

MANAGEMENT METHOD OF SHELF AND MANAGEMENT APPARATUS OF SHELF, COMPUTER DEVICE AND COMPUTER-READABLE STORAGE MEDIUM

TECHNICAL FIELD

The present application pertains to the technical field of Internet of Things, and more particularly, to a management method of a shelf, a management apparatus of the shelf, a computer device, and a computer-readable storage medium.

BACKGROUND

For a manager of a large-scale supermarket, shelf management is a critical point in daily operation of the supermarket. In an environment of great passenger flow and rapid circulation of merchandises and commodities, an effective shelf management can not only ensure timely supplying of merchandises and commodities for meeting customer's requirements, but also avoid inventory backlog and reduce unnecessary cost loss. However, manual inventory and monitoring of commodities in shelf management in the prior art have some technical problems such as low efficiency and high error rate.

SUMMARY

Embodiments of the present application provide a management method of a shelf, a management apparatus of the shelf, a computer device and a computer-readable storage medium, which can solve the technical problems of high error rate and low efficiency due to manual management of commodities on the shelf in the prior art.

In the first aspect, a management method of a shelf is provided in the present application. The method includes:

triggering, when detecting a moving object on the shelf, an image sensor to perform an image acquisition in a direction of the moving object to obtain an image acquisition result;

determining a target commodity and a target person from the image acquisition result; and

managing relevant data of the target commodity according to the target commodity and the target person.

Particularly, the method further includes steps of:

receiving settlement information of the target person transmitted by a first terminal device; and

determining, according to the settlement information, whether a settlement for the target commodity has been completed; and

updating an inventory of the target commodity when the settlement for the target commodity has been completed.

Particularly, after the step of determining whether the settlement for the target commodity is completed according to the settlement information, the method further includes a step of:

sending first prompt information to the second terminal when the settlement for the target commodity has not been completed.

Particularly, after the step of determining the target commodity and the target person from the image acquisition result, the method further includes steps of:

establishing a key-value pair relationship between the target commodity and the target person, and storing the key-value pair relationship in a cache database; and

generating shopping cart information of the target person based on the key-value pair relationship, and sending the shopping cart information to a user terminal of the target person;

the step of updating the inventory of the target commodity when the settlement for the target commodity has been completed includes:

removing the key-value pair relationship from the cache database, and updating the inventory of the target commodity, when the settlement for the target commodity has been completed.

Particularly, the method further includes steps of:

performing a face recognition on the target person to obtain an identity type of the target person; and

obtaining historical shopping information of the target person, and generating commodity recommendation information of the target person based on the historical shopping information, when the target person is a first type of user.

Particularly, after the step of performing the face recognition on the target person to obtain the identity type of the target person, the method further includes a step of:

sending second prompt information to the second terminal, when the target person is a second type of user.

Particularly, the method further includes steps of:

controlling a management apparatus of the shelf to move on a guide rail of the shelf, and invoking the image sensor to photograph a plurality of commodity areas on the shelf to obtain image capturing results of the plurality of commodity areas; and

managing the plurality of commodity areas according to the image capturing results;

where the image sensor is arranged on the management apparatus of the shelf, and the management apparatus of the shelf is arranged on the guide rail.

In accordance with the second aspect, a management apparatus of a shelf is provided in the present application. The apparatus includes an image sensor, a detector, an image processing unit and a control unit;

the detector is configured to detect a moving object on the shelf;

the image sensor is configured to perform an image acquisition in a direction of the moving object to obtain an image acquisition result;

the image processing unit is configured to determine a target commodity and a target person from the image acquisition result;

the control unit is configured to manage relevant data of the target commodity according to the target commodity and the target person.

In accordance with the third aspect, a computer device is provided in the present application. The computer device includes a memory, a processor and a computer program stored in the memory and executable by the processor. The processor is configured to, when executing the computer program, implement steps of the method according to the first aspect.

In accordance with the fourth aspect, a computer-readable storage medium is provided in the present application. The computer-readable storage medium stores a computer program instruction, that, when invoked by a processor, causes the processor to perform steps of the method according to the first aspect.

The present application has the following beneficial effects: conditions of the commodities on the shelf may be monitored in real time, when detecting the moving object on the shelf, the image sensor is triggered to perform image acquisition in the direction of the moving object, and the relevant data of the commodities is managed by analyzing the image acquisition result. Thus, the efficiency and the accuracy of

commodity management may be greatly improved, both errors caused due to manual operation and labor intensity are reduced.

DESCRIPTION OF THE DRAWINGS

In order to describe the embodiments of the present application more clearly, a brief introduction regarding the accompanying drawings that need to be used for describing the embodiments of the present application or the existing technology is given below. It is obvious that the accompanying drawings described below are merely some embodiments of the present application, a person of ordinary skill in the art may also acquire other drawings according to the current drawings without paying creative works.

FIG. 1 illustrates a schematic flowchart of a management method of a shelf according to the first embodiment of the present application;

FIG. 2 illustrates a schematic structural diagram of a management apparatus of a shelf according to an embodiment of the present application;

FIG. 3 illustrates another schematic flowchart of the management method of the shelf according to the first embodiment of the present application;

FIG. 4 illustrates a schematic flowchart of the management method of the shelf according to the second embodiment of the present application;

FIG. 5 illustrates a schematic flowchart of the management method of the shelf according to the third embodiment of the present application;

FIG. 6 illustrates a schematic block diagram of the management apparatus of the shelf according to an embodiment of the present application;

FIG. 7 illustrates a schematic structural diagram of a computer device according to an embodiment of the present application.

DETAILED DESCRIPTION OF EMBODIMENTS

In order to make the objective, the technical solutions and the advantages of the present application be clearer and more understandable, the present application will be further described in detail below with reference to accompanying figures and embodiments. It should be understood that the embodiments described in detail herein are merely intended to illustrate but not to limit the present application.

Regarding the description of the present application, it needs to be explained that, directions or location relationships indicated by terms such as “center”, “up”, “down”, “left”, “right”, “vertical”, “horizontal”, “inside”, “outside” , etc., are the directions or location relationships shown in the accompanying figures, and are only used for describing the present application conveniently and simplifying the description of the present application, rather than being intended to indicate or imply that an indicated device or component must have specific locations or be constructed and manipulated according to specific locations. Thus, these terms shouldn’t be interpreted as limitations to the present application. In addition, terms of “first”, “second” and “third” are only used for description purposes, and should not be considered as indicating or implying any relative importance, or implicitly indicating the number of indicated technical features. As such, technical feature(s) restricted by “first” or “second” can explicitly or implicitly include one or more of the technical feature(s). In the description of the present application, “a plurality of” has the meaning of two or more, unless additional definition of “a plurality of” is provided.

For a person of ordinary skill in the art, meanings of the terms in the present invention may be interpreted according to specific conditions.

First embodiment

As shown in FIG. 1, a management apparatus of a shelf may be deployed for the shelf in this embodiment of the present application, and this management apparatus of the shelf may be disposed on a guide rail of the shelf (see FIG. 2). The shelf in this embodiment may be a shelf for exhibiting commodities in a supermarket, or be an unmanned vending machine exhibited in other public place such as a warehouse, a library, a shopping mall, etc. An executive subject of the management method of the shelf may be the management apparatus of the shelf itself, or be other computer device. The management method of the shelf includes steps S10-S30 which are described below:

At step S10, when detecting a moving object on the shelf, the image sensor is triggered to perform an image acquisition in the direction of the moving object to obtain an image acquisition result.

It should be noted that, this embodiment of the present application is described by taking the management apparatus of the shelf as the executive subject of the management method of the shelf as an example. The management apparatus of the shelf

in this embodiment of the present application includes an image sensor, a detector, an image processing unit, and a control unit.

In specific implementation, the management apparatus of the shelf in this embodiment of the present application may be an electronic device integrated with various functions. The apparatus may be at least integrated with functional components such as a camera and a pyroelectric infrared (Pyroelectric Infrared, PIR) sensor, a power supply unit, a processor, and a memory, in order to improve efficiency and accuracy of shelf management.

The pyroelectric infrared sensor is used as a detector, and is mainly configured to detect a movement of a heat source on the shelf. In this embodiment of the present application, the detector may be configured to detect whether a commodity on the shelf is taken away by a person (e.g., a customer or a manager of the shelf). When detecting a movement of the heat source on the shelf, the image sensor is triggered to perform image acquisition in a direction of the heat source.

A camera (i.e., the image sensor) belongs to core components of the management apparatus of the shelf, and may be used to capture images or videos of the shelf and the surrounding environment of the shelf. When the detector detects the moving object on the shelf, the processor may control the camera to perform image acquisition in the direction of the moving object to obtain an image acquisition result.

At step S20, a target commodity and a target person are determined from the image acquisition result.

Specifically, the processor of the management apparatus of the shelf is integrated with the image processing unit and the control unit, and the image processing unit may invoke an image recognition algorithm to recognize and process information of the target commodity moving on the shelf, thereby obtaining specific information of the target commodity, such as the category and the price of the target commodity. Furthermore, the image processing unit may invoke the image recognition algorithm to recognize a person who enables the target commodity to move, and determine the target person who has taken the target commodity away from the shelf.

In addition, the image processing unit may further invoke a face recognition algorithm to perform a face recognition on the target person to determine an identity type of the target person. The identity type may at least include a customer type and a shelf administrator type.

In some other embodiments, the management apparatus of the shelf is further provided with an indicator lamp. The indicator lamp is configured to provide a visual indication, such as a shelf state, a warning, an operation prompt, or the like. The indicator lamp may also be linked with the camera and the detector. For example, when the detector and the image processing unit operate in cooperation and detect an abnormality, the indicator lamp lights up a red light to attract attention. The management apparatus of the shelf may further be configured with a speaker, the speaker may be configured to provide a sound prompt or a warning for communicating information to a related personnel. The speaker may be linked with the indicator lamp and the detector so as to implement acousto-optic alarm.

At step S30, relevant data of the target commodity is managed according to the target commodity and the target customer.

In specific implementation, the control unit of the management apparatus of the shelf is configured to receive signals from the functional components such as the image sensor and the detector, and the control unit is responsible for management of the relevant data of all commodities on the shelf, such as data processing, data storage, data transmission, and communication with an external terminal device, etc. The relevant data of the target commodity may at least include inventory information of the target commodity, such as increase or decrease of an inventory, whether the inventory is out of stock, or whether other types of commodities are placed in an area where the target commodity is located.

The embodiments of the present application have the following beneficial effects: the conditions of the commodities on the shelf may be monitored in real time, when detecting the moving object on the shelf, the image sensor is triggered to perform image collection in the direction of the moving object, and the relevant data of the commodities is managed by analyzing the image acquisition result. The efficiency and the accuracy of commodity management may be greatly improved, errors caused due to manual operation and labor intensity are reduced.

Furthermore, in some embodiments, taking the identity type of the target person as the customer type as an example, the step S30 may further include step S31 and step S32.

At step S31, settlement information of the target person transmitted by the first terminal device is received.

It may be understood that the first terminal device may be an external terminal device in communication with the management apparatus of the shelf, and taking the application scenario as a supermarket as an example, the first terminal device may be a cashier terminal device used by a cashier of the supermarket when the cashier works on a checkout counter. After the customer (i.e., the target person) takes the commodities away from different shelves, the commodities are usually taken to the checkout counter in order for settlement and payment.

At step S32, whether settlement for the target commodity has been completed is determined according to settlement information, and the control unit of the management apparatus of the shelf may determine management of the inventory of the target commodity according to the settlement information fed back by the first terminal device.

When the settlement for the target commodity has been completed, the step S331 of “updating the inventory of the target commodity” is executed. It may be understood that, after the checkout of the target commodity is completed by the target customer (i.e., the target person) at the checkout counter, which is equivalent to selling a piece of target commodity by the supermarket, the management apparatus of the shelf updates the inventory of the commodities in a database. The database may be deployed in a local storage of the management apparatus of the shelf. The database may also be deployed in a background server. If the database is deployed in the background server, the control unit may submit a database access request to the background server to obtain the inventory of the commodity in the database, thereby updating the inventory of the commodity in the database (i.e., when a piece of target commodity is sold, the inventory of the target commodity is reduced by 1), and an inventory update result is synchronized to the database.

When the settlement for the target commodity is not completed, the step S332 of “sending first prompt information to the second terminal” is executed. It may be understood that, if the customer takes the commodities away from the shelf, however, the customer does not complete the payment for the commodities at the checkout counter, it indicates that the customer does not pay for the commodities, there may be the following conditions: the customer does not want to purchase the commodity after the commodity is taken away from the shelf, and does not return the target commodity to the shelf, instead, the customer put the commodity at other corners of the supermarket; or alternatively, the customer may put the commodity into his own clothing pocket, and

want to carry the commodity out of the supermarket. Regarding the above-mentioned behaviors of the customer, many inconveniences are brought to the management personnel, and finally, economic loss of the supermarket is caused. In this regard, when the management apparatus of the shelf determines that the settlement for the target commodity has not been completed, the management apparatus of the shelf sends the first prompt information to the second terminal, where the second terminal is a portable mobile terminal (i.e., a smartphone) of the shelf manager. The second terminal has a function of receiving information sent from the management apparatus of the shelf in real time, and the first prompt information indicates that the target commodity has been taken away and the settlement for the target commodity is not completed, and the first prompt information may further include appearance feature information of the customer (i.e., the target person). After receiving the first prompt information transmitted by the management apparatus of the shelf, the managerial staff may obtain a message indicating that the settlement for the target commodity has not been completed at the first time; moreover, the managerial staff may find the customer in the supermarket according to the appearance feature information of the customer, and ask the customer about which position the target commodity which is taken away from the shelf and is not paid is left at. In this way, the economic loss of the supermarket may be reduced.

Second embodiment

Based on the first embodiment of the management method of the shelf, a related method of the second embodiment is provided. In this embodiment, referring to FIG. 4, the management method of the shelf further includes steps S11-S13.

At step S11, face recognition is performed on the target person to obtain an identity type of the target person.

In this embodiment of the present application, the identity type may include at least a first type of user (i.e., member customer), a second type of user (i.e., blacklist customer), and a third kind of user (i.e., administrator). The first type of user in this embodiment is a member customer, the second type of user is a “blacklist customer”, and the third-type user is a “managerial staff of the supermarket”. The information of the three different identity-type users is pre-stored in the database, which facilitates the management apparatus of the shelf in identifying the identity of the customer and the identity of the managerial staff of the supermarket through invoking the face recognition algorithm subsequently.

If the customer wants to become a member customer, he/she may become the member customer by using a smartphone to perform registration, and the customer may fill personal basic data information into a registration declaration page in the registration process, then, the basic data information of the customer is written into the database, and the identity type of the customer is set to the first type (i.e., the member customer), a registration identifier is allocated to the customer, the allocated registration identifier is associated with the basic data information of the user. The basic data information at least includes a head portrait information picture of the user.

After obtaining the head portrait information picture uploaded by the customer, the background server performs processing including denoising and normalization on the collected facial image to improve the image quality. Then, the background server may use a specific algorithm (e.g., a convolutional neural network) to extract a representative standard feature vector from the facial image, and then store the standard feature vector of the target person in the database.

In a specific implementation process of shelf monitoring through the management apparatus of the shelf, the image processing unit of the management apparatus of the shelf may invoke the face recognition algorithm to perform face recognition on the person who makes the target commodity to move. Specifically, the recognition process includes: extracting a feature vector of a person after photographing a facial image of the person; and comparing the newly extracted feature vector to be detected with an existing standard feature vector in the database, more specifically, determining a similarity between the newly extracted feature vector and the existing standard feature vector by using a method such as distance measurement. If there exists an existing standard feature vector having a higher similarity with the feature vector to be detected in the database, it indicates that a data record of the person is stored in the database, then, the identity type of the person may be obtained. If there does not exist an existing standard feature vector that is very similar to the feature vector to be detected, it is determined that the databased does not store any information of the person.

At step S12, when the target person is the first type of user, historical shopping information of the target person is obtained, and commodity recommendation information of the target person is generated based on the historical shopping information.

It may be understood that, if an identity type of a user A is the first type of user (i.e., the member customer), after the user A has successfully become the shopping mall member customer through registration, the bill of the commodities purchased by the user A each time will remain in the database as the historical shopping record. Under the condition that the management apparatus of the shelf invokes the face recognition algorithm to recognize the identity type of the target person (i.e., user A) as the first type of user (i.e., the member customer), the historical shopping information of the user A may be obtained, the demand and the preference of the user A are determined based on the historical shopping information, and the management apparatus of the shelf generates the commodity recommendation information of the user A based on the historical shopping information of the user A. Thus, more personalized service and recommendation are provided for the target person (i.e., user A).

In specific implementation, the management apparatus of the shelf may push the generated commodity recommendation information to the user terminal device of the member customer or the terminal display screen in the supermarket to be displayed, in order that the member customer watches the recommendation information;

For example, the user A may use a supermarket applet of an instant messaging software (e.g., Wechat or QQ) to register member information, then, the management apparatus of the shelf may push the generated commodity recommendation information to the supermarket applet of the instant messaging software to the user, in order that the user receives the commodity recommendation information.

Alternatively, if the place where the user A is located in a shopping mall is just provided with a terminal device having a display function, then, the management apparatus of the shelf may push the generated commodity recommendation information to the display screen of the terminal device which is very close to the user A, in order to facilitate the user to receive the commodity recommendation information.

This embodiment of the present application may help supermarkets to understand the requirements and the preferences of customers better, thereby providing more personalized services and recommendations.

At step S13, second prompt information is sent to the second terminal when the target person is the second type of user.

In another case, when the management apparatus of the shelf invokes the face recognition algorithm to recognize the identity type of the target person as the second

type of user (i.e., the blacklist customer), the management apparatus of the shelf sends the second prompt information to the second terminal device of the managerial staff of the supermarket. The second prompt information belongs to one kind of early warning information, and the second prompt information is used for indicating the managerial staff of the supermarket that there may exist a hidden danger.

Specifically, if an event that a commodity is stolen or a commodity is hidden and is brought out of the supermarket by a customer occurs, a camera or other monitoring device of the supermarket will record the head portrait information of these “illegal users”. Alternatively, if a condition in the step S32 of the first embodiment occurs, that is, after the customer takes the commodities away, however, the customer does not return the commodities to the shelf, instead, the commodities are disorderly placed, the identity information of the customer will be set as the second type of user (it should be noted that, in the database system of this embodiment of the present application, two identity types may be configured for the user at the same time, that is, the user identity type may include the second type of user and the first type user). If the management apparatus of the shelf determines that the customer with the second identity type has taken the commodities away from the shelf, the management apparatus of the shelf sends the second prompt information to the second terminal device carried by the managerial staff of the super market immediately, in order to prompt the managerial staff of the supermarket to pay attention to the second type of user, thereby preventing the commodities from being discarded at other corners of the supermarket by the customer, or be carried out of the supermarket. In this way, the managerial staff of the supermarket may be effectively assisted in making effective security measures.

In other embodiments, the second terminal device may be a mobile terminal used by the managerial staff of the supermarket, and there exists a correspondence relationship between the mobile terminal and the number of shelf in the database. The managerial staff of the supermarket who owns the second terminal device is responsible for maintaining the commodities of the shelf. After the management apparatus of the shelf detects that the “illegal user” takes the commodities on the shelf away, the management apparatus of the shelf sends the second prompt information to the second terminal of the managerial staff of the supermarket, thereby facilitating the managerial staff of the supermarket to better manage and maintain the commodities on the shelf which is managed by the managerial staff.

In addition, in some other embodiments, after the step S20 of determining the target commodity and the target person from the image acquisition result, the method may further include a function of establishing a shopping cart for the customer. The method specifically includes:

at step A1, a key-value pair relationship between the target commodity and the target person is established, and the key-value pair relationship is stored in a cache database;

at step A2, shopping cart information of the target person is generated based on the key-value pair relationship, and the shopping cart information is sent to a user terminal of the target person;

at step A3, when the settlement for the target commodity is completed, the key-value pair relationship is removed from the cache database, and the inventory of the target commodity is updated.

It may be understood that, after determining the target person who takes the target commodity out of the shelf, the management apparatus of the shelf establishes a “virtual shopping cart” for the target person, and sends the “virtual shopping cart” to an application program of the user terminal device of the target person (e.g., the supermarket applet of the instant messaging software mentioned above). The “virtual shopping cart” may be stored by using a cache database (for example, Redis). That is, after the customer (i.e., the target person) takes the commodities from the shelf, the management apparatus of the shelf arranged on the shelf from which the commodities are taken away will transmit the target commodity taken away to the cache database (i.e., the “virtual shopping cart”). The customer may open the user terminal to check which commodity has been selected by the customer himself/herself. In this way, the customer may conveniently pursue his/her commodity taking record in the supermarket. Once the customer has paid for the commodity carried by himself/herself at the checkout counter, a system removes the key-value pair relationship from the cache database (i.e., “empty the shopping cart”), and updates the remaining inventory of the target commodity paid by the customer in the supermarket. In this way, not only a shopping experience of the customer is facilitated, correctness of inventory data management of the shelf may also be guaranteed.

Third embodiment

The third embodiment is proposed based on the second embodiment, the management apparatus of the shelf in this embodiment of the present application is arranged on the guide rail of the shelf, and the management apparatus of the shelf has a self-moving function. The management apparatus of the shelf can move along the guide rail at intervals of a preset time interval (e.g., every two hours), and invoke an image sensor to photograph and scan each commodity area position on the shelf in a moving process, and then obtain an image scanning result of each commodity area, such that the conditions of the commodities on the shelf may be monitored in real time. In specific implementation, referring to FIG. 5, the management apparatus of the shelf implements real-time monitoring of the shelf by performing the following steps:

At step S41, the control unit of the management apparatus of the shelf controls the management apparatus of the shelf to move on the guide rail of the shelf every preset time interval, and invokes the image sensor to photograph each commodity area on the shelf to obtain an image capturing result of each commodity area;

At step S42, the commodity area is managed according to the image capturing result.

Specifically, each commodity area on the shelf is attached with a corresponding commodity label, when the management apparatus of the shelf moves to the corresponding position of each commodity area, the management apparatus of the shelf uses the image sensor to photograph each commodity placed on the commodity area, and invokes a commodity recognition algorithm to recognize commodity information of each commodity placed on the commodity area. The commodity information may include a name, a specification, and a price of the commodity.

In specific implementation, a shelf manager of the supermarket may input commodities information of different types of commodities into the database in advance, including uploading an external shape and packaging image information of the commodities. After obtaining the external shape and the packaging image information uploaded by the shelf manager, the background server pre-processes the external shape and the packaging image information, which includes the operations such as cropping, scaling, denoising, contrast enhancement, and the like. Thus, the processed image is enabled to be more suitable for subsequent processing. Then, the features such as shape, color, and texture may be extracted by using an image processing algorithm or a deep learning-based algorithm. Next, the extracted features may be further processed and

modeled, for example, a feature vector or a feature map is constructed. Finally, the constructed model may be trained by using a machine learning training model or a deep learning training model. For example, a large number of images and labels of known commodities are used for training, the model is enabled to learn feature modes of different commodities, and finally, a commodity standard model and a commodity standard feature data are obtained and stored in the database.

In the process of moving the management apparatus of the shelf along the guide rail at intervals of the preset time interval, the management apparatus of the shelf invokes the commodity recognition algorithm to recognize the commodity information of each target commodity placed on the target commodity area. The identification process specifically includes: if there exists a commodity in the target commodity area to which the management apparatus of the shelf has moved, a sub-step 421 is executed, when the image sensor photographs the external shape and the packaging image information of the target commodity, the feature of the target commodity to be tested is extracted, a commodity standard model or commodity standard feature data corresponding to the target commodity area in the database is determined, and the feature of the target commodity to be tested is matched with the trained commodity standard model or the commodity standard feature data in the database. If the matching is successful, it indicates that all commodities currently placed in the target commodity area meet the requirement. However, if the matching is unsuccessful, it indicates that there exist other categories of commodities in the commodities currently placed in the target commodity area (e.g., it may be possible that a customer takes a commodity away and does not want to pay for it; then, the customer discards this commodity at a commodity area that does not correspond to the commodity). In this case, the third prompt information needs to be sent to the second terminal device of the managerial staff of the supermarket. The third prompt information indicates a disorderly placed commodity on the shelf, and is used to prompt the managerial staff of the supermarket to place the disorderly placed commodity at its correct position again.

Certainly, in the process of moving the management apparatus of the shelf along the guide rail every preset time interval, if the image sensor cannot photograph any commodity in the target commodity area, after a commodity label of the target commodity area is determined, the processing unit executes the step S422 of sending fourth prompt information to the second terminal device of the managerial staff of the

supermarket. The fourth prompt information indicates stockout of the target commodity area on the shelf, and is used to prompt the managerial staff of the supermarket to replenish the commodity corresponding to the commodity label.

Fourth embodiment

The management method of the shelf in the embodiments of the present application is described in detail with reference to FIG. 1 to FIG. 5. A management apparatus 600 of a shelf provided in this embodiment of the present application is described in detail below with reference to FIG. 6 to FIG. 7.

FIG. 6 is a schematic block diagram of the management apparatus 600 of the shelf according to this embodiment of the present application. The management apparatus 600 of the shelf includes:

- a detector 61 configured to detect a moving object on the shelf;
- an image sensor 62 configured to perform an image acquisition in a direction of the moving object to obtain an image acquisition result;
- an image processing unit 63 configured to determine a target commodity and a target person from the image acquisition result;
- a control unit 64 configured to manage relevant data of the target commodity according to the target commodity and the target person.

Specifically, the detector 61 may specifically use a pyroelectric infrared sensor which is mainly configured to detect a movement of a heat source on the shelf, thereby detecting whether the commodity on the shelf has been taken away by a person (such as a customer and a managerial staff of the shelf). When a heat source moving on the shelf is detected, the image sensor 62 is triggered to perform image acquisition in the direction of the heat source. The image sensor 62 may be connected to the image processing unit 63 and the control unit 64 in a wireless or wired manner.

The image processing unit 63 and the control unit 64 may be integrated circuits integrated into a processor chip of the management apparatus 600 of the shelf.

It should be noted that FIG. 6 is a schematic structural diagram of the management apparatus 600 of the shelf according to this embodiment of the present application. Certainly, more components may also be added or incorporated based on the management apparatus 600 of the shelf shown in FIG. 6 in specific application. For example, the management apparatus 600 of the shelf may further include a component such as a power supply unit, an indicator lamp, and a loudspeaker. The power supply

unit may provide power supply for the management apparatus 600 of the shelf. The loudspeaker is configured to send an alarm sound or a voice prompt. The indicator lamp is configured to indicate an operating state of the image sensor 62, such as power up, photographing, face recognition, and the like.

In specific implementation, the various components in the management apparatus 600 of the shelf may be connected to the internal processor chip in a wired or wireless manner, thereby forming a holonomic system.

The management apparatus 600 of the shelf in this embodiment of the present application may be disposed on a guide rail of the shelf (as shown in FIG. 2), and the control unit 64 may control the management apparatus 600 of the shelf to move on the guide rail to realize functions of automatically monitor and managing the commodities on the shelf, thereby improving the efficiency and the accuracy of shelf management.

In addition, the management apparatus 600 of the shelf may also be internally provided with a network communication module. The network communication module may be connected to the network in a wired or wireless manner to implement remote monitoring and management. For example, a wired network module may be used to perform remote communication with the customer terminal device, the display screen of the terminal device inside the public place, the second terminal device of the managerial staff of the supermarket, and the first terminal device of the checkout counter described in the embodiments mentioned above.

Fifth embodiment

FIG. 7 is a schematic structural diagram of a computer device according to an embodiment of the present application. The computer device may be the management apparatus of the shelf shown in FIG. 6, or be another terminal device capable of executing the management method of the shelf shown in FIG. 1. For example, in some other embodiments, the shelf of the supermarket includes a camera and a detector, the detector is linked with the camera. When detecting a moving object on the shelf, the detector triggers the camera to perform image collection in the direction of the moving object. Then, the camera transmits the image acquisition result to the processor of the computer device in this embodiment to perform the subsequent steps of “determining the target commodity and the target customer from the image acquisition result; and managing relevant data of the target commodity according to the target commodity and the target customer”.

As shown in FIG. 7, the computer device 700 includes a processor 701, a memory 702, a communication interface 703, and a bus 704. The processor 701, the memory 702 and the communication interface 70 communicate with each other through the bus 704, or use other methods such as wireless transmission to realize communication with each other. The memory 702 is configured to store an instruction, the processor 701 is configured to execute the instruction stored in the memory 702. The memory 702 stores a program code 6021, and the processor 701 may invoke the computer program 7021 stored in the memory 702 to execute the management method of the shelf shown in FIG. 1.

It should be understood that, in the embodiments of the present application, the processor 701 may be central processing unit (CPU), and may also be other general purpose processor, digital signal processor (DSP), application specific integrated circuit (ASIC), field-programmable gate array (FGPA), or some other programmable logic devices, discrete gate or transistor logic device, discrete hardware component, etc. The general purpose processor may be a microprocessor, as an alternative, the processor can also be any conventional processor, or the like.

The memory 702 may include read-only memory and random access memory, and provides instructions and data to the processor 701. The memory 702 can also include a non-volatile random access memory. The memory 702 may be a volatile or a non-volatile memory. Alternatively, the memory 702 can include the volatile memory and the non-volatile memory. Where, the non-volatile memory may be a read-only memory (ROM), a programmable read-only memory (PROM), an erasable programmable read-only memory (EPROM), an electrically erasable programmable read-only memory (EEPROM), or a flash memory. The volatile memory may be a random access memory (RAM) that serves as an external cache. By way of illustration rather than limitation, RAM in various forms, such as a static random access memory (SRAM), a dynamic random access memory (DRAM), a synchronous dynamic random access memory (SDRAM), a double data rate SDRAM (DDR SDRAM), an enhanced synchronous dynamic random access memory (ESDRAM), a synchlink dynamic random access memory (SLDRAM) and a direct rambus random access memory (DRRAM), are available.

The buses 704 can not only include a data bus, but also include a power bus, a control bus, and a status signal bus. However, for clarity, the various buses are all marked as bus 704 in FIG. 7.

The above-mentioned embodiments may be fully or partially implemented through software, hardware, firmware, or any combination thereof. When the embodiments are implemented using software, the embodiments may be fully or partially implemented in the form of computer program product. The computer program product includes one or more computer instructions. When loading or executing the computer program instructions on a computer, all or a part of the processes or functions described in the embodiments of the present application are generated. The computer may be a general-purpose computer, a specialized computer, a computer network, or other programmable devices. The computer instructions may be stored in a computer-readable storage medium or be transmitted from one computer-readable storage medium to another computer-readable storage medium. For example, the computer instructions may be transmitted from a website, a computer, a server or a data center to another website site, another computer, another server or another data center through a wire transmission method (e.g., a coaxial cable, a fiber optic, a digital subscriber line (DSL)) or a wireless transmission method (e.g., infrared, wireless, microwave, etc.). The computer-readable storage medium may be any available medium that may be accessed by the computer, or a data storage device such as a server or a data center containing one or more sets of available media. The available media may be a magnetic medium (e.g., a floppy disk, a hard disk, a magnetic tape), an optical medium (e.g., DVD), or a semiconductor medium. The semiconductor medium may be a solid state drive (SSD).

The foregoing embodiments are only intended to explain the technical solutions of the present application, rather than limiting the technical solutions of the present application. Although the present application has been described in detail with reference to these embodiments, a person of ordinary skilled in the art should understand that, the technical solutions disclosed in the embodiments may also be amended, some technical features in the technical solutions may also be equivalently replaced. The amendments or the equivalent replacements don't cause the essence of the corresponding technical solutions to be deviated from the spirit and the scope of the technical solutions in the

embodiments of the present application, and thus should all be included in the protection scope of the present application.

CLAIMS

1. A management method of a shelf, comprising steps of:

triggering, when detecting a moving object on the shelf, an image sensor to perform an image acquisition in a direction of the moving object to obtain an image acquisition result;

determining a target commodity and a target person from the image acquisition result; and

managing relevant data of the target commodity according to the target commodity and the target person.

2. The method according to claim 1, further comprises steps of:

receiving settlement information of the target person transmitted by a first terminal device; and

determining, according to the settlement information, whether a settlement for the target commodity has been completed; and

updating an inventory of the target commodity when the settlement for the target commodity has been completed.

3. The method according to claim 2, wherein after the step of determining whether the settlement for the target commodity is completed according to the settlement information, the method further comprises a step of:

sending first prompt information to the second terminal when the settlement for the target commodity has not been completed.

4. The method according to claim 2, wherein after the step of determining the target commodity and the target person from the image acquisition result, the method further comprises steps of:

establishing a key-value pair relationship between the target commodity and the target person, and storing the key-value pair relationship in a cache database; and

generating shopping cart information of the target person based on the key-value pair relationship, and sending the shopping cart information to a user terminal of the

target person;

the step of updating the inventory of the target commodity when the settlement for the target commodity has been completed comprises:

removing the key-value pair relationship from the cache database, and updating the inventory of the target commodity, when the settlement for the target commodity has been completed.

5. The method according to any one of claims 1-4, further comprises steps of:

performing a face recognition on the target person to obtain an identity type of the target person; and

obtaining historical shopping information of the target person, and generating commodity recommendation information of the target person based on the historical shopping information, when the target person is a first type of user.

6. The method according to claim 5, wherein after the step of performing the face recognition on the target person to obtain the identity type of the target person, the method further comprises a step of:

sending second prompt information to the second terminal, when the target person is a second type of user.

7. The method according to any one of claims 1-4, further comprising steps of:

controlling a management apparatus of the shelf to move on a guide rail of the shelf, and invoking the image sensor to photograph a plurality of commodity areas on the shelf to obtain image capturing results of the plurality of commodity areas; and

managing the plurality of commodity areas according to the image capturing results;

wherein the image sensor is arranged on the management apparatus of the shelf, and the management apparatus of the shelf is arranged on the guide rail.

8. A management apparatus of a shelf, comprising an image sensor, a detector, an image processing unit and a control unit;

wherein the detector is configured to detect a moving object on the shelf;

the image sensor is configured to perform an image acquisition in a direction of

the moving object to obtain an image acquisition result;

the image processing unit is configured to determine a target commodity and a target person from the image acquisition result;

the control unit is configured to manage relevant data of the target commodity according to the target commodity and the target person.

9. A computer device, comprising a memory, a processor and a computer program stored in the memory and executable by the processor, wherein the processor is configured to, when executing the computer program, perform steps of the method according to any one of claims 1-7.

10. A computer-readable storage medium, which stores a computer program instruction, that, when invoked by a processor, causes the processor to perform steps of the method according to any one of claims 1-7.