

Wireless Intelligent Billing Trolley for Shopping Malls

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Abstract: Time is the most significant factor in today's world. Contrarily shopping malls are the places where people get their needs on a daily basis. After the completion of purchase the process of billing is time consuming and long queues leads to customer dissatisfaction and also leads to reduction in sales which affects the profit margins. A research by tech company box technologies giant intel also found that 38% of customers could not purchase because of long queues. In the proposed system, smart trolley is where the billing of products can be done in trolley by smart billing process using ESP32 and barcode reader. This system also suggests about the products having offers using RFID system which acts as beacons and displays it on TFT display. Products can be selected easily from the purchase history of the customer.

Keywords: Smart trolley, RFID, TFT display, Server, Smart billing, Shopping malls.

1. Introduction

Since wireless technology has been introduced the word smart, which is trending. Shopping at shopping malls are purchasing different products for daily needs which has its own advantages and disadvantages, though the food items are available at the door steps through online. The advantage is that the best product of our interest can be selected. And the main disadvantage is standing in queue at the billing counter which is hectic and time consuming.

The problem of long queues and crowds in shopping malls, propelled to introduce a smart trolley which can save time and satisfies the customer. In this proposed system updates are given to store management system. In this proposed system the technologies used are: 1. ESP32 microcontroller for achieving communication with the main server, here the communication established is wireless. 2. Barcode reader for scanning the products required. 3. Weighing module sensor along with a buzzer to weigh the products, which helps in preventing theft. Other technologies like TFT display and RFID systems are used for displaying product details and offers during sale respectively, here RFID system acts as beacons. This system, smart trolley minimizes time consumed at billing counters which turns shopping easier and pleasant. Also huge crowds in the shopping malls will be reduced.

2. Literature survey

A. Paper [1] - "Automated Shopping and Billing System Using Radio-Frequency Identification"

Author: Raghav Chadha, Srishti Karkkar, Garima Aggarwal

The author provides an idea about automated shopping & billing trolley system, by using RFID and an application, the trolley consists of a Wi-Fi module i.e. ESP8266 which helps in connecting to the application created by the owner, and all the details of the product will be displayed LCD display as well as in application.

B. Paper [2] -Intelligent Shopping Cart Using Bolt Esp8266 Based on Internet of Things

Author-T.R. Lekhaa, S. Rajeshwari, J. Aiswarya Sequeira, S. Akshayaa

This system introduces a new concept i.e. Bolt ESP8266 which is the latest version of IoT. It's actually a Wi-Fi microchip with full TCP/IP stack which can be used to connect many sensors and upload the data to the cloud base. This helps in monitoring the products which is been loaded and removed from the trolley using internet.

C. Paper [3] -An Analysis of Li-Fi based Prevalent Automated Billing Systems in Shopping Malls

Author->Himani Pangasa, Shipra Aggarwal

In this proposed system it consists of microcontroller, transmission medium and scanning system, The microcontroller used is PIC16F877 as it is cheap and user friendly to program, the programming language used in this is embedded C, The transmission medium used is LI-FI and it works on the principle of light wave, and scanning system used is RFID reader once the RFID tag is tapped over the RFID reader the product detail is been updated to main computer, if the product is been load without scanning then the buzzer present in the trolley will beep as this prevents theft in malls.

D. Paper [4] -RFID and IR based Smart Shopping Mart Management System

Author-Ria Singh, Satyam Verma, M S Kriti

This paper deals with placement and storage of goods. By

using RFID and IR sensor, each product present in the mall consists of a unique RFID code. The product present in the mall will be effectively space managed. The data from the cart would be saved in EEPROM from EEPROM it will be transmitted to main system using a wireless communication that is Zigbee.

E. Paper [5] – Electronic Shopping Trolley for Shopping Mall Using Android Application

Author- Deepika P.Radke, Shruti Tiwari, Dinesh V .Jamathe

The author proposed a system in which an android application is created, which helps the customer to know about the product details in advance and all the purchased details, Once the shopping is done the customer can check out their bill through online payment or paying at the counter using this application.

F. Paper [6] –SISC: Sensor-based Intelligent Shopping Cart

Author-Rajlakshmi Badi, Bashir Ahmed Momin

In this proposed system, promotion of the products will be displayed on the customer's smartphone and its done by using machine learning algorithm, and the total bill amount of the product is displayed on the screen which is attached on the trolley, and automatic billing is done using RFID technology.

G. Paper [7]: Smart Shoppe Using Beacon

Author- Rajput Pugaliya, Jaydip Chabhadiya, Nirav Mistry, Ankit Prajapati

The author implemented mobile based shopping application with beacon solution based on Bluetooth low energy technology. In this application customer gets notifications to their mobiles when they pass through any malls or stores, if they like the notification, then the customers reach the store. After entering the store, they get notifications of nearby products like discounts, offers, price, description and reviews of previous customers. After the completion of shopping the customer can pay the bill using mobile wallet.

H. Paper[8]–RFID Based Supermarket Shopping System

Author-Kulkarni Radhika Ravindranath, Agarwal Isha Sanjay, Chawandke Manasi Prashanth

The author proposed the system in which RFID Reader is fitted into the trolley and RFID tag is attached to all the products in the shopping mall, they used an LCD to display the name of scanned product, cost and total bill amount. The customer get their price limit in the matrix form, so that if the bill amount exceeds the price limit then the customer will be warned by the buzzer. After the completion of shopping, the customer has to press a button on the keypad to send the bill to master computer. At the exit they kept RFID sensors which is used to ensure that no product can be taken away without scanning.

I. Paper [9] –RFID Cloud Smart Cart System

Author- Yerlan Berdaliyev, Alex Pappachen James

In this paper RFID technology is used for billing, once the product is scanned by the RFID reader all the details of the purchased product is sent to cloud server with the help of

Arduino and Zigbee transmitter and receiver, the server used here is IBM cloudant which is an open source which means that anyone can build their own cloud base.

J. Paper[10]–Development of Smart Shopping Carts with Customer-Oriented Service

Author->Hsin-Han Chiang, Wan-Ting You, Shu-Hsuan Lin, Wei-Chih Shih, Yu-Te Liao, Jin-Shyan Lee, and Yen-Lin Chen

The author proposed a smart cart which can be applied for shopping malls. The operator interface provides the facial identification and efficient data to promote the customer service. Used RFID tags to scan and detect the product and its information is displayed on the screen. The automatic billing will avoid queue in the exit process, so that the customers will have a better shopping experience. Finally, the stored data will be transferred to the billing counter, this process interacts with the customer to provide convenient shopping service.

K. Paper [11]–3S-Cart: Lightweight, Interactive, Sensor-based Cart for Smart Shopping in Supermarkets

Author-You-Chiun Wang

The author proposed a sensor based smart shopping cart system by using medium conscious ability of sensors which is used to detect the behaviour of customers. They proposed two applications to indicate the quality of practicable, one is the sales-promotion application to check if the customer has an interest in some products and to display the information of the product. Another is product-navigation application, in this the customer asks the system to find the fastest way to obtain the wished product.

L. Paper [12] –An Enhanced Shopping Model for Improving Smartness in Market Using SABIS Architecture

Author- P. Iyappan, S. Surya Jana, S. Anitha, T Sasirega, V. Prasanna Venkatesan

The author considered Universal computing as the recent technology period, which in order to learn about different ways to allow smart devices to function without need for user effort and knowledge. It is the concept of computer science, when compared to the desktop computing, the Universal computing occurs using any device. It is considered to be wireless or mobile allowing its users to be more connected to the outside world. They used Zig-Bee protocol for transferring the product list to the billing system.

M. Paper [13]–A Novel Video Processing Based Cost Effective Smart Trolley System for Supermarkets using FPGA

Author-Sudhir Rao Rupanagudi, Varsha G.Bhat, Fathima Jabeen

The author explained a novel method to get the better of problems faced by a customer at a shopping mall. They developed smart trolley which is not only carrying the goods of the consumer, but also instructing the consumer to the prescribed directions in the mall based on their shopping list. They used web camera along with video processing to complete the tasks, where the camera is connected to FPGA which in turn

Table 1
Literature survey

Authors	Year	Technology Used	Advantage/scope
Raghav Chadha, Srishti Karkkar, Garima Aggarwal	2019	RFID, Mobile application, Wi-Fi module	This system gives prior knowledge about the product.
T.R. Lekhaa, S. Rajeshwari, J. Aiswarya Sequeira, S. Akshayaa	2019	Bolt ESP8266	It helps in monitoring the product which is been loaded and removed from the trolley using IOT
Himani Pangasa, Shipra Aggarwal	2019	PIC16F877, Li-Wi, RFID	Prevents theft in malls
Ria Singh, Satyam Verma, M S Kriti	2018	RFID, IR, EEPROM, Zigbee	Product present in malls are well organised
Deepika P.Radke, Shruti Tiwari, Dinesh V. Jamathe	2018	Android application, Cloud base data storage	Checkout bills using this application, this prevents queue system in malls
Rajlakshmi Badi ,Bashir Ahmed Momin	2018	Machine learning algorithm, RFID	This system displays promotion of product in mall.
Rajput Pugaliya, Jaydip Chabhadiya, Nirav Mistry, Ankit Prajapati	2017	Mobile application, Beacon	Get notifications to the mobile when they pass near the malls.
Kulkarni Radhika Ravindranath, Agarwal Isha Sanjay, Chawandke Manasi Prashanth	2017	RFID, Buzzer, RFID sensor	If the bill amount exceeds the price limit then the customer will be warned by the buzzer.
Yerlan Berdaliyev, Alex Pappachen James	2016	RFID, Zigbee, IBM cloudant	Checkout bills using RFID technology
Hsin-Han Chiang, Wan-Ting You, Shu-Hsuan Lin, Wei-Chih Shih, Yu-Te Liao	2016	Face recognition , Camera, RFID	The camera will photograph his/her face image and activate the facial recognition process.
You-Chiun Wang	2016	sales promotion and product navigation applications	Find the shortest path to get the desired products.
P.Iyappan, S.Surya Jana, S Anitha, T Sasirega, V.Prasanna Venkatesan	2016	Ubiquitous computing, ZigBee	Connected to the external world and environment friendly.
Sudhir Rao Rupanagudi, Varsha G.Bhat, Fathima Jabeen	2015	Web Camera, Video processing , FPGA	Guides the shopping cart about direction to purchase the desired product.
OuWenxig, Wang Lei, Jiang Zhipeng	2015	NFC, Mobile application	This is used to locate product in mall
Iuana Rogojanu, George Suci, Maria Cristina Ditu	2015	Online platform, Speed-test application	Get to know customers opinion on the product.

guides the shopping cart, where to go and where to stop to purchase that particular product.

N. Paper [14]–Smart Shopping Technologies for Indoor Markets

Author-Iuana Rogojanu, George Suci, Maria Cristina Ditu
The author analyzed several technologies which can be implemented for indoor shopping and for improving customers experience. They proposed an online programme based on speed to text application to analyze the customer’s opinion on the products, so that clients can avoid further troubles such as standing on the line to buy a product. The system used more technologies such as iBeacon for sending identification number and measuring the power, Meshlium scanner for noticing the devices which works with Wi-Fi or Bluetooth interfaces.

O. Paper [15]–Implementation of Smart Shopping System Based on NFC Technology

Author-Ou Wenxing, Wang Lei, Jiang Zhipeng
The author proposed an application that is developed using JavaEE, this application is used to know about the product detail in advance and helps the customer to return the product if they are not satisfied, and it is also used to locate the products present in malls just by typing the product name in their phone. A new concept of NFC (near field communication) has been introduced which can replace customary credit card payment.

3. Conclusion

This proposed system, smart trolley discussed in these papers changes the customer’s shopping experience by reducing the time. While shopping the customers will have prior knowledge about money required to buy the products. Offers of the products are also displayed by using RFID system. By using

weighing module sensor along with the buzzer prevents theft and shopping is done in a disciplined manner.

4. Future scope

As a part of future scope, combination of different products can be used like using zigbee, raspberry pi, and other technologies. Also an automatic billing system can be implemented in the trolley itself for card payments.

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