Stadium integrated service equipment control program design

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Abstract. In the post-COVID-19 era, national fitness has been rapidly promoted, covering a wide range of people, benefiting many communities, involving rich venues and comprehensive fitness programs. However, ball sports require cumbersome sports equipment and inconvenient to carry. This design for the outdoor court goods storage and ball rental and put forward ideas, complete the stadium integrated service equipment control program design. It provides a new way to solve the problem of drinking water, ball use and sports injury for sports enthusiasts on the court. The services provided by this design include the purchase of drinks, the rental of sports equipment, the purchase of emergency medication for injuries, and the temporary storage of small objects. This control program, which is the user end of the software, is required to run on the Android mobile phone of the system, mainly to assist users to directly purchase drinks, purchase emergency medical kits, rent sports equipment and other functions in the sports venue, as well as to view related information such as drink information and emergency knowledge. And according to the requirements of the management side and the main functional modules of the client to operate and manage. It solves the problem of people's demand for outdoor sports equipment and emergency treatment of emergencies.

Keywords: court service, first aid supplies, rental, sale, sports equipment

1   Introduction

Automatic selling equipment has covered all areas of people's lives, and domestic and foreign scholars have also competed to put forward their own insights. Hu Qirui applied 3D printing technology to the personalized production of ice cream in the ice cream vending machine at the amusement park [10]. Zhang Xin studied a hotel automatic sales intelligent recommendation system, which can recommend to the landlord for product allocation and pricing according to customer preferences, effectively re-

ducing the extra cost paid by the landlord to meet the special needs of visitors [11]. Zhu Yuesong et al. studied the integrated rice/noodles unmanned vending machine, which can realize the quantitative distribution of rice/noodles, quantitative filling of dishes, packaging of lunch boxes and other functions [12]. In order to ensure freshness from the source and make use of the convenience of the vending machine, Zhang Tan designed an integrated device that integrates automatic noodle making, cooking, spicing, dressing and selling with great market prospects [13].

Business automation has a wide range of applications in the manufacturing industry, service industry and retail industry, such as many common vending machines and playground self-service rental equipment in life, which are large and cannot be moved flexibly, and maintenance costs increase if they are placed outdoors in harsh environments[1-2].Especially for the ball stadium, there is no comprehensive consideration in the process of sports, such as: ball players need to rent the ball and store personal belongings needs; The need for emergency treatment of ball players injured due to special circumstances in sports; The need for beverage supplies and other issues such as automated field service equipment appeared.

The purpose of this design is to provide a kind of integrated service equipment for sports enthusiasts in the field of drinking water, ball problems, sports injuries to provide a new way to solve the problem[5-6]. In the design of the equipment structure, it is more flexible to adapt to the outdoor environment, so as to solve the user's sports service needs and adapt to the changing outdoor venues proposed in the above background technology. The device is designed to be small and lightweight, and provides services such as the purchase of drinks, the rental of sports equipment, the purchase of emergency medication for injuries, and the temporary storage of small items. This paper only introduces the control program design of the device.

2   Design of control methods for integrated service equipment of the stadium

As shown in Figures 1 and 2, the control method of the integrated service equipment of the stadium is as follows: The user chooses to search the application mini program of the integrated service equipment of the stadium through wechat mini program or Alipay mini program or scan the two-dimensional code of the integrated service equipment of the stadium on the mobile device to enter the application mini program of the integrated service equipment of the stadium[3]. The user's operations in the mini program of the integrated service device will be fed back to the enterprise cloud server[4]. After operation identification and information processing, the enterprise cloud server will send relevant instructions to the central controller 2 of a golf course integrated service equipment. After the central controller 2 recognizes the information, the corresponding module responds and completes the command action, while the other modules are in the hibernation state. After the course integration service device completes the corresponding operation, the relevant information and data are uploaded to the enterprise cloud server, and the corresponding information is pushed to the clien[8-9].

The central controller 2 includes the processor, communication module, pressure sensing module, image processing module, lock body control module and storage module. The processor recognizes the information, and processes the information after the identification, and sends the corresponding information to the communication module, pressure sensing module, image processing module, lock body control module and storage module. And the communication module receives and forwards the information after receiving the instruction. After receiving the command, the pressure sensing module controls the pressure sensor to identify the pressure. After receiving the instruction, the image processing module controls the electronic camera for image recognition. After receiving the instruction, the lock body control module controls the corresponding electronic lock 6 to open or close the lock. The storage module is used to store information in central controller 2.

Related door detection modules are installed in beverage cabinet 3, locker 8 and ball cabinet 10. The door closing detection module is fixed under each electronic keyhole and electrically connected with the ESP8266 chip to realize the detection of the door closing state.

When operating the above integrated court equipment, you can use the dedicated mobile device side of the integrated court device application applet. Mobile devices end court integrated equipment application small program, including drink sales, emergency medical care, ball rental, item access, personal center five user interfaces. Beverage sales: Beverages in the beverage cabinet 3 of the integrated equipment of the stadium are sold. Emergency medical care, emergency medical report and emergency medical care for emergencies on the pitch. Ball rental: The ball in the ball locker 10 of the integrated equipment of the court is leased. Item access, access users carry small items with them. Personal center, display user personal information, coupon information, order information.
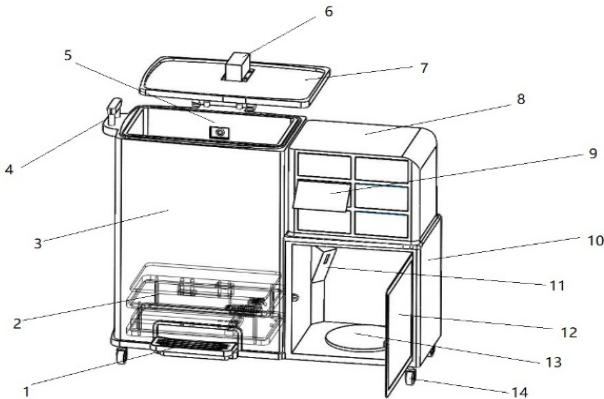
1-foot pedal, 2-central controller, 3-beverage cabinet, 4-hand push rod, 5-beverage camera, 6-electronic lock, 7-beverage cabinet door, 8-locker body, 9-locker door, 10-ball cabinet body, 11-ball sensor camera, 12-locker door, 13-pressure sensor disk, 14-universal roller

Fig. 1. Overall engineering drawing of the device
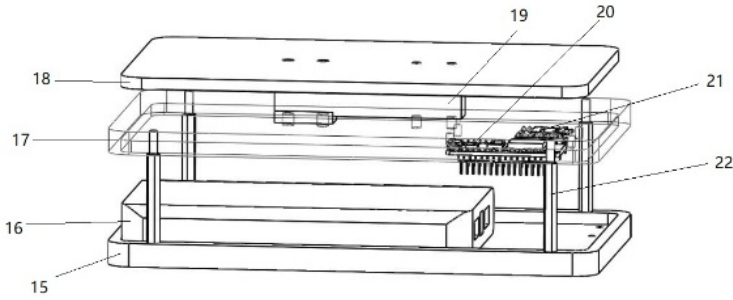
15-Central controller bottom partition, 16-central controller power module, 17-central controller middle partition, 18-central controller top partition, 19-central controller sensor module, 20-central controller ESP8266 chip module, 21-central controller MP3 voice announcer module, 22-central controller hex support copper column

Fig. 2. Schematic diagram of the central controller

The user enters the software terminal, authorizes the login, selects the service type, and scans the bound unique device. On the software side, the user uses a mobile device, such as a smart phone, to enter the application mini program of the integrated stadium device, which is a kind of integrated stadium service device. The cloud server generates the corresponding initial order according to the service type selected by the user, and sends the corresponding command to the corresponding device, such as "open the door". The corresponding module of the device responds to the command and completes the specified command action to determine whether the use is complete. For example, if "yes" is selected, the cloud server saves the data to the database and pushes the final information to the user.

When the user plays sports, you can choose the ball rental service: The user can search the court integrated device application applet or scan the two-dimensional code of the court integrated service device on the mobile device through the wechat mini program or Alipay mini program, enter the court integrated device application applet, select the ball rental function, and the central controller of the court integrated service device 2 controls the locker 10 electronic lock 6 unlock after receiving the command. The user opens the locker door 12, takes out the rental ball, closes the locker door 12, and the door closing detection module in the locker body 10 detects whether the user has closed the door properly. If "no", the central controller will control the central controller MP3 voice broadcast mode 21 to remind the user to close the locker door 12. If it is detected that the user has closed the locker door 12, the user's rental time begins. When the user chooses to return the rental ball, the same step into the court integrated equipment application mini program, select the ball return function, the court integrated service equipment central controller 2 after receiving the command control locker 10 electronic lock 6 unlock, the user opens the locker door 12, returns the rental ball, close the locker door 12. The door closing detection module in the locker 10 detects whether the user has closed the door properly. The detection principle and procedure are the same as when renting the ball. If it is detected that the user has closed the locker door 12, the pressure sensor disk at the bottom of the locker

body 10 will detect whether the user has returned the rental ball, and the ball sensor camera 11 will start to detect and compare the condition of the rental ball (whether there is damage and replacement). If the return of the rental ball is detected, the rental period of the user is ended and the order is generated for the user in the court Integrated device application applet.

When users are resting, they can choose to sell drinks: Users can search for the mini program of integrated stadium equipment through wechat mini program or Alipay mini program on their mobile devices, or scan the two-dimensional code of integrated stadium service equipment, enter the mini program of integrated stadium equipment, and select the drink selling function. After receiving the instruction, the central controller 2 of the stadium integrated service equipment controls the beverage cabinet 3 electronic lock 6 to unlock, the user steps on the pedal 1, opens the beverage cabinet door 7 through the rear connecting rod inside the beverage cabinet 3, the user takes out the drink, and the beverage sensor camera 5 starts to work. Identify and record the type and quantity of drinks taken out by the user and feed the data to the processor on the central controller 2. If the user does not open the door 7, the door closing detection module will start and close the door 7 within five seconds to prevent the user from maliciously unlocking the door. When the user closes the beverage cabinet door 7, the door closing detection module in the beverage cabinet body 3 detects whether the user has closed the beverage cabinet door 7. The detection principle and procedure are the same as when renting the ball. If it is detected that the user has closed the door of the beverage cabinet 7, the sensor module on the central controller 2 located at the bottom of the beverage cabinet 3 will start to work, compare the total weight of the beverage in the beverage cabinet 3 before the user opens the door and after the door is closed, and feed the data processing results to the processor on the central controller 2, which processes the corresponding data. And generate orders for users in the small program of the stadium integrated equipment application.

In case of sports injury, users can choose emergency medical services: Users can search for the mini program of integrated stadium equipment through wechat mini program or Alipay mini program on mobile devices or scan the two-dimensional code of integrated stadium service equipment, enter the mini program of integrated stadium equipment, select emergency medical care function, and report the injury situation. After receiving the instruction, the central controller 2 of the integrated service equipment of the stadium detects whether there are medical supplies that meet the conditions of use in the locker 8. If "yes", control the locker 8 specify the locker door 9 electronic lock 6 Open the lock, the user takes out medical supplies, and then close the locker door 9. The door closing detection module in the locker 8 detects whether the user has properly closed the locker door 9. The detection principle and procedure are the same as when renting the ball. After detecting that the user has closed the locker door 9, a service order will be generated for the user in the stadium integrated equipment application applet.

Storage services can be selected when the user is exercising: The user can search for the stadium integrated device application applet through wechat mini program or Alipay mini program on the mobile device or scan the two-dimensional code of the stadium integrated service device, enter the stadium integrated device application

applet, select the storage function, and select the designated locker door. The central controller 2 of a ballpark integrated service device detects the presence of items in locker 8 after receiving instructions. If "no", control the locker 8 specify the locker door 9 electronic lock 6 Open the lock, the user stores the items, and close the locker door 9. The door closing detection module in the locker 8 detects whether the user has closed the door properly. The detection principle and procedure are the same as when renting the ball. After detecting that the user has closed the cabinet door, a service order will be generated for the user in the stadium integrated equipment application applet. When the user chooses to take out the storage items, enter the stadium integrated equipment application applet, select the previously generated service order, select the unlocking and retrieving items, a central controller of the stadium integrated service equipment 2 controls the locker after receiving the instruction 8 Specify the locker door 9 electronic lock 6 Unlock, the user takes out the items, and then closes the locker door 9. The door closing detection module in the locker 8 detects whether the user has properly closed the locker door 9. The detection principle and procedure are the same as when renting the ball.

3 Control program design of stadium integrated service equipment

Ballpark integrated service equipment small program design referred to as the ball software client. The user end of the software is required to run on the Android mobile phone of the system, which mainly assists users in directly purchasing drinks, purchasing emergency medical kits, renting sports equipment and other functions in the sports venue, as well as viewing related information such as drink information and emergency knowledge, and carries out management according to demand: Home page, Personal center, beverage classification management, rental information management, order information management, order distribution management, system management; Client: Home page, drink purchase, emergency medical kit purchase, sports equipment rental, venue use, my operation and management of major functional modules.

3.1 Operating Environment

Hardware requirements, as shown in table 1:

Table 1. Basic hardware requirements

Category	Basic requirement
Supporting environment	Inte1(R) Core(TM) i5 -4200H，GPU:2.8GHz，8GB RAM, 1TB hard drive
Operating platform	Various Android phones or tablets and IOS phones or tablets

Software requirements, as shown in show as table 2:

Table 2. Basic software requirements

Name	Basic environment
Host software	Windows10，Wechat developer tools, Visual Studio Code
Operating system	Android2.2 and above, or IOS7.0 and above

3.2   Software compilation environment

This software is developed using wechat developer tools and Visual Studio Code, and the same software is required for development and compilation.

3.3   General Requirements

Overview of System Functions.

In today's society, the pace of life is getting faster and faster, and people's demand for mobile phone wechat is getting higher and higher. Not only in terms of simple operation and complete functions, but also in terms of user experience, there are higher requirements. The most efficient and efficient way is to use the Internet to combine the wechat Ball software and the hardware equipment of the integrated service box project. To provide users with convenient and fast services.

The system is divided into two parts in function: front management and back management. The front desk mainly provides customers with membership registration, shopping cart management, product browsing and order inquiry. The backstage is mainly to provide commodity management, customer information management, order management and other functions for the administrator. The online fresh supermarket system has powerful interactive functions, which can make it convenient for merchants and customers to transfer information and complete electronic trade or EDI transactions.

Through a detailed investigation of the actual objects to be dealt with, we carry out matching replenishment, product customization, brand maintenance, account management and other matching functions for business customers who purchase or operate the stadium integrated service box project and customized users who put forward product requirements for the Global Treasure software. Capture events from the backend, process the event data, store it in the database, perform word segmentation and semantic processing, extract event attributes, establish event models, and visualize them.

System Structure.
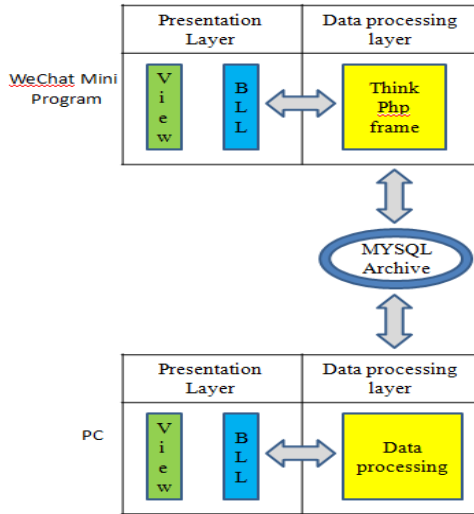
The overall system structure is shown in Figure 3:

Fig. 3. Overall system structure composition diagram

3.4   Software Development

Software requirement analysis.

The main purpose of the software is to improve users' purchasing efficiency and meet users more conveniently and quickly, better store all data information and fast and convenient retrieval function. The various modules of the software are determined by reasonable analysis of many developed wechat purchasing software to consider users' operability and follow the principle of system optimization. After a thorough investigation and research.

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The client of the software is required to run on the Android mobile phone of the system, which mainly assists users to directly purchase drinks, purchase emergency medical kits, rent sports equipment and other functions in the sports venue, as well as view related information such as drink information and emergency knowledge. The management side can be carried out according to the needs: home page, personal center, beverage classification management, rental information management, order information management, order distribution management, system management; Client: Home page, drink purchase, emergency medical kit purchase, sports equipment rental, venue use, my operation and management of major functional modules.
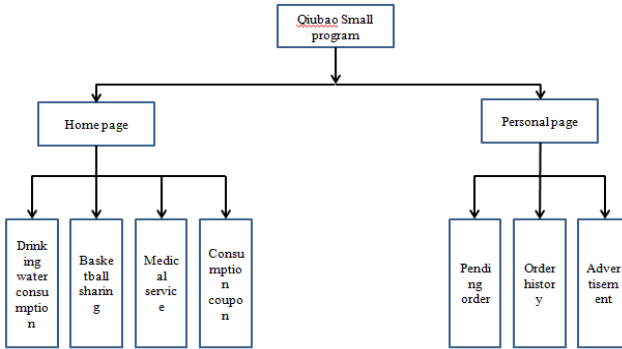
The software structure is shown in Figure 4:

Fig. 4. Software structure diagram

Summary design of software.

The requirements of Globo software are analyzed from function, data flow, feasibility and operation environment. The database and function of the software are designed in detail, the main interface design and related component design are analyzed, and the realization of the software is introduced. Obtain data from the database, write data to the database, realize the system directly to the database for a variety of database query, insert, delete, update and other operations, add dynamic content in the web page, so as to achieve the various basic functions required by the ball software. The software adopts B/S architecture, the front-end framework is developed using wechat developer tools, and the background data is realized using MYSQL.

3.5   Software design

Design skills.

The front-end user interface uses the JS, JSON, WXML and WXSS development frameworks of wechat software to realize the purchase interface and the operation of each module on the smart phone. Compared with the preparation of ordinary app applications, wechat software adopts the new rpx as the unit of interface layout, which can better adapt to the display problems of different smart devices. Only one development is required, and different screen sizes can be adapted at the bottom of the system through proportional calculation. If there is a display problem, it can be optimized separately. Greatly reduce the workload required for development [7].

Through the swiper component of the wechat software editing tool to achieve the operation of the rotograph, the picture path is saved in the corresponding JS file, and set the rotograph format to fully display the short side, if necessary, take the picture in the other direction, maintain the aspect ratio, so that the rotograph box can be filled with the whole picture, and keep each picture the same size.

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the other direction, maintain the aspect ratio, so that the rotograph box can be filled with the whole picture, and keep each picture the same size.

Real-time reporting of weather conditions is carried out using web crawlers, developed using the scrapy framework and deployed on cloud servers. Considering that the data crawled by the crawler is mostly semi-structured or unstructured data, we use the MYSQL database for data storage and deploy on the cloud server.

Module Design Description.

The whole system is divided into 5 modules:

a) Component module: The component module is deployed in the entire system and can be specified through commands at all levels to complete feedback.

b) Service module: The function of the service module is to realize the visual selection task of the related services provided by the system for the limitation of the outdoor sports field, as well as the real-time display of the outdoor temperature, humidity, ultraviolet intensity and other conditions for the user, and apply for real-time positioning to the user, and timely feedback on the site occupation.

c) User module: Personal module includes order to be paid, order history and other sub-modules.

d) Product module: Display of various drinking products for users to choose.

e) Entertainment module: mainly provides users with game services, sports sharing functions, etc.

Detailed description of user modules.

The wechat login process is shown in Figure5:

a) Get the code in the wx.login() function;

b) open-type= "getUserInfo" to obtain the user's header and nickname;

c) Send the obtained code to the server through ajax;

d) The server uses appid+scecret+code to exchange openid and session_key;

e) Openid+ nickname can be stored to the server;

f) After successfully storing to the server, you can customize the login status of the user's information.
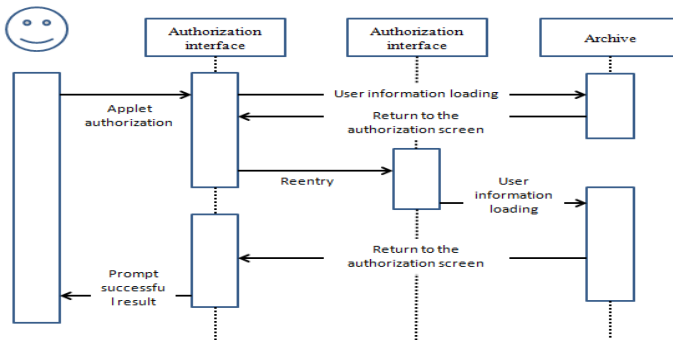

Fig. 5. Flowchart of wechat login

Detailed description of Service modules.

a) Product list implementation

The software side requests the server side interface information through js, and the interface accesses the corresponding database to obtain the commodity information of the corresponding section in the database, and calls to the software front end.

b) Historical bill realization

The software side requests the server side interface information through js, and the interface accesses the corresponding database to obtain the commodity information of the corresponding section in the database, and calls to the software front end.

c) User purchase relationship

Components Detailed design of the module.

Component modules can abstract functional modules within a page into custom components that can be reused in different pages. It is also possible to split complex pages into multiple low-coupling modules, which helps with code maintenance.

In the js file of a custom Component, you need to use Component() to register the component and provide the component's property definitions, internal data, and custom methods. The component's property values and internal data will be used to render the component wxml. Where the property value can be passed in from outside the component. The node tree generated after the component template is combined with the component data is inserted into the reference location of the component. A <slot> node can be provided in the component template to host the child nodes provided when the component is referenced.

3.6   Interface Development

Interface for retrieving User Information.

Calling this interface will obtain the information dialed up by the user after the authorization of the software side. We use this interface to realize the connection between wechat software and the database to complete the basic work of user information entry into the database.

wechat Pay transfer interface.

Calling this interface will obtain the user's consumption information on the software side, and we will use this interface for wechat Pay return data to help complete the record retention of user consumption information entering the database.

Payment Result Notification Interface.

Wechat Pay notifies merchants of successful payment messages through the payment notification interface.

The link is set through the request parameter "notify_url" in the basic order interface. After the user completes the payment, wechat will send the relevant payment

result and user information to the merchant, who needs to receive and process the message and return the response.

Order Information Query interface.

Calling this interface will obtain the order information of the user on the software side. We use this interface to obtain the relevant consumption information of the specified user from the database and return it to the wechat software in the form of an order. By searching the user order information, the user's service usage information is calculated.

The software side obtains the actual amount paid by the user according to (unit price of the product * quantity of the product)-(value of the coupon * quantity of the coupon used).

Coupon Query Interface.

Calling this interface will obtain the coupon information of the user. We will use this interface to connect wechat software and database to complete the reduction and remission of the coupon used by the user when consuming.

Adding and deleting Billing Interfaces.

Calling this interface will fetch the order information in the database, and we will use this interface to modify the relevant billing information from the database to achieve the ability to update the billing data.

Logical design:

a) Verify whether the parameter exists (verify the bill ID) and output the result. Parameter insufficient, release form, parameter present, lock form.

b) Determine the bill useTime (that is, whether the user has used it or not). If the user does not complete the order, it will directly delete the order and output the operation result. If the user completes the bill, call up the wechat Pay refund interface.

Coupon interface.

The coupon use interface is the billing completion interface, and applying this interface will achieve the following operations:

a) According to the service type and the discount volume level, the discount volume name and price of the discount volume are automatically selected for the user, and the number of discount volumes is updated to the bill table in the database.

b) Design SQL using the quantity information of coupons: first, search the service type in the goods table according to goods_id, then search the coupon table according to the found service type, and return an array of qualified coupons; (Eligible coupon and coupon grades).

c) If yes, then compare whether the usercoupon table corresponds to the coupons in the above array. If yes, update the coupon name and quantity of users in the bill table according to their level; (The default number of primary users is 1, query the level of

the user, the higher the level of the user, the more discount volumes can be used at the same time).

Logical design:

a) Verify whether the parameters exist (verify the user ID and bill ID) and output the result.

Parameters are insufficient, release the relevant data, parameters exist, lock the relevant data.

b) Obtain the number of discount volumes qualified by the user, determine the service type of goods_id, and sort according to the grade of the discount volume.

c) Determine whether the user has this discount volume, if there is a judgment to perform the following update, no directly update no discount volume.

d) Obtain user level;

(If you are a VIP user, you can use 2 coupons at the same time, if you are an ordinary user, you can only use 1 coupon at the same time).

e) Output order details and update the coupons owned by users.

4   Conclusions

A. The design uses self-service equipment to provide emergency medical kits, cold drink sales, ball rental and other integrated services to solve the actual situation of a variety of different items needed at the same time under the ball game court, and provides perfect services for the athletes. Taking into account the convenience factor, the cold drink sales service provided by it can perfectly solve the problem of the last 200 meters to the store after exercise. The ball rental service provided by the company solves the awkward situation of ball lovers without a ball available on the court. Taking into account the factors of timely care after sports injuries, the emergency medical kit service provided by the company can be handled immediately when the athletes are injured, prevent secondary infection injuries, and provide a strong guarantee for the timely medical care of the injured.

B. This design and other vending equipment is different, there is no complex mechanical structure, the use of simple intelligent control to achieve human-computer interaction. Pressure sensors and cameras are set up inside the drinks cabinet to sense the number and type of drinks taken by the user, and the central controller will perform intelligent calculations according to the price of drinks, reduce the weight of drinks, etc. Automatically deduct fees to the user at the small program end. The camera is also set up in the ball locker to record the ball rental situation, the central controller will perform intelligent calculation according to the ball rental situation, rental duration, rental price, etc., and automatically deduct fees to the user at the small program end, eliminating the complicated operation, simple and low cost.

C. Taking into account the difference with common vending equipment, the design has low production cost, the external use of lighter quality, higher strength materials, the internal without complex mechanical facilities, lighter weight, smaller volume and the bottom provides universal rollers to facilitate movement in complex environments. More friendly for outdoor sports venues.

Acknowledgment

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