

# Design of Supermarket Shopping Guide System

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**Abstract.** As the economy develops, the scale of the supermarket is getting bigger and bigger. There is an increasing shift from convenience store to one-stop shop. So, how to find the goods you want rapidly, accurately and efficiently has become an urgent problem. To solve the problem, we have designed a kind of supermarket shopping guide system, which has the function of is based on STM32 single chip microcomputer and Radio Frequency Identification. The design consists of hardware design and software design, and the dissertation will discuss the two parts in detail. This plan is likely to bring more benefits to supermarkets as well as shoppers. For supermarkets, they will benefit from the increasing of user engagement. As for shoppers, they can save time by not walking back and forth in search of multifarious goods.

## Background of the Project

### Economic Environment

In recent years, the economy of China is developing at an incredible speed, China makes a big contribution to world growth: it is, after all, 9% of global GDP and it is growing at 10% a year. Per capita consumption is increasing year by year, too. Thus it can be seen that people's material lives get richer each day. With development and prosperity of commercial economy, a variety of goods comes into being. Shopping in supermarkets is becoming an indispensable part of 20th-century life. How to find the goods you want in the variety of goods rapidly, accurately and efficiently has become a puzzling problem to shoppers for a long time and the supermarket shopping guide system we designed is one attempt to solve that problem.

### Technological Environment

It is wise to praise highly "People-oriented with innovative technology" in the world of technology and internationalism. We should implement the strategy of developing the country by relying on science and education. Many developing countries provide subsidies to new and high technology enterprises. Environment of scientific and technological innovation have altered a lot in recent years. In the first place, intellectual property system in China have been improved. In the second place, the high-tech market and business is on the way toward maturity. There are many angel investors help the newest and most fragile firms to develop, which infuses innovation activities with new energy.

As for the people, most people, especially young ones view convenient and efficient technology products in a positive light. In such a positive and active technological environment, our product has a certain extent attraction to the customers, which is of great benefit to the supermarkets.

### Cultural Environment

The economic development has accelerated the paces of the whole social process, and also accelerated the rhythm of people's life. Today, modern people advocate a fast-paced lifestyle. It can be seen everywhere people who dashed around different locations who believes time is life. So for them, whether saving time is one of the important factors to consider. The system is precisely what the modern lifestyles accommodate with. Thus supermarkets equipped with a shopping guide system a preferred option for modern man.

## Design of Hardware Part

The entire supermarket shopping guide system is mainly composed of supermarket coordinate, shopping cart and server.

### Supermarket coordinate

Supermarket coordinate consist of RFID tags laid in the ground. Each RFID tag corresponds to that an aisle or a crossing and has a unique number, which is used as a marker of somewhere in the supermarket. The correspondence between number and place is given by server. RFID tag stores its number only. The location information is not stored there. That is to say, RFID reader reads number from a RFID tag and get location information by comparing the data with that stored on the server. This kind of approach can help the system adapt to different kinds of supermarkets without writing different location information according to different supermarkets, and then made it a modular system with better adaptability.

As shown in Figure 1 below, on the sketch map, blue rectangles represent supermarket shelves, gray represent supermarket aisle and red dots represent RFID tags.

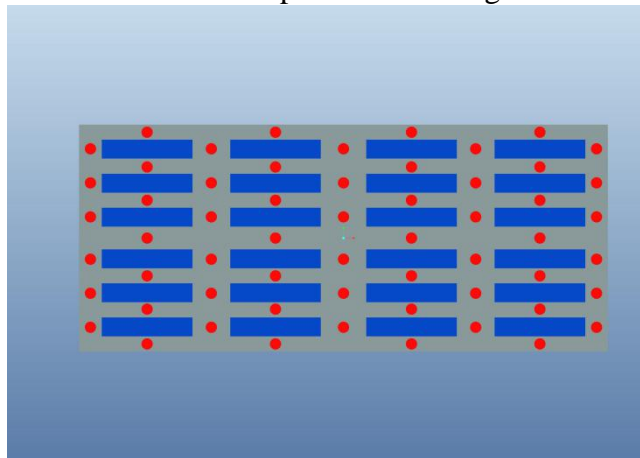


Fig. 1 a sketch map of the arrangement of RFID tags

### Shopping cart

The shopping cart mainly consist of a RFID reader, which can read number from RFID tags, STM32 microprocessor, Zigbee wireless receive module, a touchscreen and other major parts.

STM32 microprocessor and the server communicate via two-way ZigBee protocol radio communication. The server sends location information of RFID tags to STM32 microprocessor after initialization.

Shoppers can input the shopping information easily in LCD, and the display can show them, and tell shoppers how to do in next step. If the information is not correct, they can return to the home page, and re-input them. Shoppers have two methods to input the shopping information--enter the product name directly or select it from the list.

RFID module is responsible for reading the number of RFID tags laid in the ground and send the number to STM32 microprocessor. Then STM32 microprocessor calculates the optimal solution of the path and sends the solution to the server using ZigBee technology. The server determines whether the path is crowded or not and provide feedback to STM32 microprocessor. STM32 microprocessor determines whether the path should be shown as calculated or recalculated.

### Server

The server is responsible for forming a net work that connect all shopping carts together. The major functions of the server are as follow. First, store relationship between some place in the supermarket and RFID tags. Second, enter and save the location of goods. Third, get road conditions in real time and judge the feasibility of the path.

## Design of Hardware Part

### Software functions

The software should be used in supermarkets to point consumers to featured items using a

graphical interface. It can not only show the path to designated locations to shoppers but also provide enterprises with commodities promotion. The specific functions are as follows.

1) Enter the data of purchasing into the database when stocking, including the product name, the product price, the product location, the product type (can be customized to meet customer requirements) and so on.

2) Enter the data of the partition information and corresponding product categories placed in a certain area.

3) Enter the data of personal information and shopping information for each customer after they get membership cards. Provide the ability of register as a member and open a VIP service.

4) Help shoppers get directions to the goods they need using a graphical interface thereby guiding consumers.

5) Analyze the shopping information and shopping habits of a certain shopper in the database and get the product he most frequently buys. Then we can recommend appropriate products to them thus providing convenience for the shoppers as well as giving publicity to the commodity. When the mechanisms of the recommendation are mature, the supermarket could raise profitability by charging to advertisers.

### **Implementation method**

1) The main interface. The main interface includes some options such as cargo information management, shoppers' information management, cart operations and personnel management. The staff of the supermarket can log in and perform other operations after authentication. Users can go to sub-menus by clicking corresponding buttons on the menu screen.

2) Cargo information management. This window lets administrators manage (that is, add, modify, delete, or query) the cargo information based on the actual situation. Users can click back to the main interface on this interface.

3) Shoppers' information management. This window lets administrators manage (that is, add, modify, delete, or query) the Shoppers' information based on the actual situation. The information can be managed by both staffs and shoppers. Users can click back to the main interface on this interface.

4) Cart operations. Shoppers can choose the goods they want in the commodity classifications or through searches. This is the interface where shoppers can browse the products, looking for details, key in order quantity and add to shopping cart.

5) Personnel management. This window lets administrators manage (that is, add, modify, delete, or query) the personnel information and grant access for each user. Only trusted administrators should be granted permission to create data sources and run imports/exports. Users who do not have administrator permissions can change their own user names, passwords, and e-mail addresses.

6) The navigational interface. The system automatically obtains the user's current position and looks for the best path in real time. Rotating a hand-held map is a simple way to more easily match your orientation with the navigational interface.

7) Product recommendation. The system gets the types of goods that might be of interest by making use of shoppers' information in the database and recommends the goods purchased or similar goods to the shoppers.

### **Conclusion**

The shopping guide system we designed has the advantages that:

1) Costs are lower while markets are expanding. One of the modern reasons which restrict its more development of supermarket shopping guide system is the cost of it is too high. The system we developed is mainly composed of RFID tags, RFID reader, STM32 microprocessor, a 2.4 inch full color LCD screen and computer software. Because of their simple structure, low price and high reliability, the system would be widely used in many big supermarkets.

2) RFID technology has obvious strong-point. The tag can be read if passed near a reader, even if it is covered by the object or not visible, which keeps RFID tags clean and reducing wear. RFID has applied in many fields for its readability and writability, speed identification,

long-distance identification, high-speed movement identification and running in atrocious environment.

3) The system makes shopping and sales promotion very human and the benefits would be twofold. Here you can enjoy commodity location, path planning, navigation and advertisements recommendation, all of which embody the humanized design. We designed the system seeing things from the customer's point of view, which helps greatly improve shopping efficiency and result accuracy. We commit to create a relaxed shopping environment for customers as well as give the supermarkets more opportunities to increase their income. It can be said that the system can solve the embarrassment big supermarkets is experiencing right now that the scale is increasing continuously but the income is not.

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