



Design and Implementation of Retail Industry Cashier Management System

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Abstract. This paper provides a convenient and low-cost cash register management system for small and medium-sized stores. Ensure the accuracy of various data while improving efficiency, so as to meet the daily sales and management needs of the store. Combined with the characteristics of retail industry, business requirements and system functional requirements, the overall system structure design, system functional module design and database design are carried out.

Keywords: data management · retail · visualization · crawler · cash register management · sales · data cleaning · information retrieval

1 Introduction

1.1 Background and Significance

Retail is a business activity that directly sells goods or services to individual retailers or final consumers, and is the last step of goods or services entering the consumption field from the circulation field. Retail is an industry that directly faces consumers and provides products and services to consumers. It plays an important role in the national economy. Retail is a commercial activity that directly sells goods or services to individual retailers or final consumers. It is the last link of goods or services entering the consumption field from the circulation field. Retail is an industry that directly faces consumers and provides products and services to consumers.

1.2 Current Situation

This system is in the shopkeeper only mode, and can only be operated by the shopkeeper. Therefore, it is more suitable for small and medium-sized manned shops. Most systems on the market are bundled with related hardware, and the price is slightly expensive. Compared with the all-in-one POS system on the market, this system is more portable, with lower performance requirements and lower cost.

1.3 Research Content

Based on the current development trend of the retail market, this paper designs the overall framework of the retail cash register management system to meet the various needs of the store sales management, and implements the various functions of the system using object-oriented programming technology.

2 Relevant Technical Theory

2.1 Development Language and Framework

This system uses Java + SpringBoot, making full use of many advantages of Java language and its mature third-party framework. Therefore, Java is used as the main background language for the development of this system, and the SpringBoot framework is used as the website development framework.

2.2 Development Tool

- (1) Kettle: It is an open source data processing tool with the functions of extraction, conversion, loading, etc. In addition to supporting various large databases, it also supports some small data sources, such as Excel, Access, etc. The processing function of kettle is very powerful. It can not only visually drag and drop, but also write Java code segments, use regular expressions to quickly filter the information needed, and so on.
- (2) MySQL Database: It is a relational database and can be operated in SQL language. MySQL has many advantages, and Java, Python and even many other languages have corresponding connection tools, which can be more convenient to connect and use. It is popular with developers in actual development.
- (3) Data Visualization Tool: It is an open source JavaScript based data visualization chart library that can run smoothly on PCs and mobile devices, and is compatible with most current browsers. ECharts has the ability to visualize and render hundreds of billions of data, and supports rich visualization types such as line chart, pie chart, thermal chart, funnel etc.

3 System Analysis and Design

3.1 System Requirements Analysis

1. Administrator: In a business cycle, the administrator will not be in the store all the time, so there should be two statuses on the administrator side: in-store terminal login and remote access. In-store login can make some price changes, activity release, etc. For security reasons, remote access should prohibit the modification of sensitive data and only retain part of the query function.
2. Shop assistant: The shop assistant is the person who accompanies every sales cycle, and needs to interact with the system frequently every day to deal with customers' requirements in real time.

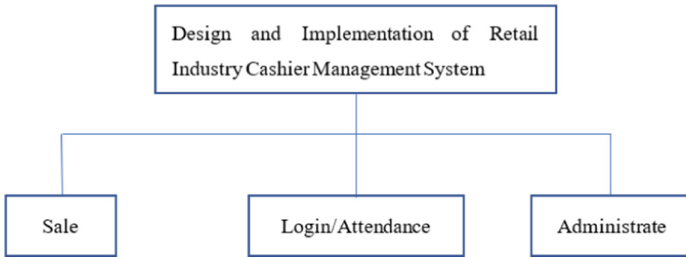


Fig. 1. System Function Module Diagram

3.2 System Design

The function of the system is mainly divided into three modules, namely inventory module, sales module and management module.

1. Inventory module: it mainly includes two aspects: inventory information retrieval and goods warehousing and delivery.
2. Sales module: it includes sales of goods, return of goods, increase and decrease of membership points, discount calculation, etc.
3. The management module includes employee appointment and dismissal, attendance query, price management, activity release, etc.

First, use Python to generate simulation data according to barcode rules, and then query the barcode in the search engine. If the commodity name can be obtained, it is the correct barcode. Associate the two and get as much information as possible, and finally store it in the database. If there is no commodity name, delete the barcode. Then use kettle to filter and process null values. The overall function module of the system is shown in Fig. 1.

3.3 Database Design

Database is an important part of a program and also the basis of a program. Because this system involves amount calculation, all fields in this part are of decimal type, which is used to specify their limited length and decimal value range. At the same time, in order to facilitate the tracing of sensitive data operations, a log table is designed to store the operator, operation time and other information of key operation information.

4 Data Processing

Data processing is very important in the whole preliminary preparation stage of the system, which is mainly divided into three stages: data acquisition, data preprocessing and data storage.

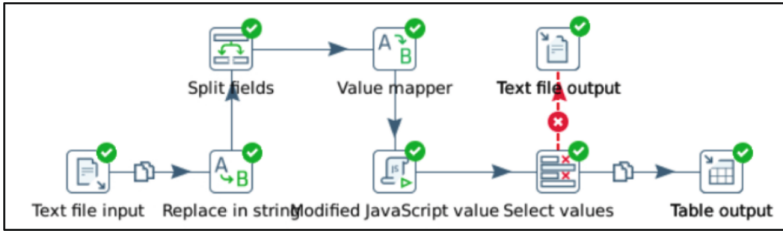


Fig. 2. Kettle Data Processing Diagram

4.1 Data Collection

With the development of crawler technology, most websites will set anti-crawling mechanism in order to reject crawlers. However, the open directory declared in the robots protocol can be used for data collection. As long as the target website does not make a large number of flood requests for a short time, there is no legal problem.

4.2 Data Preprocessing

The data preprocessing stage is also very important. This step is to filter non-standard, incomplete and wrong data. First read in the collected text data set, then replace the meaningless symbols in it, then split the data that was mistakenly collected in the key information column, filter out the null value and error value through the script, finally get the processed data through data filtering, output the error data, and manually find out whether there is any information that can be retained and valuable. The following Fig. 2 is the operation diagram of the system using the kettle tool to preprocess the crawled data.

4.3 Data Storage

After data processing with Kettle, directly dump the cleaned data to the specified table of MySQL database through Kettle.

5 System Implementation

The system has rich functional design, which can be roughly divided into three functional modules, namely login/attendance module, sales module and visualization module.

5.1 Login to the Attendance Module

1. Login function: this module mainly includes login and attendance. Login is a necessary step to verify whether the user has the system permissions. Attendance is an important basis for judging employees' attendance. The access permission check of the system is set in the interceptor, that is, every link requested by the user will

be captured by the interceptor. Only after the login status and permissions are verified correctly can the request be submitted to the Controller for execution. At the same time, the login information will be written to the log table through customized annotations to ensure that sensitive operations can be followed.

2. Attendance function: Attendance is an important reference for employees' labor remuneration, and the employee login system is designed to automatically clock in, provided that the employee logs in for the first time on the same day. In the same way, when you log out, you will automatically sign out. Automatic sign-off means that the non-first sign-off overwrites the last sign-off to avoid abnormal sign-off caused by other reasons.

5.2 Sales Module

This module is the work menu of the clerk's daily work. It clearly lists all authorized actions of the role, which can effectively improve work efficiency.

1. Sales function: When selling goods, you need to enter the barcode of the goods, and the server will retrieve it. If there is no barcode, you will return a prompt. You are required to manually enter the price or cancel the sales of the goods, and make feedback in the system to facilitate the later addition/matching of the barcode; When the barcode is available, the commodity information will be returned to the new line on the screen. If there are duplicates, the quantity will be added to the original information automatically. At the same time, the system will match the preset activity information and automatically discount the goods. Finally, it will still prompt to confirm whether there is member information. If you enter the member information, the most favorable price will be calculated. Of course, if you configure some activities to share with members, you can combine the discounts, otherwise the two will not be shared by default.
2. Commodity information retrieval function: It can be retrieved by commodity barcode, commodity name and supplier. The system will give the commodity price and surplus. If the shelf information is configured, the system will give the approximate placement position.
3. Member value storage function: Members have two types of cards, one is a credit card, and the other is a stored value card. This function recharges the membership card. In order to prevent malicious recharging and ensure security, a special password is required. This password is dynamic, and part of it is determined by the server time. Recharge can only be performed after verification.

5.3 Visualization

The sales data can be displayed in a chart, which can include a pie chart of the proportion of the number of goods sold per day to the number of goods sold in the current month, a column chart of the number of goods sold per day this week, and the trend of the number of goods destroyed in a single month in the past six months. As shown in Fig. 4.



Fig. 3. Home page visualization module diagram

6 System Test

The first is the single test. The developer will enter the test group if there is no problem after the single test. According to the test book written in advance, set various harsh conditions and conduct the test. The bugs found need to be recorded, including the test conditions, recurrence probability, expected results. After the developer completes the modification, it is also necessary to conduct a retest and confirm the cause of the occurrence; Then the program will be handed over to the customer, who will conduct the acceptance test. The newly discovered problems at this stage will be marked as leakage and non-conformity, which is one of the main factors that directly affect the project quotation. After all the problems are checked, the system will be put into production environment for trial operation for a period of time, and then it can be officially released. For a B/S structure system, compatibility, functionality, stability, security, etc. need to be tested. This system takes compatibility and functionality as the main test items (Fig. 3).

7 Summary

In the preparation stage, we understand the current situation of the retail industry and the use of the cash register management system, so as to determine the design direction of the system, and determine the development language and basic framework in combination with the required architecture of the system. At the implementation stage, actively understand the industry's demand for system functions, determine the system entity relationship, and carefully design and improve the data tables in the database.

When the design is converted into code, the mutual calls between various functional modules are fully considered, and the possible errors are predicted. At the test stage, the test process has perfect conditions and high coverage.

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