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Automated store planogram generation and maintenance

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ABSTRACT

This disclosure describes techniques to automatically generate store planograms with the use of network connected cameras. Images are periodically obtained by a camera mounted on a shopping cart while a customer travels through a store. Obtained images are transmitted to a central hub where machine learning techniques such as deep neural networks are utilized to detect item stock and to alert employees if restocking is needed. For example, if an image is received from a camera that indicates a shelf with only a few loaves of bread left, a store employee is automatically notified to restock bread. Additionally, when permitted by the customer, location data is obtained and can be utilized to obtain insight to customer behavior. For example, inefficiencies in store layout can be detected when multiple shopping carts show traversal routes that indicate confusion.

KEYWORDS

- planogram
- item stock
- restocking
- shopping cart
- store layout
- product placement

BACKGROUND

For retailers, it is of great importance to understand the store layout to be able to manage inventory and to provide better customer experiences by indicating where a product can be

found. Retailers also benefit from a broader understanding as to the regional differences in their stores and can utilize such understanding to optimize store layouts. Retailers use third party or in-house planogrammers to optimize retail spaces. However, these options have associated inefficiencies related to cost and consistency. For example, in two different locations of the same retailer, it is often difficult for customers to find the same item due to differences in the layout of the retail space. In addition to differences in layout, information about the stock of items on shelves is not readily available to customers.

DESCRIPTION

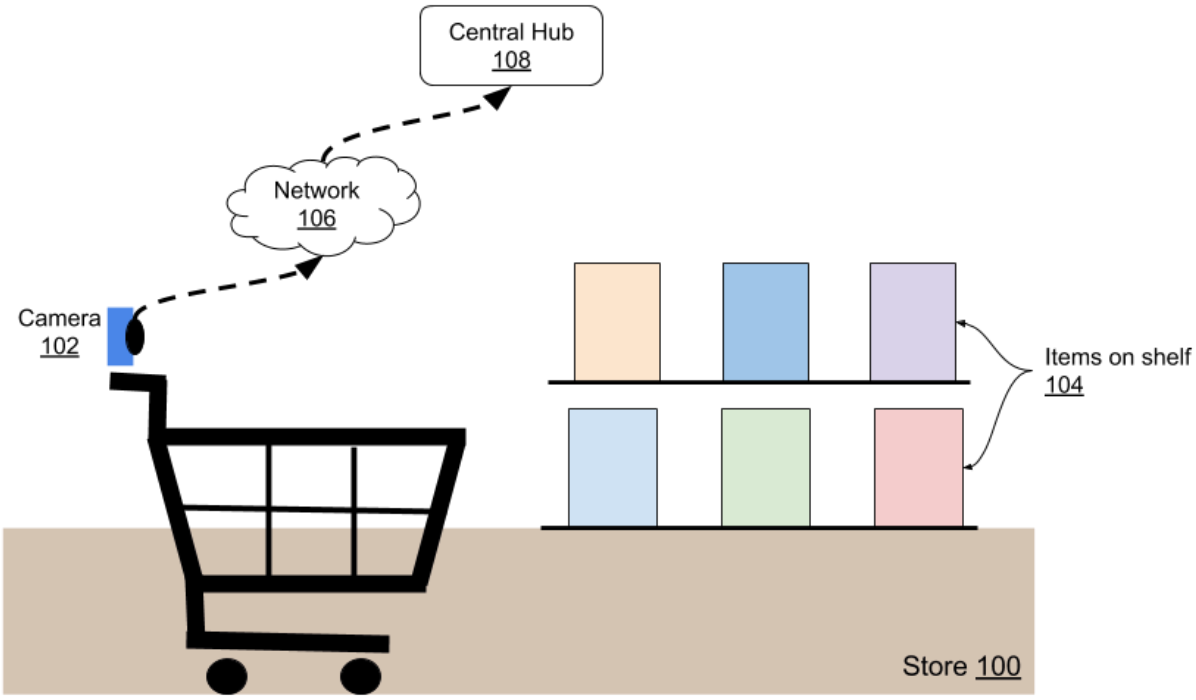

Fig. 1: Automated store planogram using cameras

Fig. 1 illustrates an example store (100) in which a camera (102) mounted on a shopping cart is utilized to obtain images to automatically generate a store planogram at a central hub. The camera is connected wirelessly, e.g., via WiFi, Bluetooth, or other wireless network (106). The

camera is activated, with user permission, to periodically obtain images of items on shelves (104) as a shopping cart travels through the store. Images captured by the camera are transmitted to a central hub (e.g., server, machine cluster, etc.) along with the position of the shopping cart. The central hub matches the received position to the store layout. The central hub can use suitable image processing techniques, e.g., deep neural networks or other machine learning techniques, to detect item stock based on the received images. The central hub automatically generates updated planogram in near real-time as images are received and can ascertain inventory levels of items on store shelves.

Based on the inventory levels, store employees are alerted, e.g., to restock certain items. The planograms and updated inventory levels can also be utilized to provide up-to-date information to customers of stock or location of an item within the store. For example, such information may be provided via a mobile app or store kiosk and can include the location of the item within the store.

Additionally, when permitted by the customer, location data is obtained and can be utilized to obtain insight to customer behavior. For example, inefficiencies in store layout can be detected when multiple shopping carts show traversal routes that indicate confusion. If some aisles of the store see little traffic, such data can help identify product lines that are not of interest to consumers.

Power for the camera and communication modules on the shopping cart can be provided by converting the energy generated when the shopping cart is pushed through the store. On-board sensors can be deployed to detect the location of the shopping cart. The camera is activated upon the shopping cart entering the store and is powered down upon the cart exiting the store.

Additional techniques

The described techniques can also be implemented with robots (e.g., drones), IoT devices, and/or body cameras. Robots can travel through store aisles for periodic assessment of shelf utilization and stocking levels. Additionally, robots can also guide customers to the location of an item.

Alternatively, or in addition to the shopping cart or robot, IoT devices can be utilized to detect product placement via sensors or shelf mounted cameras. Further, body cameras worn by store employees can also be utilized to collect image data of item stock on shelves.

Other applications

The described techniques that combine a camera with vehicles that normally move within a space and use image analysis techniques can also be applied in other contexts. For example, the techniques can be utilized to monitor crops, by attaching a camera to a tractor. The camera can periodically obtain images of crops in a field which can be analyzed to monitor the health of the crop and other parameters.

CONCLUSION

This disclosure describes techniques to automatically generate store planograms with the use of network connected cameras. Images are periodically obtained by a camera mounted on a shopping cart while a customer travels through a store. Obtained images are transmitted to a central hub where machine learning techniques such as deep neural networks are utilized to detect item stock and to alert employees if restocking is needed. For example, if an image is received from a camera that indicates a shelf with only a few loaves of bread left, a store employee is automatically notified to restock bread. Additionally, when permitted by the customer, location data is obtained and can be utilized to obtain insight to customer behavior.

For example, inefficiencies in store layout can be detected when multiple shopping carts show traversal routes that indicate confusion.

REFERENCE

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