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Intelligent ordering recommendation system based on microservice

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ABSTRACT. *The intelligent ordering recommendation system is to help customers find the right dishes, overcome the shortcomings of information overload, through the analysis of customer's behavior, summarize customer's interest, so as to predict customer's interest and preference, and make the dishes recommendation associated with customer's interest and preference. In order to overcome the complexity of single application, we use the micro service architecture to design and implement an intelligent ordering recommendation system based on the micro service. We use the recommendation algorithm based on the user's label preference to label each dish. By analyzing the similarity between each dish and the user's preference label, we can realize the recommendation of the user's dishes Function. In the design and development stage, the development of the server and client side of the system adopts B / S structure, supplemented by JavaScript, J2EE Web program development technology and MySQL database development technology to create a website.*

KEYWORDS: *ordering system intelligent recommendation microservice*

1. Introduction

With the explosive development of information technology in the contemporary society, the online operation mode has brought more and more impact on offline entity operation. In order to improve the profit and living space of an entity operator, developing an online business website has become a necessary means for today's operators.

Developing an online business website can not only improve the work efficiency of the entity operators, but also broaden the sources, improve the overall service level and speed to lay a solid foundation for large-scale business. The multi-functional service in online ordering can let consumers browse the menu of the restaurant calmly, or compare the price to choose the delicious food that suits their own taste. At present, there are more than independent operators providing take out and delivery services online, and take out and delivery services account for more than half of the catering business. Food and beverage consumers are increasingly

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using the form of online ordering to buy takeout, especially young consumers.

In this paper, we design an intelligent ordering recommendation system based on microservice. In this system, we use microservice architecture to separate the user module and other modules, and use different databases to store these two kinds of information. At the same time, we use the recommendation algorithm based on the user's label preference to realize the function of recommending dishes to specific users.

2. Related technologies

This system is an intelligent ordering recommendation system based on microservice, which is a web project based on Java. Different from traditional software development, we use microservice architecture in system implementation. In the intelligent recommendation module, we use the recommendation algorithm based on the user's label preference to realize the recommendation of dishes for specific users.

2.1 Microservice architecture and traditional architecture

At present, the system architecture in the process of software development should follow three standards: 1) to improve agility: to respond to business needs in time and promote enterprise development; 2) to improve user experience: to improve user experience and reduce user churn; 3) to reduce cost: to reduce the cost of increasing products, customers or business solutions;

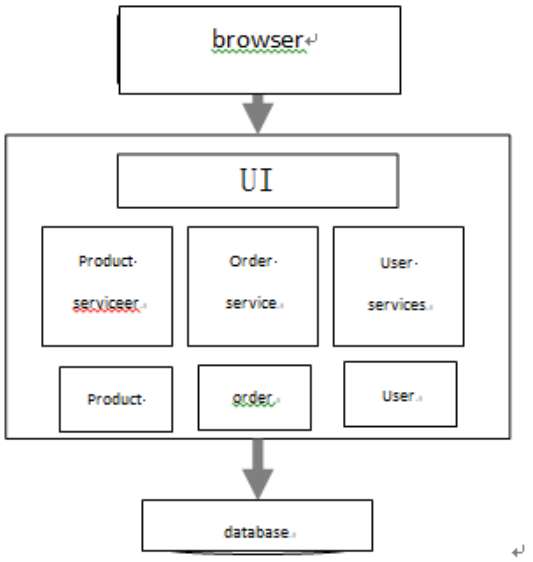

Figure 1 Schematic diagram of Architecture

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The traditional software development method is also called monolithic, which packs all functions in a war package, basically without external dependency (except for container). It is deployed in a Java EE container (tomcat, JBoss, Weblogic), including do / Dao, service, UI and other logic. Its architecture is shown in Figure 1.

This development method has the following advantages: 1) simple development and centralized management; 2) basically no repeated development; 3) all functions are local, without distributed management and call consumption; however, this method gives our software development a greater disadvantage when it enjoys the above advantages: 1) low efficiency: all development changes code in the same project, mutual etc To wait, conflicts continue; 2) maintenance is difficult: code functions are coupled together, new people don't know where to start; 3) inflexibility: long construction time, any small modification needs to reconstruct the whole project, time-consuming; 4) poor stability: a small problem may cause the whole application to hang up; 5) insufficient scalability: unable to meet the high concurrent business needs.

Microservice architecture advocates that a single application can be divided into a group of small services. Services coordinate and cooperate with each other to provide the ultimate value for users. Each service runs in an independent process, and each service uses lightweight communication mechanism to communicate with each other. Each service is built around its own specific business and can be deployed independently. Therefore, microservice architecture can realize agile development and deployment through effective application splitting. Its architecture is shown in Figure 2.

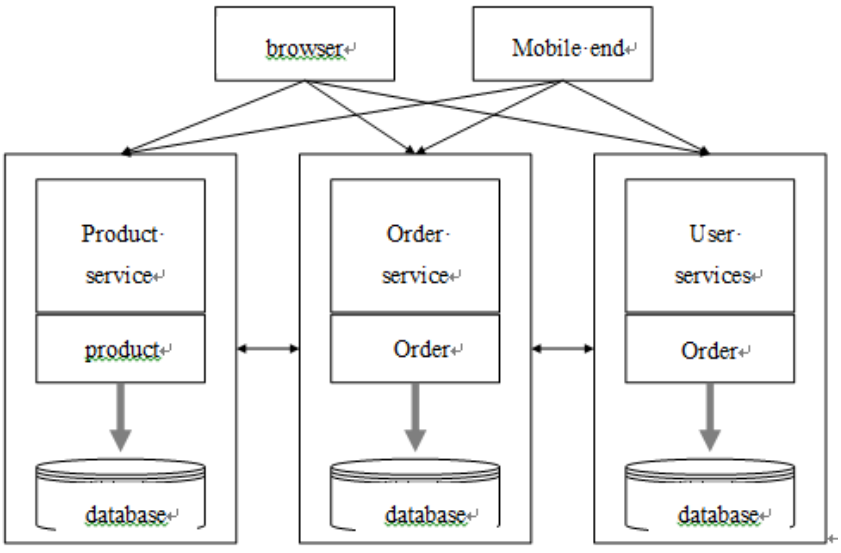

Figure 2 microservice based architecture

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2.2 Recommendation algorithm based on user label preference

Taking the recommendation system proposed in this paper as an example, the basic idea of the potential factor algorithm is that each user has his own preferences, such as a likes Sichuan cuisine, dishes with spicy, hemp and other elements. If our dishes contain these elements, then we recommend this dish to the user, that is to use elements to connect users and dishes. Each person has different preferences for different elements, so when users register, they need to choose their own preferences. In this way, when recommending dishes, the system can make a comparison between the user's preferences label and the dishes information. If a dish contains the user's preferences label, the system will recommend the dish to the user.

3. System design

The system can provide convenient and smooth ordering service. The system provides two types of users: ordinary customers can register and log in through the browser, can order meals in the system, access personal center and other operations; administrators can manage dishes and users. In addition, the system also provides search and query functions.

3.1 Business process

Table 1 business process

Number	Business logic	role
1	New user registration: register as a user and then log in	customer
2	Login: users log in to the system and enter the home page	customer
3	Browse food information: users can directly browse food and details without login	Customer administrators
4	Modify personal information: users can enter the information center to check, modify, etc	Customer administrators
5	Browse food information by page: first page, next page, last page	Customer administrators
6	Add shopping cart: the dishes that users can need are added to their shopping cart	customer
7	View shopping cart: users can query their own shopping cart and delete it	customer
8	Generate order: the user fills in the information in the order page to confirm the order	customer
9	Query historical orders: users can query all their orders in descending time order	customer
10	Food management: the administrator can add, delete, and modify the food information	administrators
11	User management: administrators delete, modify and check customer information	administrators

The main process of this project is to identify the user's identity. Ordinary customers do not need to log in to search and view the food information. After registering, they can add the food to the shopping cart and place an order for settlement. After ordinary customers log in, they can access personal center, query or

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modify personal information, query historical orders and other operations. After the administrator logs in, he / she enters the dishes and user management module respectively to realize the "add, delete, change and query" operation for dishes and users. Main business process:

3.2 Overall function of the system

In order to realize the online ordering system, the system can be divided into two parts: customer ordering and backstage management from the consideration of user role. The functions of different user roles are different.

The main demand of customers is to order meals online. Its main functions are to log in and register, browse dish information in pages, view dish details, add dishes to shopping cart, generate orders, visit personal center, view historical orders, etc.

The administrator mainly carries out background management, which can realize user management and dish management. User management mainly includes viewing user information and deleting user information. Food management includes adding, modifying and deleting food information.

3.3 system architecture design

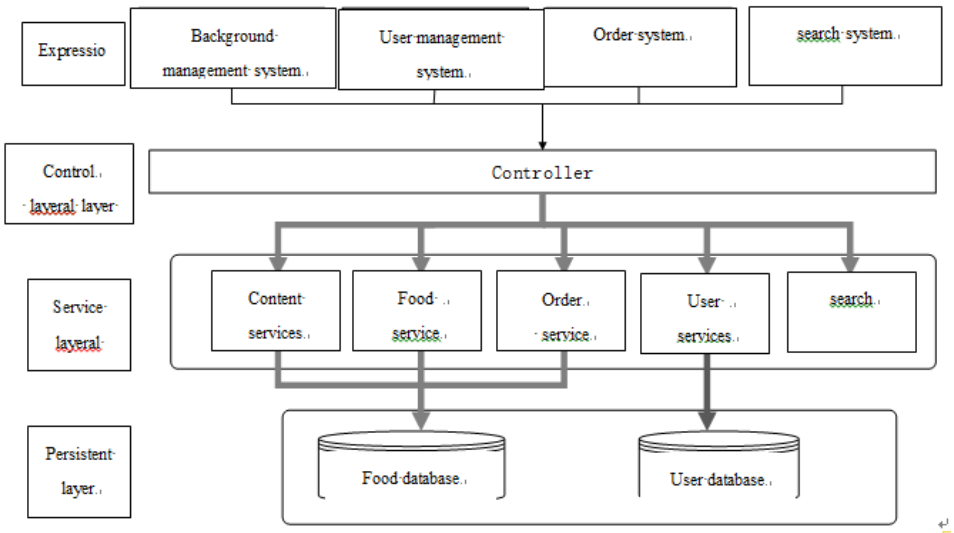

Figure 3 system architecture

Architecture is the backbone of a system, which is very important for the system.

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The system adopts B / S (Browser / server) model. The system is based on spring and other new generation website development framework, and is implemented based on four-tier architecture. Among them, the presentation layer (UI) mainly refers to the interface with which users interact. It is used to receive the data input by the user and display the data required by the user after processing. The control layer realizes the jump between pages; the business logic layer (BLL) is the bridge between UI layer and DAL layer. It is mainly used to operate data layer and realize business logic, such as validation, calculation, business rules, etc. The data access layer (DAL) is mainly responsible for the interaction with the database to realize the addition, deletion, modification and query of data. Submit the data stored in the database to the business layer, and save the data processed by the business layer to the database. Because it is based on microservice, the database involves two databases. At the same time, the user's operation service is published in the form of web service on another server, while the other server directly calls the published interface to realize the business logic. These operations are based on the presentation layer. The system architecture is shown in Figure 3.

3.4 database design

The entities involved in the conceptual structure are: users, dishes, orders, and order items. The task of database logic design stage is to transform E-R diagram into data type supported by specific database products. The main work of the database logic design phase is to convert the basic E-R diagram obtained in the database outline design phase into the database relational model according to the transformation rules, that is, the entity, the attribute of the entity and the relationship between the entities are transformed into the relational model. The main transformation rule is to transform a real body into a relational model. The specific conversion is shown in Table 2:

Table 2 transformation relationship

Relationship name	**Properties and codes**	**Other constraints**
user	(user name, password, email, preference element)	User name, password and email address are not empty
variety of dishes	(item number, item name, original price, description, picture, discount price, element label)	Dish No., dish name, original price, picture, element label are not empty
order	(order number, order time, quantity, total price, payment status, address, contact number, user name)	The order number, user name, order time, quantity, total price, payment status, address and contact number are not empty
Order item	(quantity, price, (dish No., order No.)	Dish No., order No., quantity and price are not empty

In this system, the micro service architecture is used to separate the user module from other modules, and two databases are created to store these information.

There are three tables in database 1, dish table, order table and order item table.

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Only user information is stored in database 2, so there is only one user table customer. Each table contains a primary key or union primary key, and other attributes are completely dependent on the primary key or primary key group, that is to say, it eliminates the partial functional dependence of non primary attributes on codes, so it belongs to the second paradigm. Finally, there is no transfer function dependence of non primary attribute on code in each table. Therefore, the database relational model of this intelligent ordering recommendation system belongs to the third paradigm.

The task of database physical design stage is to arrange physical storage for database and select access method for relational schema. There are three kinds of access methods: index method, clustering method and hash method. This intelligent ordering recommendation system selects MySQL database as the development database. MySQL database has a very fast and stable thread based memory allocation system, which can be used continuously without worrying about its stability. The main access mode of the intelligent ordering recommendation system in the database physical design module is index mode, which is a structure to sort the values of the columns in the database table. In MySQL database, set the column of primary key in each table to index. The purpose of indexing is to speed up the query of database. For example, "search the user information of 'id = 100' in the user table.". In the case of no index, the whole table will be searched until the ID is found; however, if the ID column is indexed, only the ID column will be searched, so the retrieval speed can be greatly accelerated.

4. System implementation

Adhering to the concept of "simple, efficient and beautiful" interface, in order to provide users with high-quality services and excellent customer experience, the system adopts the popular bootstrap front-end development framework in the industry.

5. Summary

The intelligent ordering recommendation system based on microservice mainly adopts the microservice architecture and the recommendation algorithm based on the user's label preference to realize the independent deployment of the user module and the recommendation of dishes for users. The system can complete the basic ordering activities first, and then it can realize the intelligent recommendation. It can recommend the most interested dishes to users when they browse the dishes information. On the basis of meeting the specific needs of users, it is also necessary to be able to screen and recommend through many factors such as the consumption records of surrounding users, the evaluation information of users on food, and the nutritional composition of the dishes themselves.

At the same time, the system has the following prospects:

The front and back of the system are currently deployed on two servers. Pay

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attention to the control of the number of people online at the same time. In the background, we can set up firewalls to improve security.

Through the design and implementation of the intelligent ordering recommendation system, it can better enrich the application of the recommendation system in the field of e-commerce, more effectively improve people's online ordering activities, and enhance the user experience.

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