram is as follows in Figure 2 below:

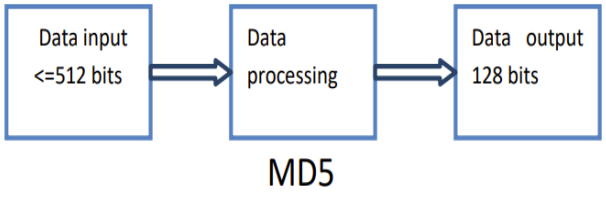


Figure 2. MD5 implementation diagram

(2) Algorithm principle

Data Entry

Enter the data in the message so that the message length is 448 and set the message length to X. That is, X mod 512 = 448 is satisfied. This formula will get the length of the data you need to enter. How to fill in: Write after the information. The first digit entered is 1 and the rest are 0.

Add message length

After the result of the first step, enter the length of the original message. The available storage length is 64 bits. If the message length is greater than 264, only the lower 64-bit value is used (i.e., the message length is 264). After this step, the final message length will be an integer multiple of 512.

Data processing

Prepare the necessary data:

4 constants: A=0x67452301, B=0x0EFCDAB89, C= 0x98 BADCFE, D=0x10325476;

4 functions: F (X, Y, Z) = (X & Y) | ((~X) & Z); G (X, Y, Z) = (X & Z) | (Y & (~Z)); H (X, Y, Z) =X ^ Y ^ Z; I (X, Y, Z) = Y ^ (X | (~Z));

Divided into 512-bit groups for message processing, each group receives 4 rounds of translation. The calculation is performed with the above four constants as starting variables, and the four variables are output again. Then use these four variables for grouping. If this is the last group, these four variables will be the final result, the MD5 value.

(3) The problem solved by the algorithm

If specific password information needs to be stored for identification purposes without taking security measures and instead directly storing the password information in a clear-text database, the system administrator can easily obtain the original password information and it is also easy to explain [11]. However, the information in the database must be encrypted and kept private to improve security. As a result, although the entire database is available, the only way to recover the original password information is to use a decoding algorithm. MD5 algorithm can solve this problem.

3.6. Chapter Summary

This chapter mainly introduces development tools, development support platforms, and databases for system design and development. It also briefly describes the four main components of Android and their functions, and briefly describes the connections and relationships between these components. There are also databases that use the MySQL system database, because it is relatively secure and MySQL has some concurrency capabilities. In summary, this section describes the environment and platform required to develop a project on Android, the tools used, and the database.

4. Project Design

4.1. Project Design Goals and Principles

The goal of this project is to develop a mobile service application that belongs to the system phase. The main purpose of this chapter is to implement all pages of campus administration. Especially for the home page of the website, please log in with the passwords corresponding to all your registered accounts. User data management is just a simple application implementation, including registration, user password login, maintenance personnel orders, maintenance personnel orders, all maintenance information, etc. Students can use photos, text, etc. to apply for maintenance online, and can also check the maintenance information and maintenance status submitted by students in the system. The project is devoted to designing a working system and reducing the

connections between modules. For future maintenance and redesign.

4.2. Module Flow Chart of the Project

1. Main interface business flow chart

The framework diagram constitutes the whole maintenance system. It combines the overall functions of the main management interface and the background maintenance personnel interface. The background maintenance interface includes functions and modules including maintenance personnel, maintenance initiators, and background managers. The structure diagram of the overall module is shown in Figure3 below.

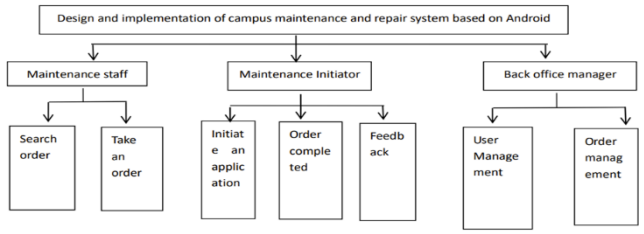


Figure 3. Main business flow chart

2. Business flow chart of splash interface

The splash interface designs a drawing board to display student data and information, and it checks its version editor to determine whether the application needs to be updated to the latest system; the function and integrity of the application are checked, and the business process diagram, such as software diagram shown in Figure4 below.

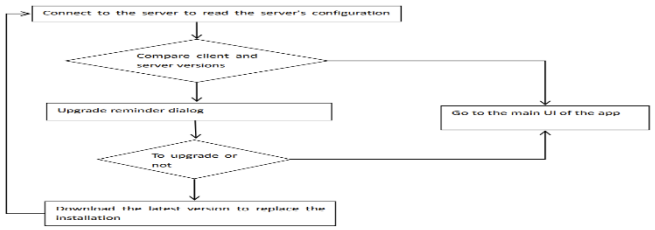


Figure 4. Flowchart of splash interface

3. The business flow chart of interface login

Users can register and log in on the login interface. If the user does not have an account, he can choose to register and then log in. Your registered username and password will be checked for identity when you log in the next time. If your username is the same as your registered password, you will not be able to register if you log in the next time. Business work flow chart, as shown in Figure 5.

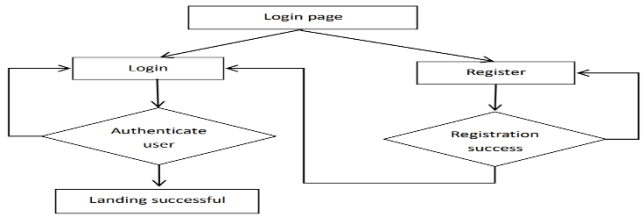


Figure 5. Login interface flowchart

4.3. Summary of this Chapter

This chapter mainly introduces system design, system goals and system design principles. Requirements analysis provides information about the functionality of the system. This chapter mainly explains the operation logic of each module. It clearly informs the designer of the application of each module and takes into account the structure and the overall system.

5. Database Design

5.1. Database Design Principles

Conceptual design typically uses four methods:

Top-down, bottom-up, gradually expanding and re-integrating a hybrid strategic concept to redesign an overall strategic concept. Use a design framework to facilitate the integration of the various strategic planning design components from the bottom up and the architecture as the main physical concept [12]. In the strategic design phase, we can clearly delineate the physical conceptual structure of the two basic steps.

The database framework under physical conditions is determined. In relational database, it explains the user access method and its storage structure. The structural evaluation criteria in physics are effects in time or space.

5.2. Description of Database Design Process

The database adopts the ideas and methods of software engineering. Currently, this is considered a relatively complete and reliable design method. Figure 6 illustrates the database design process.

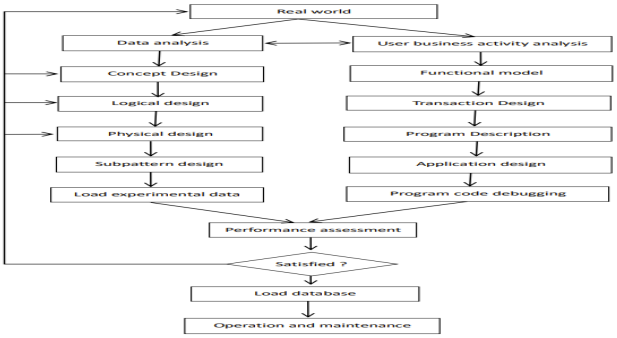


Figure 6. Design description diagram

The main content of this chapter is to introduce in detail several important technical stages of the system structure design of the database logic management framework, such as the analysis of the basic requirements of the system, the conceptual management framework structure design and the data logic management framework structure design, and provides detailed instructions with photos, diagrams and text. At each stage, the corresponding tasks, methods and steps are described in detail.

6. System Test

System testing is mainly to verify whether the system functions are correct and whether the logic is reasonable. It also aims to discover deficiencies in the system, especially those that do not conform to the requirements put forward in the requirements analysis stage. Through the problems found in the test, the system is optimized and improved. And it provides users with a more user-friendly and fully functional system [13].

6.1. Test Environment

Before testing, deploy the system first, which requires building a server running the system, and installing and configuring the database for data storage. After the

environment is prepared, the system can be accessed locally by publishing the system in Tomcat [14]. The environment requirements to be built for software testing are as follows:

The conditions for software testing are as follows:

Computer hardware: memory 32G, Intel I7 processor, 502G C drive storage

Server system type: 2008 version of Windows system

Development tool: Eclipse

Development technology: Android

Database: MySQL

Web server: Tomcat

Operating system: Windows 10

6.2. Test Plan

Functional testing mainly detects whether the system has reached the required design function. Here, function tests of system login, function management, information change and other modules are performed respectively.

The test cases involved in the system designed and implemented this time are introduced:

(1) User login function test case

When using the system, users need to enter the account and password corresponding to their identity to successfully log in to the system. The specific situation of the test introduction of the user login function module is shown in Table 1:

User login module test case, the test case table is shown in table 1 below:

Table 1. User's login test case table

Test name	User login test			
Number of tests	The first time		Test person	
Test (module/function/performance)			Login module	
Test time		2020.02.03		
Serial number	Action performed	Result	Processing time	Note
1	Log in with the correct account and password after registration	Login successful	2020.03.03	
2	Enter correct username, wrong password	Login failed	2020.03.03	Show password error
3	Enter invalid username, correct password	Login failed	2020.03.03	Display username is incorrect

(2) Add maintenance personnel function test case

On the interface shown in Figure 6-2, the main test function is to add the corresponding personal information of the maintenance personnel, the purpose of which is to verify whether the addition of the personnel module in the system is reasonable. Enter the user's name, password, name, type and contact phone information, and the required content is not empty. When the administrator enters, the system will automatically determine whether the input content is empty. If the information is not added as required, the system will give a corresponding prompt. After the information is added, click the Submit button to complete the information addition operation.

The test case table for adding information is as follows:

Functional test interface for adding information, Table 2 Use case table for administrator to add information

Table 2. Use case table for administrator to add information

Test name	Add admin info test			
Number of tests	The first time		Test person	
Test (module/function/performance)			Add stuff module	
Test time		2020.03.03		
Serial number	Action performed	Result	Processing time	Note
1	Enter the information completely in the correct format	Added successfully	2020.03.03	
2	Enter illegal characters	Added failed	2020.03.03	Prompt for correct characters
3	Required fields are not entered	Added failed	2020.03.03	Prompt that the information was not entered as required

(3) Maintenance order management test case

The interface shown in Figure 6-3 is the test case for adding maintenance information. The administrator can click the "Change Information" button to enter the interface, and then follow the interface prompts to perform corresponding operations= Maintenance order management test interface

The use case table for adding maintenance information is shown in the following figure:

Table 3. Use case table for maintenance order management

Test name	Repair Order Management Test			
Number of tests	The first time		Test person	
Test (module/function/performance)			Maintenance information	
Test time		2020.03.03		
Serial number	Action performed	Result	Processing time	Note
1	Enter complete and accurate repair information	Modified successfully	2020.03.03	
2	Enter illegal characters	Added failed	2020.03.03	Prompt for correct characters
3	Required fields are not entered	Added failed	2020.03.03	Prompt that the information was not entered as required

6.3. Test Analysis

This campus maintenance and repair system has realized all the functions proposed in the demand analysis stage, and can meet the needs of users in terms of response speed and homepage loading delay. However, there is still room for further improvement in the optimization of the system interface. In the later stage, a certain amount of time needs to be invested in the improvement of the code and the optimization of the interface to make the system perfectly.

Table 4. Test case table

Serial number	Requirements/functions	Number of test cases	Total number of bugs	Pass or not
1	User login	30	1	Yes
2	Admin login	30	1	Yes
3	Maintenance staff added	30	3	Yes
4	Repair order added	30	0	Yes
5	Repair order assignment	30	0	Yes
6	Repair result confirmation	30	0	Yes
7	Customer feedback	30	1	Yes

The total number of bugs and the number of modified bugs is both 6.

All test cases passed;

The test has achieved full coverage;

6.4. Test Results

This campus maintenance and repair system based on mobile technology; therefore, the functional test of the system is divided into the functional test of the client and the functional test of the computer. After testing and comparison, comprehensively, the test results of the client and the test results of the computer meet the requirements, and all the functions and requirements can be fully realized, and the system meets the requirements for production.

6.5. Chapter Summary

This chapter mainly introduces all aspects of the test of the campus maintenance system based on mobile technology, including the test environment, various test solutions, data analysis and the results of the last test. The hardware and software environment required for the test system is determined by the application environment. The test plan adopted in the test method is described. Finally, the test results are analyzed and summarized.

7. Summary

So far, all functions of the campus maintenance and repair system based on mobile technology have been developed and passed the system test. The test results show that the system is stable and fully functional, and can be used in the production environment. The realization of this system is to reduce the work concentration of managers and improve management efficiency.

Acknowledgments

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