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Research Article

Automated Supermarket Run System

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I N F O

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A B S T R A C T

Automation has become a new trend in today's world. We propose an automated shopping system in which the customer scans the products, place it on the conveyor belt through which all the products will be packed in bags and will be ready for the customers at the exit door. For this, an application is developed in which the customer must register himself into the system. After taking all the products into the cart, the customer would go to checkout counter which is attached with a conveyor belt. The customer first scans the unique barcode from the application and then scans each product and places it on the belt. If a product is placed without scanning on the belt, weight sensor will detect the extra weight and the belt will halt. The app shows the previous shopping list and can also navigate through the mall using the indoor navigation system in the app. Thus, making an IoT based automated system for better shopping experience.[1]

Keywords: Smart Shopping Application, barcode, Automation, Signal Clustering

Introduction

Purchasing and shopping at big malls in traditional way can be a tedious job for the customer. As the billing process at the checkout counter is lengthy and also searching for products in these big malls is hectic, we need to find a way which will automate the whole shopping experience.[2] Our system focuses on making an automated shopping system which overcomes the above problems. The customer will be able to know a particular products location. In this system, the customer scans the products one by one, place it on the conveyor belt through which all the products will be packed in bags and will be ready for the customer at the exit door. For this, an application is developed in which the customer must register himself which will give him a unique barcode. The customer must scan the barcode at the entrance door by which he will be logged in into the system. The app also shows the previous shopping list and can also navigate through the mall using the indoor navigation system in the app. The scanned products would be placed in the customers bag and bill is generated on customers app through which he/ she can pay directly. At the exit door, the user needs to show the final OTP generated after the billing to ensure security.[2]

Literature Survey

In the previous study of the application there are some research works being published as IOT submissions on Protected Smart Shopping System[1] which consist of a smart cart equipped with a UHF RFID reader, a micro controller, an LCD touchscreen, a Zig-Bee adapter, and a weight sensor. The smart cart is able to automatically read the items put into a cart via the RFID reader. Design of Smart Shopping Application[2] uses a barcode function to scan the barcode of products through a smartphone camera and then receives the products information and generates the bill. Indoor Positioning using Wi-Fi Finger print with Signal Clustering[3] uses indoor positioning using Wi-fi utilizing RSS and KNN.

Implementation

Work Flow of System

Initially customer has to register through the mobile

application into the server. After registration he/she will get a barcode which will uniquely identify him/her. Customer must be logged in before using the system. After taking all the products into the cart, the customer would go to checkout counter which is attached with a conveyor belt. The customer first scans the unique barcode from the application and then scan each product and places it on the belt. If a product is placed without scanning on the belt, weight sensor[4] will detect the extra weight and the belt will halt.

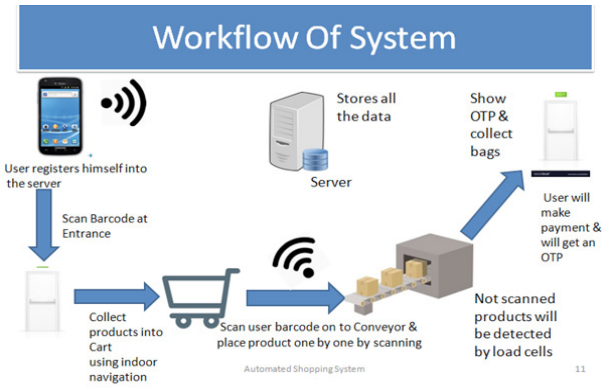
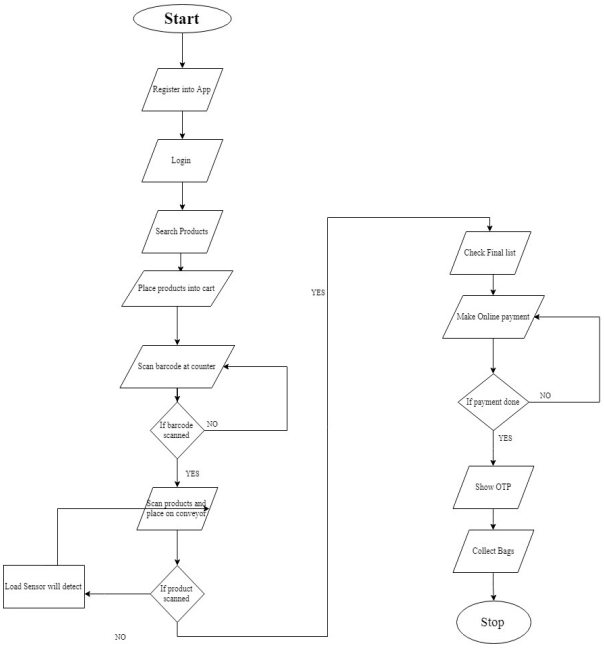


Figure 1.Workflow of System

The scanned products would be placed in the customers bag and bill is generated on customers app through which he/she can pay directly. At the exit door, the user need to show the final OTP generated after the billing to ensure security. The app also shows the previous shopping list and can also navigate through the mall using the indoor navigation system in the app.[5]

Flowchart



Components

Table 1.List of Components along with Specifications

Name	Description	Specification
Barcode Scanner	Used for scanning all the Barcode sicker on the products & Conveyor	Pegasus PS1146 Laser Barcode scanner
Arduino	It is used as microcontroller used for controlling and processing data.	Arduino UNO 3 ATMEGA328P
Load Cell	Load cell is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being measured.	HX711 chip 10KG load cell
Router	Routers are used as Access point for navigation.	Any router
Wi-Fi Module ESP8266	The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller	ESP01 802.11 b/g/n Standards 1MB Flash Memory
DC Motor	DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy.	
CH375B USB Disk	CH375B U-DISK Read Write USB Communication SPI Interface Module Micro Controller	2×8 connector, easy with the MCU mount. On board 3.3 V LDO 1117, provides 800 mA current.

Navigation

Indoor Positioning System (IPS)[3] locates the position of moving objects in indoor spaces. While there are various positioning methods such as ultrasound, infrared and RFID tags, numerous researchers are adopting Wi-Fi signals for their systems because Wi-Fi networks are prevalent in the indoor environments these days; also it is more

efficient than other methods as one can estimate his location by simply comparing current signal strength with the fingerprint of Wi-Fi signals measured in advance at the area. Indoor positioning with Wi-Fi utilizes RSS (Received Signal Strength)[5] of AP (Access Point). Then the user's location can be estimated based on the magnitude of the RSS. However, as the wireless signal is very unstable due to multipath effects, it is very hard to determine the exact location using the RSS; for example, if there are obstacles or people in the signal path, the RSS may suddenly be measured low. This is one of the reasons why the accuracy of Wi-Fi based IPS is relatively low. Accordingly, many researchers have investigated algorithms in order to improve the accuracy of the IPS. One of the basic methods is K-Nearest Neighbours (KNN). In addition, trilateration method using the relationship between RSS and distance, and a probabilistic interpretation of Bayes theorem using Maximum Likelihood Estimation are also studied.[3]

Algorithm

K-Nearest Neighbours (KNN)

Nearest Neighbour is one of the simple ways to compare with the fingerprint and aims to find the RP that has the closest value to the current RSS through the distance formula:

Di = (nk-1—RSSik RSSk—p) 1/p

RSSik denotes the fingerprint RSS from APk measured at RPi and RSSk represents the current RSS from APk measured at user's location. For each RP, calculates the distance according to the p value. If p is 1, Manhattan distance, and if p is 2, Euclidean distance, which is adopted in this paper. While NN finds only one smallest value, KNN finds K smallest values and determines user's location as a result of majority.[3]

Conclusion

In this paper we propose an Automated Shopping System which reduces the manpower required at the billing which can be efficient for the mall owner and also reduces the time for billing and checkout at counter which gives the customer enhanced shopping experience. By using this system, customer can easily locate himself in the mall and know the product location which allows him to track a particular product.

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