



# Research on Design and Implementation of Baking Industry Information System

Siyun He

School of Food Science and Technology, Wuhan business University, Wuhan, Hubei ,430000

790693032@qq.com

**Abstract.** With the continuous expansion of enterprises, the replicability and standardization of management has become the primary problem of enterprises. As the baking industry in the new era, both the early manual management and the preliminary information management are faced with many puzzles. Therefore, all kinds of advanced management ideas and concepts must be integrated and solidified into the information system, so that such a system can become the information system urgently needed by the domestic baking industry. This topic launches the research on the design and implementation of baking industry information system. This paper combines the characteristics of cloud computing technology and information business of baking industry, designs the information platform of baking industry based on cloud computing technology, and adopts SOA (Service-Oriented Architecture) and query optimization algorithm based on semi-connected strategy. The research shows that for a given query example, most of the combinations of the algorithms in this paper are good, and the average cost of generating plan of this algorithm is improved by 40.201% compared with incremental heuristic algorithm and 20.126% compared with simulated annealing algorithm. Therefore, it can be concluded that the optimization scheme proposed in this paper is feasible.

**Keywords:** Baking industry; Information system; Query optimization

## 1 Introduction

With the progress and prosperity of society, people's demand for baked goods is increasing. With the continuous upgrading of the baking consumer market, higher requirements are put forward for the baking industry's marketing practice and innovation ability. How to promote sales more scientifically and reasonably, meet the market demand and integrate into the mainstream of the international baking industry requires the baking industry and operators to think and explore together. With the continuous expansion of enterprises, the replicability and standardization of management has become the primary problem of enterprises. As the baking industry in the new era, both the early manual management and the preliminary information management are faced with many puzzles.

In data decision-making, foreign information systems fully implement the overall idea of planning, implementation and verification, and constantly make corresponding marketing strategies and management plans by mastering and controlling business plans, behavior plans and implementation processes. At present, the collection information management is only a simple management of sales information indicators, but the market information of baked products includes many aspects, such as sales information, inventory information, demand information, etc. The system needs to grasp from many angles, so as to fully and accurately grasp the market information [1-2]. Amazon's best management is its Linux virtual machine resources, which can be divided into three types according to their sizes: small virtual machines, large virtual machines and large virtual machines. Amazon has specified the charging standards for them, and users buy them from the company according to their actual needs [3-4]. The cloud computing application platform developed by Google is Google App Engine, which is based on the deployment of Google's data center. The platform provides users with a series of free resources, including resource search, file storage, etc. Only when enterprises or users need hardware resources, a certain fee will be charged. China, China Telecom, China Unicom and other large state-owned enterprises have also launched cloud application projects; Taobao's Skynet dispatching system, Baidu's box computing and so on are all promoting the rapid development of domestic cloud computing applications.

The profit dilemma brought by comprehensive assimilation and the bottleneck encountered in expansion have become the focus of attention of entrepreneurs in the industry [5]. The baking industry is a food service industry that integrates food processing, logistics, sales and franchise chain. At present, in most baking industries in China, except for some simple accounting with the aid of computers, information management is rarely carried out in various business processes. Information transmission and feedback are slow, and the effectiveness is poor. Therefore, all kinds of advanced management ideas and concepts must be integrated and solidified into the information system, so that such a system can become an information system urgently needed by the domestic baking industry and bring real valuable things to enterprises.

## **2 Research method**

### **2.1 Overall design of information system**

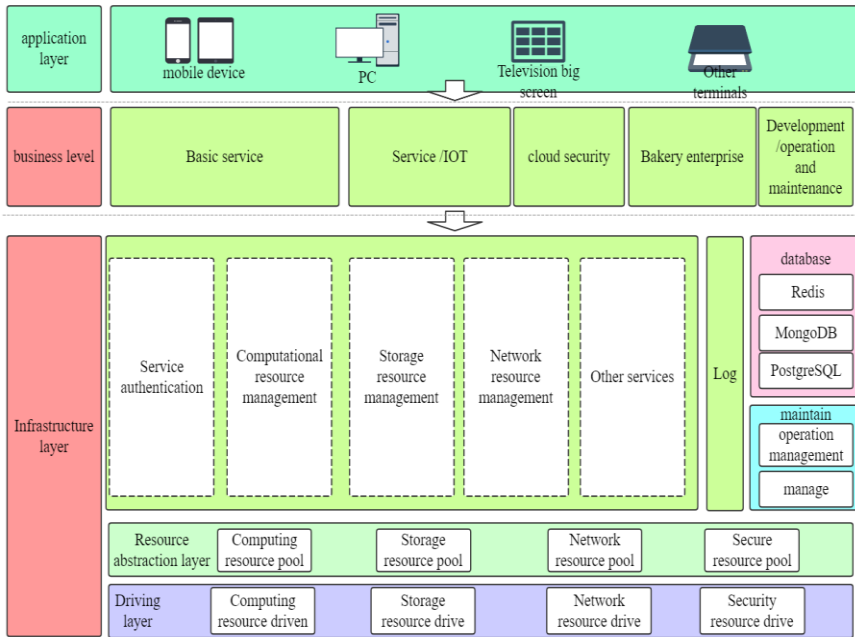
The market is changing, and many factors are difficult to grasp and control. In order to formulate a correct marketing mix strategy, in-depth and meticulous market research is the magic weapon to win. For the baking industry, building a strong brand power can form the ultimate competitiveness of the market. At present, brand marketing in baking industry lacks effective contingency measures and marketing means. Therefore, enterprises must look at themselves from the height of the whole industry, make effective strategic decisions in the current competitive situation in combination with their own resources, and determine brand marketing and management methods around strategic decisions. The baking industry should combine its own resources and advantages,

screen out the professional projects that can keep its long-term advantages, and then build a strong brand.

Through the application of information technology, enterprises can easily get all the detailed data in the process of production and operation, such as: product sales report, sales plan analysis, period sales analysis, member consumption analysis, contribution analysis, gross profit analysis, etc. Through the reasonable quantity of goods required by the baking system stores, the headquarters will automatically summarize the store list, print the production task list according to the processing department, and cooperate with active distribution, group purchase and other activities to promote the factory production, so as to avoid the capital occupation of purchasing raw materials and the inventory occupation of raw materials, and reduce the probability of errors. Strict document management is carried out from the planned production, processing, distribution, distribution, receipt, sales, loss reporting, inventory and other links of products, so that every product in the enterprise has nowhere to hide.

The baking industry information system is located at the back end of the baking supply chain, that is, through statistical analysis of the production and sales of products at the front end of the supply chain, it can determine the abnormal situation of the market, accurately predict the market demand, and then organize the next stage of product production mode according to the demand. The baking demand within the region calculated by using the decision analysis model of the system is determined by the jurisdiction of the decision maker. Through intelligent analysis software and the actual situation, formulate the best delivery route of each batch of delivery vehicles in each area, and submit the delivery route to the comprehensive purchasing and supply department for review; After the comprehensive purchasing and supply department reviews the order information and delivery routes, it informs the warehousing and distribution department to make preparations before delivery; Such as the number of large-scale enterprises, monthly/annual gross output value of industrial enterprises, total profits, year-on-year and month-on-month percentages, input and output of enterprises, energy conservation and emission reduction, etc. The purpose is to facilitate decision-making, formulate reasonable industrial planning and layout, optimize industrial structure and promote sustained economic growth.

Cloud computing can effectively solve the dilemma of the lack of information in the baking industry. The idea of cloud computing is that IT is used as a service for users. IT can effectively solve the dilemma of the lack of information in the baking industry, reduce the cost investment and risk, and improve the professional level of the baking industry, so that enterprises can obtain IT solutions more suitable for their development [6-7]. This paper combines the characteristics of cloud computing technology and information business of baking industry, designs the information platform of baking industry based on cloud computing technology, and adopts SOA (Service-Oriented Architecture) and query optimization algorithm based on semi-connected strategy. As shown in Figure 1, it can be divided into application layer services, business layer services and infrastructure layer services.



**Fig. 1.** System architecture model

The infrastructure of baking industry information system based on cloud computing should have the following three levels of services: infrastructure services, business services and application services. Using SOA concept in the system framework, the modules contained in the traditional baking industry information system are encapsulated into various services according to their functions. These loosely coupled services are directly oriented to users, and users can customize rules through personalized business processes according to their own needs. The platform layer is an important hub between the application system and the virtualization platform of the cloud data center. It is responsible for establishing contact with the databases in the cloud data center, adding, deleting, checking and other operations to the databases according to users' requests, and returning the results to users.

The idea of SOA is adopted to design and develop the management information system of the design institute. Its idea is to transform the original functional modules from the structured combination of fixed business processes into encapsulating the operations and data involved in the business processes into services, and through the call and combination of services, various work processes are generated [8]. For example, the employee recruitment, employee training, salary management and other sub-processes in the human resource management module are approaching maturity in the traditional baking industry information system, and the process similarity among different enterprises is high. It can be considered to package them into services and directly merge them into the human resource management module without further decomposition.

The main task of the information system is to obtain the information needed for management through a large amount of data. Therefore, establishing a good data organization structure and database so that the whole system can quickly, conveniently and accurately call and manage the required data is one of the main indicators to measure the quality of information system development. Relational database is the most popular application development database [9]. Compared with other data storage formats, its "mechanical efficiency" is low, but from the development point of view, it is easier to operate. In the analysis stage, the logical entity relationship diagram only defines the data required by the application, and the logical model only describes the "business view" of the data, but ignores the implementation details. After the data storage format is determined, a physical data model should be created to show the implementation details.

The entities of this website are: individual members, corporate members, positions, policies and regulations, work trends, important jobs, organization profiles, enterprise windows, enterprise services, etc. The overall entity relationship of the database is shown in Figure 2.

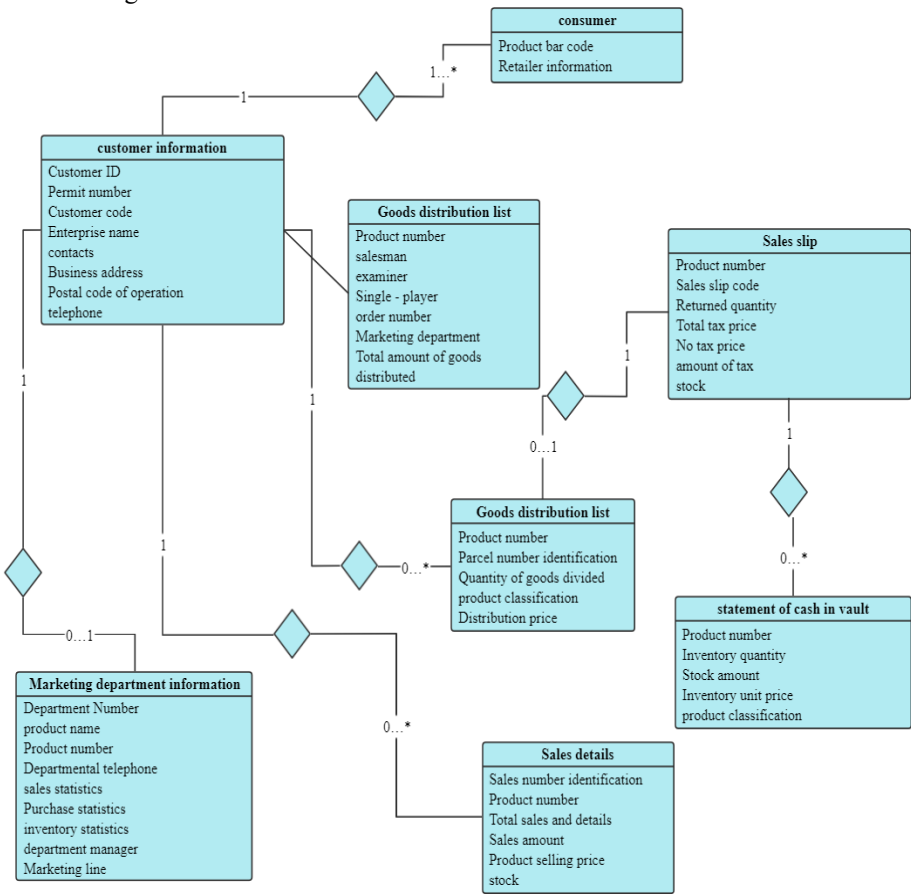


Fig. 2. E-R diagram design of database

Usually, the system development team strictly follows the naming rules. Therefore, the physical entity relationship diagram will be named by using the actual construction that is available when it is implemented. The attributes are converted into fields, and then the length, data type, default value, valid value and field description of the fields are added to the case knowledge base [10].

The default value is the storage content specified for columns that do not explicitly provide attribute values when a record is added to the table. Valid values are a fixed list of specific valid attribute values, or expressions of check codes that define the data format of a table or column.

## 2.2 Key technology realization of the system

As a computer program, whether it is as large as an operating system or as small as a simple application program, its operation log is very valuable for mining and using. The user log of the baking information system is also very important. Through the user log, the performance and working status of the system can be monitored, the illegal operation of the system users can be supervised and managed, the network security problems that the system may face can be prevented, and the system data can be protected from being leaked. One of the characteristics of cloud computing information system is "single instance and multi-tenant". Through personalized process customization, each user of the system may have different rights and roles. A single system log can't treat users with different identities differently, so it's difficult to further analyze and manage them. At the same time, it can't intuitively reflect the system usage process of a specified user [11].

Distributed database system, which uses computer network to connect a number of centralized database systems which are geographically dispersed but whose management and control need to be centralized in different degrees to form a unified database system. The distribution of data in distributed database system will inevitably lead to the distribution of transaction management and execution, and the query optimization algorithm based on semi-join strategy can better reduce the intermediate data when there is a large amount of data.

The basic idea of PSO (Particle swarm optimization) algorithm is that birds are abstracted as "particles" with no mass or volume, birds are equivalent to a solution group, "good news" is equivalent to the optimal solution in each generation of the solution group, food source is equivalent to the global optimal solution, and migration from one place to another is equivalent to the evolution of the solution group. Corresponding to the different solution spaces of the problem, the coding methods are different. In the complex query of distributed database, a query request may contain a large number of relationships, and the scale of the whole strategy space will increase exponentially, thus making the search efficiency very low.

The formula of basic PSO algorithm can't be applied to multi-join query optimization problem, so this paper constructs a new formula of speed and position as follows.

$$X_{id}^1 = X_{id} + \omega V_{id} \quad (1)$$

$$X_{id}^2 = X_{id}^1 + c_1 rand() (P_{id} - X_{id}^1) \quad (2)$$

$$X_{id}^3 = X_{id}^2 + c_2 rand() (P_{id} - X_{id}^2) \quad (3)$$

The mutation operator  $\omega V_{id}$  is applied to  $X_{id}$  to obtain  $X_{id}^1$ .  $X_{id}^2$  represents the result of intersection operation between the current solution and the local optimal solution.  $X_{id}^3$  represents the result of cross operation between the solution  $X_{id}^2$  and the current global optimal solution.

When the two relationships are not in the same site, when the connection operation involves the data transmission between sites, the transmission network cost should be considered. There are two factors that affect the connection result, one is to choose different transmission modes, and the other is to choose the execution site. The communication cost calculation model of distributed query is:

$$C_{com}(X) = C_{init} + C_{tran} * X \quad (4)$$

That is, the intermediate result relationship generated in the semi-join algorithm is smaller than the size of a single join relationship, which can reduce the amount of data transmission required in the process of query execution, thus reducing the cost of network communication. The program flow of the algorithm is shown in Figure 3:

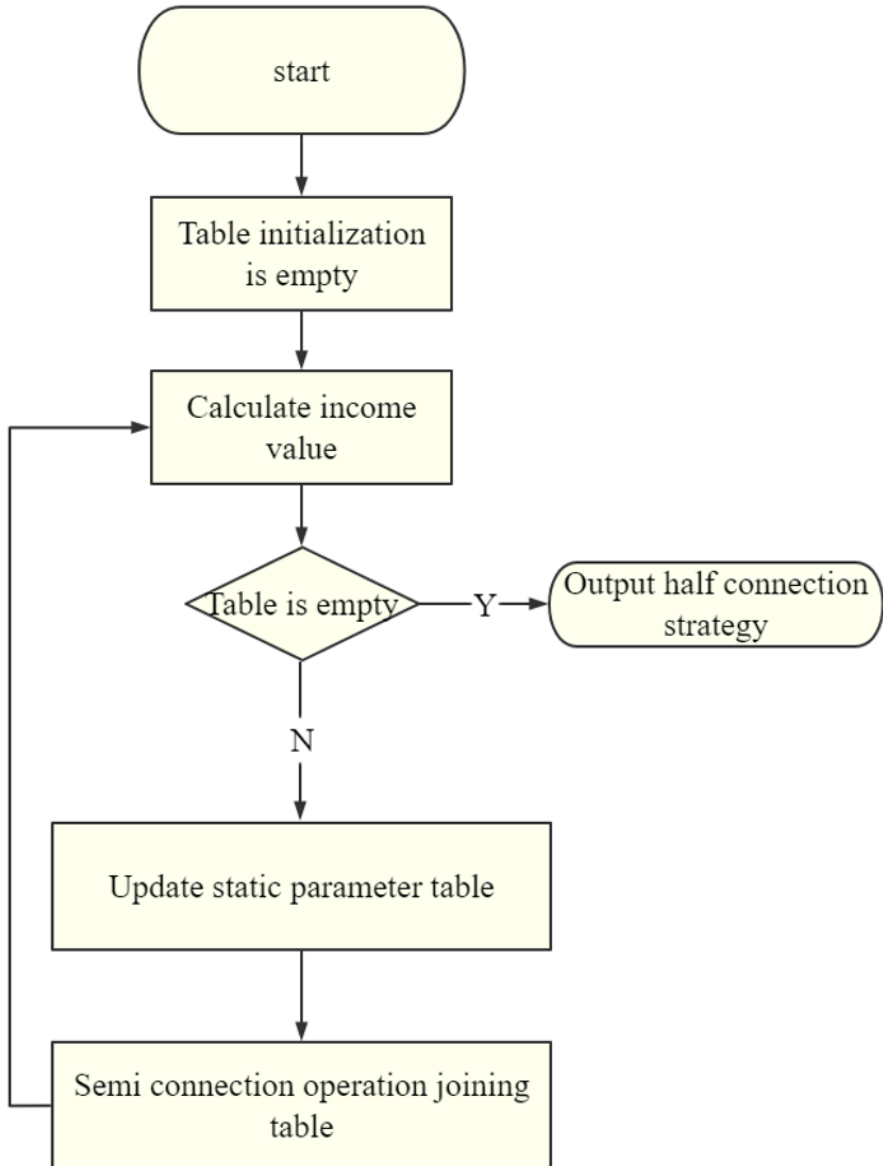


Fig. 3. Program flow of algorithm

In the execution strategy set, cancel the semi-join operation used to reduce the relationship on the execution site. That is to say, if the site of the last semi-connection operation happens to be the execution site, it can be ignored. Delay the expensive semi-connection operation to make the best use of the reduced relationship, thus reducing the overall transmission cost.



### 3 Result analysis

It can be seen that for a given query example, most of the combinations of algorithms in this paper are good, and the average cost of generating plan of this algorithm is improved by 40.201% compared with incremental heuristic algorithm and 20.126% compared with simulated annealing algorithm, and the improvement trend is more obvious with the increase of the number of relations. To sum up, this algorithm is superior to the other two algorithms in solving multi-join query optimization problems.

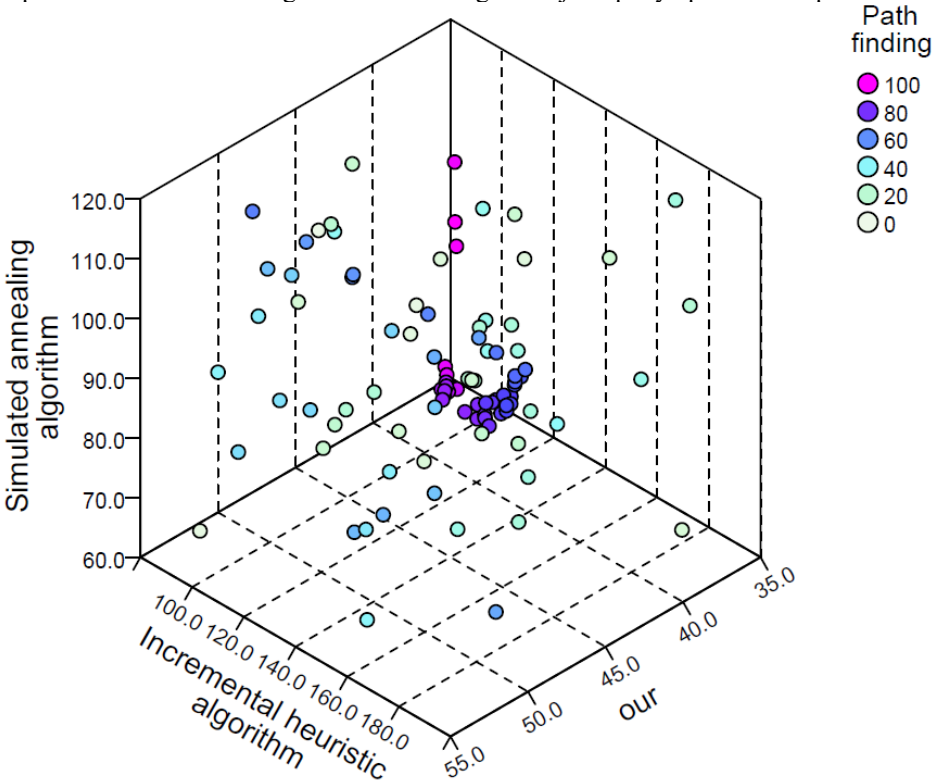


Fig. 4. Select path distance comparison

Figure 4 shows the results of 100 groups of randomly generated cargo spaces visited by three ways. From the line chart, it can be seen that the path length of this algorithm is lower than the path length selected by the simulated annealing algorithm, and far lower than that of the incremental heuristic algorithm based on the minimum cardinal rule. Therefore, it can be concluded that the optimization scheme proposed in this paper is feasible.

## 4 Conclusion

The profit dilemma brought by comprehensive assimilation and the bottleneck encountered in expansion have become the focus of attention of entrepreneurs in the industry. This topic launches the research on the design and implementation of baking industry information system. This paper combines the characteristics of cloud computing technology and information business of baking industry, designs the information platform of baking industry based on cloud computing technology, and adopts SOA and query optimization algorithm based on semi-connected strategy. The research shows that for a given query example, most of the combinations of algorithms in this paper are better. The average cost of generating plan of this algorithm is improved by 40.201% compared with incremental heuristic algorithm and 20.126% compared with simulated annealing algorithm, and the improvement trend is more obvious with the increase of the number of relations.

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