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SMART REFRIGERATOR FOR GROCERY MANAGEMENT

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ABSTRACT

The invention discloses a grocery management system. The grocery management system resolves an identity of food products in a refrigerator. The system further determines a status, e.g., expiration dates, weights, freshness, quantity, or any other measure, of the food products shelved in the refrigerator. The system compares the status of the food products with one or more predetermined criterias, e.g., whether the food product is within a threshold number of days of its expiry date, whether the food product is below a threshold quantity, e.g., by weight, volume, count, etc. Accordingly, the system provides customized notifications to a user of the refrigerator.

PROBLEM STATEMENT

Wasted food due to spoilage is a critical resource issue. Once food products are purchased and put away in a refrigerator, their expiration date and/or freshness isn't readily known to consumers unless they individually examine and track each item. Moreover, for food products which are not labeled with an explicit expiration date, consumers' expiration expectations can significantly diverge from reality. This leads to significant food spoilage, illness due to consumption of expired food, and resulting additional expenditure for the consumers.

Currently, there exist some applications that assist consumers with meal planning and dietary control. However, traditional meal planning applications do not have a mechanism for assisting the consumers with grocery management. Accordingly, a method and system that determines status of food products in a refrigerator and notifies the status to a user, is described.

GROCERY MANAGEMENT SYSTEM

The system and techniques described in this disclosure relate to a grocery management system. The grocery management system can be implemented for use in an Internet, an intranet, or another client and server environment. The system can be program instructions implemented locally on a user device or implemented across a client device and server environment. The user device can be any physical storage device, e.g., refrigerator, cooler, fridge, cold storage, or chiller.

Fig. 1 illustrates an example method 100 for determining a status of food products in a refrigerator and notifying a user if the status satisfies one or more predetermined criteria. Method 100 can be performed by a physical storage device implementing the grocery management system.

As shown in Fig. 1, the system resolves an identity of a product in a physical storage device (110). The system detects food products, e.g., vegetables, fruits, eggs, milk, meat, produce or any other grocery items, as they are shelved in the physical storage device. A few examples of such physical storage device can be a refrigerator, cooler, fridge, cold storage, chiller, or any other electronic appliance which has the ability to store food products. Such physical storage devices can have various sensors such as weight sensitive sensor plates, infrared sensors, built in cameras with image recognition software that can withstand low temperatures, etc. The system can also make use of separate sensors or scanning devices, e.g., user's electronic device, that are not integrated with the physical storage device. The user's electronic device may include phone, laptop, tablet, wearable device, computer, handheld device, etc.

The system checks the packaging of the food product by scanning the packaged food products. The packaging can include an embedded information that describes or points to a resource that describes identity of the food product. The system can communicate with sensors or scanners, e.g., that are embedded in the physical storage device or distinct from the physical storage device, to resolve the embedded information. For example, the packaging can include a printed QR code or some other type of barcode. The system can communicate with a barcode scanner or camera, e.g., that is fitted in the physical storage device, to scan the QR code or barcode and receive the information encoded by the QR code or barcode.

In another example, the packaging of the food product can include an RFID tag. The system can communicate with a RFID scanner installed in the physical storage device to read the RFID tag and receive the information electronically stored in the RFID tag. As a further example, the packaging can include a NFC tag. The system can communicate with a NFC reader associated with the physical storage device to read the information on the NFC tag and receive the information. Additionally, or alternatively, the system may resolve the identity of the food product by using a combination of visual scanning and image recognition for products that do not have barcodes or tags, e.g., fruits and vegetables. The scanner can be fitted in the physical storage device in a way that allows the system to quickly and easily scan each food product as it is shelved and reshelved.

After detecting that the product has been placed into the physical storage device, the system determines a status of the product (120). The system can make use of the sensors in order to determine the status of the food product. After scanning the food products, the system retrieves the status of the food product that may include various parameters associated with the

food product, e.g., expiration dates, weights, freshness, quantity, or any other measure. For example, the system can track quantity of food products over time from the pressure sensitive shelves that may detect the weight of the food product, e.g., the system determines that 250 grams of meat and 500 milliliter milk is shelved in the physical storage device. In another example, the system can count the number of items, e.g., 10 apples and 12 bananas using a camera and image recognition software. In another example, the system retrieves information from a camera in combination with machine trained algorithms that can determine the freshness level of the food products.

Alternatively, or additionally, the system can determine the expiry date of the packaged food products from the embedded information. The embedded information can contain information that describes the status of the food product. Alternatively, the embedded information may provide a path or pointer, e.g., website uniform resource locator, to retrieve the status of the food product. The system can then retrieve the status of the food product by accessing the path or pointer. In one example, the system can establish a communication path with a server in order to retrieve the status pertaining to the scanned packaged food product based on the path or pointer.

On determining the status of the product, the system provides a notification to the user if the status of the product satisfies one or more predetermined criterias (130). The one or more predetermined criterias may include whether the food product is within a threshold number of days of its expiry date, whether the food product is below a threshold quantity, e.g., by weight, volume, count, etc. The system can automatically set the one or more predetermined criterias or the user can input the one or more predetermined criterias into the system via a settings menu.

For example, the user can set the threshold number of days within the expiry date or the threshold quantity into the system. The one or more predetermined criterias can be stored in a memory of the physical storage device, user's electronic device, in a cloud server, or in an account associated with the user, etc.

The system can notify the user on an electronic device associated with the user. The system can notify the user using various notification techniques, e.g., e-mail notifications, reminder cards, message/ping notification or any audio/visual notification. The system may either provide a notification that summarises the status of the food products in the physical storage device or the system can notify the user when the status of a food product satisfies the one or more predetermined criterias. For example, if the pressure sensitive plate determines that the quantity of apples satisfies the predetermined criteria, e.g., is below 250 grams or a count of 3 apples, the system provides a notification to the user describing the low quantity status of the apples. In another example, the system determines that a pack of meat is about to expire tomorrow. The system provides a reminder to the user describing the expiration status of the meat.

Additionally, or alternatively, the system can generate notifications that recommend an action for the user to take based on the food items that satisfy the predetermined criteria. For example, when the quantity of apples is below the threshold level, the system notifies the user to buy more apples from the market. As a further example, when meat is within it's expiration date, the system notifies the user to cook the meat that day. In another example, if food products X and Y are near expiration, the system may notify the user to purchase another food product Z. In this

example, the system can look up cooking recipes off the internet and identify that food product Z is commonly prepared with food products X and Y.

Alternatively, or additionally, the system may provide location based reminders to the user based on the status of the food products. For example, if the system determines that the user is in a grocery store and the weight of milk in refrigerator is less than a threshold quantity, then the system notifies the user to buy milk from the grocery store. The system may receive geolocation information for the user from various sources. For example, the system can receive global positioning system (GPS) coordinates from one or more electronic devices associated with the user. By automating detection and management of groceries, the system makes consumers far more likely to engage in efficient grocery management, reducing food expenditures, and vastly reducing food waste.

Fig. 2 illustrates an example use of a grocery management system. As shown in Fig. 2, a refrigerator 210 stores food products A, C, M, and W. The system resolves the identity of the food products stored in the refrigerator 210. The refrigerator 210 can be fitted with various sensors, e.g., cameras, barcode/QR code readers, or RFID scanners to determine the identity of the food products. For example, a barcode reader may determine that the product M is milk and a camera and image recognition software determines that the product W is watermelon.

The system then determine a status of the food products in the refrigerator (220). The status may include various parameters associated with the food product, e.g., expiration dates, weights, freshness, quantity, or any other measure. The refrigerator 210 may have pressure sensitive shelves to determine the quantity of product M as it is shelved. Further, the system can identify the expiry date of product A from the information associated with the barcode/RFID/QR

code of product A. The system provides a notification to the user (230) if the status of the product satisfies one or more predetermined criterias. The one or more predetermined criterias may include expiry date of the product A within 2 days, or quantity of product M is below 1 liter, etc. The system may notify the user on an electronic device 240 that product M is less than 1 liter and product A will expire in 2 days, as shown in Fig. 2.

Fig. 3 is a block diagram of an exemplary environment that shows components of a system for implementing the techniques described in this disclosure. The environment includes client devices 310, servers 330, and network 340. Network 340 connects client devices 310 to servers 330. Client device 310 is an electronic device. Client device 310 may be capable of requesting and receiving data/communications over network 340. Example client devices 310 are personal computers (e.g., laptops), mobile communication devices, (e.g. smartphones, tablet computing devices), set-top boxes, game-consoles, embedded systems. The other devices 310' that can send and receive data/communications over network 340 may include refrigerator, cooler, fridge, cold storage, chiller, any other physical storage appliance which has the ability to store food products, etc. Client device 310 may execute an application, such as a web browser 312 or 314 or a native application 316. Web applications 313 and 315 may be displayed via a web browser 312 or 314. Server 330 may be a web server capable of sending, receiving and storing web pages 332. Web page(s) 332 may be stored on or accessible via server 330. Web page(s) 332 may be associated with web application 313 or 315 and accessed using a web browser, e.g., 312. When accessed, webpage(s) 332 may be transmitted and displayed on a client device, e.g., 310. Resources 318 and 318' are resources available to the client device 310 and/or applications thereon, or server(s) 330 and/or web pages(s) accessible therefrom, respectively.

Resources 318' may be, for example, memory or storage resources; a text, image, video, audio, JavaScript, CSS, or other file or object; or other relevant resources. Network 340 may be any network or combination of networks that can carry data communication.

The subject matter described in this disclosure can be implemented in software and/or hardware (for example, computers, circuits, or processors). The subject matter can be implemented on a single device or across multiple devices (for example, a client device and a server device). Devices implementing the subject matter can be connected through a wired and/or wireless network. Such devices can receive inputs from a user (for example, from a mouse, keyboard, or touchscreen) and produce an output to a user (for example, through a display). Specific examples disclosed are provided for illustrative purposes and do not limit the scope of the disclosure.

DRAWINGS

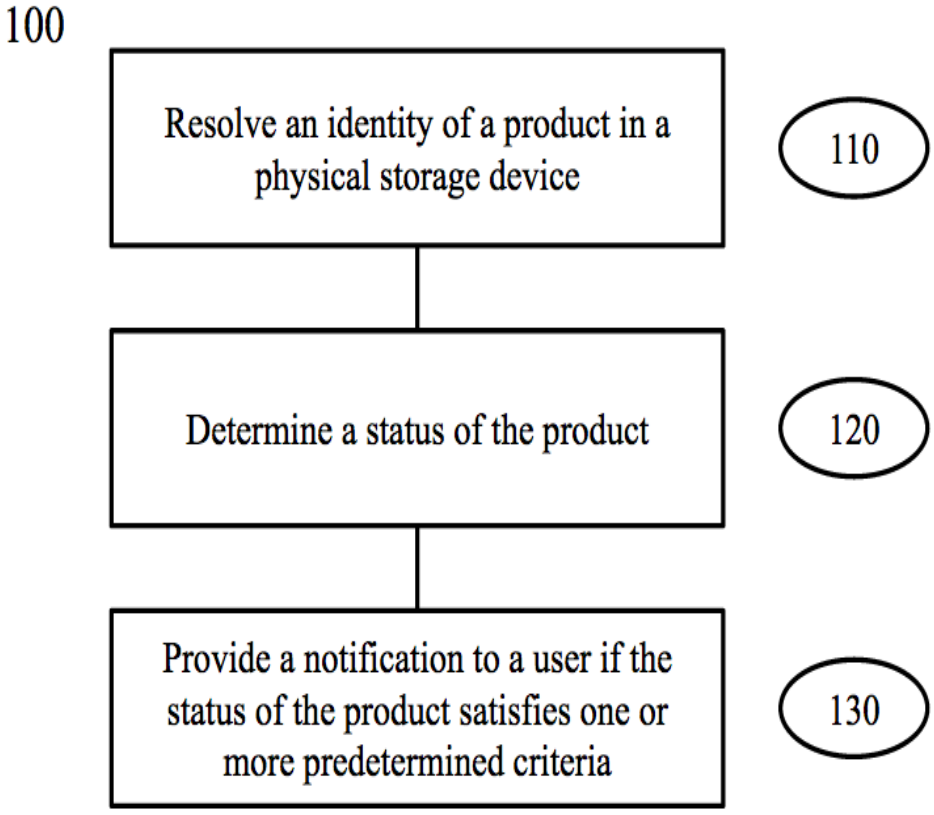

Fig. 1

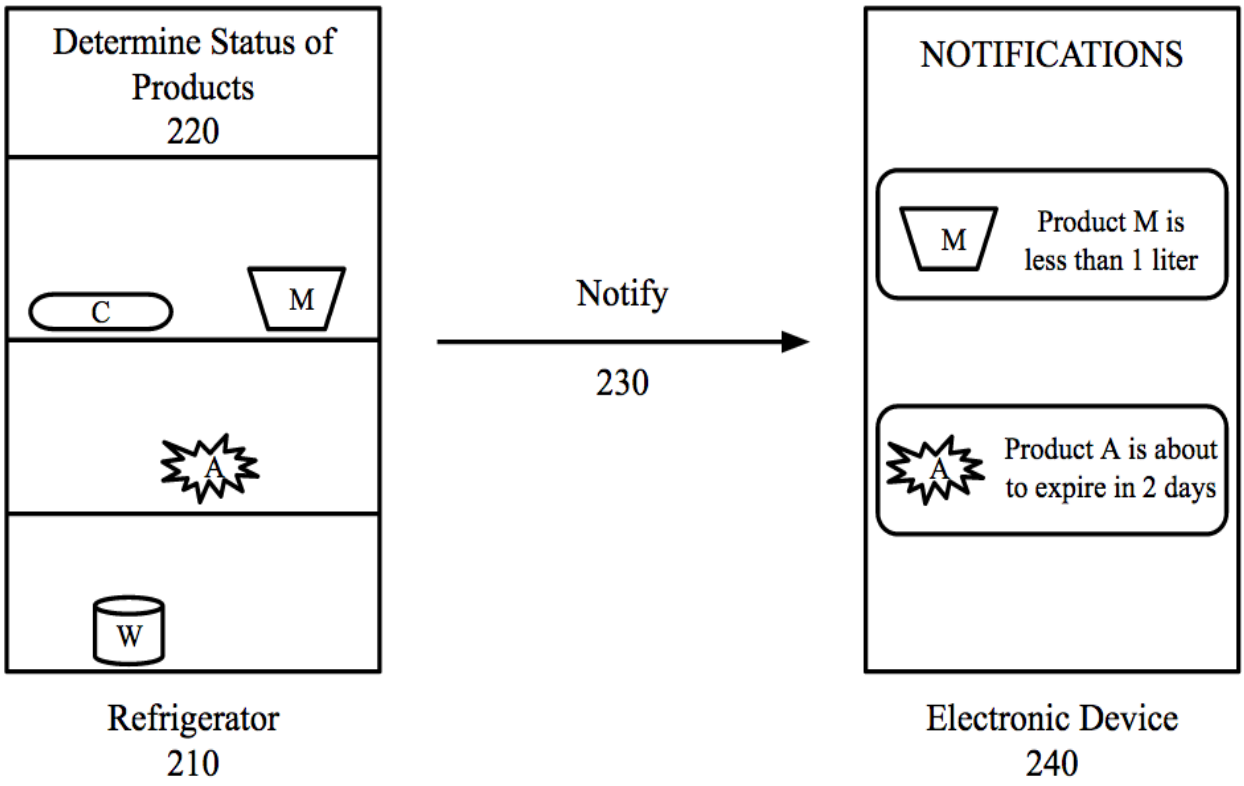
Determine Status of Products
220
C
M
A
W
Refrigerator
210
Notify
230
NOTIFICATIONS
M
Product M is less than 1 liter
A
Product A is about to expire in 2 days
Electronic Device
240

Fig. 2

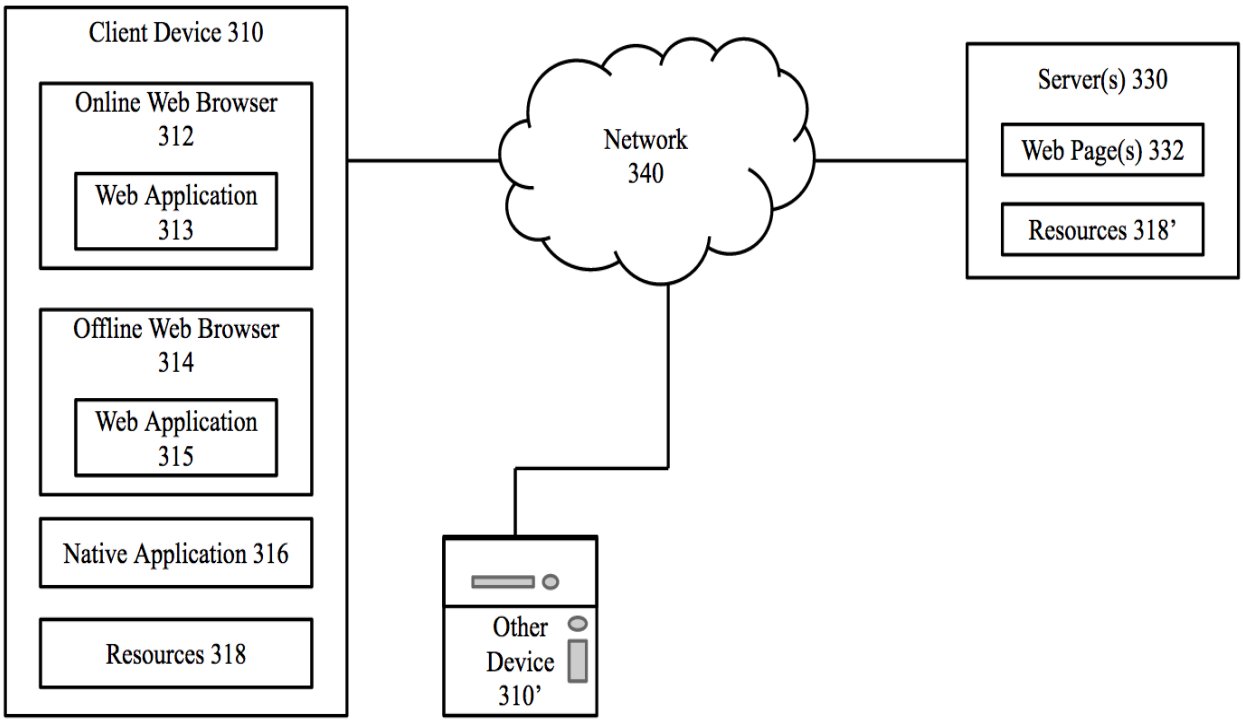
Client Device 310
Online Web Browser 312
Web Application 313
Offline Web Browser 314
Web Application 315
Native Application 316
Resources 318
Network 340
Server(s) 330
Web Page(s) 332
Resources 318'
Other Device 310'

Fig. 3