

# Self Directed Smart Cart using RFID Technology

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**Abstract**—In today's world we can see a huge rush at shopping malls on holidays and weekends. This becomes even more when there are huge offers and discounts. Now a day's people purchase a variety of items and put them in the trolley. After total purchasing one should approach counter for billing purpose. By using barcode reader the cashier prepares the bill which is a time consuming process. This results in long queues at the billing counters. In this project we depict reasonable and cost-effective Smart Shopping Cart utilizing IoT (Internet of Things) innovations. The smart trolley consists of Raspberry pi, RFID reader and user interface app. When a user put some product in trolley then its code will be detected using RFID reader and cost of a product added to the list. The overall process can be controlled and operated using android application. To achieve this all products in the mall should be equipped with RFID tags and all trolleys should be equipped with a RFID reader. Hence the billing can be done in the trolley itself thereby saving a lot of time to the customers. This system will ensure that the customers will have the best shopping experience.

**Keywords**— Smart trolley, Raspberry pi, RFID.

## I. INTRODUCTION

In the era of Internet of Things (IoT), connected things have drawn more and more attentions as they can make people's everyday activities more convenient and efficient. There are many research of IoT on different applications. One of the biggest IoT applications is the smart shopping systems that can enable fast shopping, easy checking out and efficient store managing. Items put into a cart are automatically scanned; the bill is generated real-time as the customer shops; store shelves are aware of status of the items and reports to a central server; the central server can alert the store staff about the item status based on demand; inventory managing can be batch-processed in just a few minutes. With adoption of RFID and IoT technologies, such a smart shopping system is only a few steps from becoming true. Nowadays people purchase a variety of items & put them in the trolley. After total purchasing one should approach counter for billing purpose. This result a long queues at the billing counter. The project presents an idea to develop a system in shopping malls to overcome the above problem. This implements an automatic shopping cart that provides great convenience and efficiency to the customers. The smart cart which we are going to develop helps the customers to locate the desired product easily and also provide security money wise for customer satisfaction. This is implemented using android which supports RFID. The

application would read the product id of the product assigned in the RFID and add it in the cart in the application. The quality of product can also be changed so that the list can be edited. The smart cart automatically navigates itself to the location of product. Every purchased product price and weight calculation is done by the website which we will be developing. When the shopping is completed the amount gets debited from the customer prepaid account.

## II. RELATED WORK

There are earlier work done on modernizing shopping carts. These works mainly focused on autonomous movement of the cart and finding the location of the desired product inside the shopping complex.

Mr.P. Chandrasekar and Ms.T. Sangeetha has proposed Smart Shopping Cart with automatic Billing System through RFID and ZigBee provides centralized and automated billing system using RFID and ZigBee communication where each product of shopping mall, super markets will be provided with a RFID tag, to identify its type. Shopping cart is designed or implemented with a Product Identification Device (PID) that contains microcontroller, LCD, Radio Frequency Identification (RFID) reader, programmable read-only memory (EEPROM), and ZigBee module. The main aim was to provide an automatic billing to avoid queue in malls and super markets.

Sanga Son, Yongtae Shin has proposed Design of smart shopping application using barcode scanning & location based coupon service intends to design an application, which is able to add products into Mobile shopping cart by scanning the barcode through smart phone camera and place an order with connected online store. The designed smart phone shopping application that scans products' barcode and receives coupons nearby stores based on Beacon technology. Customers can shop at both online and offline with cheap price and manage the products on their own mobile shopping cart.

Prasiddhi K, Dhanashri H, Gawali has proposed Innovative shopping cart for smart cities for successful implementation of smart, advanced, methodical and low cost system to make shopping more convenient and user friendly. The system is more reliable for real-time application. RFID technology is replacing other asset tracking technologies due to its high working efficiency with assurance of security. This system has successfully achieved goal of budget setting, product recommendation, add and deduct cost of product according to

the condition when product is kept in cart and taken out respectively.

Jay Dave, Sagar Gondaliya, Bhumi Patel has proposed M-Commerce Shopping Using NFC which provide the details of the products and are displayed on the LCD screen which is attached to the cart/trolley as the products are dropped in to the trolley and at the end of shopping the customers pays the bill shown on the LCD screen and conform their payment and Customer can touch or wave their mobile on NFC tag and add/remove. This way the y designed system that reduces the physical task by customer load effectively.

### III. PROPOSED SYSTEM

In the proposed method getting product information is easy and it is not time consuming. The products are scanned through RFID reader. This method takes less time since billing is done through online mode, customer doesn't need to wait for longer time in queue and human staff is not needed for billing. Using Radio frequency Identification (RFID) helps to identify the products easily. This has high efficiency and hands-free access control.

### IV. METHODOLOGY

Taking into consideration the problems faced in present shopping system a new working model is proposed. The features incorporated are automatic product detection and smart billing with the help of RFID technology. The payment is processed through mobile banking or cash payment and the cart system will verify the products and complete the process successfully. The interactive based cart is designed which uses the RFID technology to identify the products details which are already available in the database. The proposed system have the facility to browse the available products list onscreen in the display connected to cart interacting with the main server and will generate the bill once all required products placed in cart. The block diagram consists of different modules where each block is studied in detail taking into consideration specifications for each individual block.

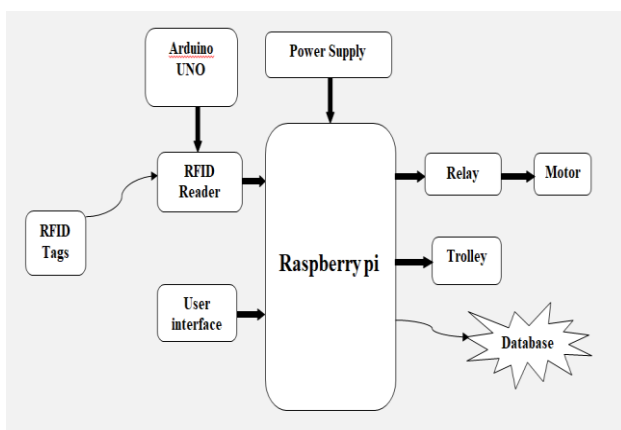


Fig 1. Block diagram of Self-directed smart cart using RFID.

### V. IMPLEMENTATION

Smart-Cart is a wholesome solution to various problems faced in the supermarket and aims to make the shopping experience better. It starts with unique RFID card, which would be given to every customer during the registration process. Initially, the

details of the customer and the prepaid amount will be updated on the server. RFID card serves the purpose of authentication whenever the person visits the supermarket. When the RFID card is read by the RFID reader on the Smart-Cart, it is followed by a welcome message. After which balance amount and an option to choose the list of products will be displayed on the screen. Now the customer can select the required products. After the customer makes the list of products, the smart cart automatically routes itself to the location of the product. Thereby, reducing the time spent in searching the products of interest in the supermarket.

- *Authentication:*

Every customer is identified by the unique RFID which is issued to the customer during registration. In registration the customer can get this card by paying some prepaid amount and the details regarding the customer will be updated on the server. Every product in the shopping mall is also tagged with RFID tags, identification card on the reader present on the cart.

- *Routing:*

The intelligence of the Smart-Cart facilitates automatic routing of the cart after the customer chooses the products of interest from the displayed list. The Cart calculates the shortest path and tracks the shortest distance for procuring the products.

- *Billing:*

The customer has to scan the products while dropping them into the Smart-Cart. With the help of RFID reader Smart-Cart bills concurrently when the tags attached to the products are scanned. This helps the customer in planning the shopping according to the wallet balance.

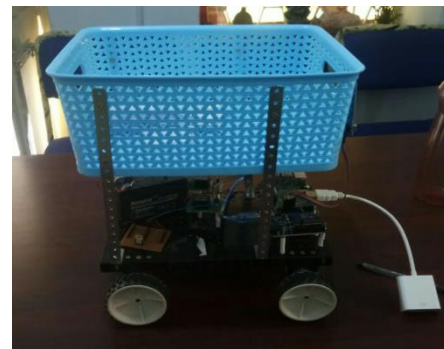


Fig 2. Prototype of Smart cart

### VI. RESULTS

The system will help to save valuable time of customer and helps to make the present process more convenient and user friendly. Problem may arise while using RFID tags when two or more products are kept simultaneously in a cart. But this problem can be solved by replacing LF RFID tags by HF RFID tags as multiple HF RFID tags can be read by RFID reader. There may be data collision when two or more cart bills concurrently at the same time but it can be eliminated by developing a mesh network for RF module which will help to receive correct data of each cart. The successful implementation of smart, advanced, methodological and low cost system is to make shopping more convenient and user

friendly. This makes the system to be reliable for real time application. RFID technology is replacing other asset tracking technologies due to its high working efficiency with assurance of security. It has developed a wide scope in many applications and has the potential to enhance the experience of shopping.

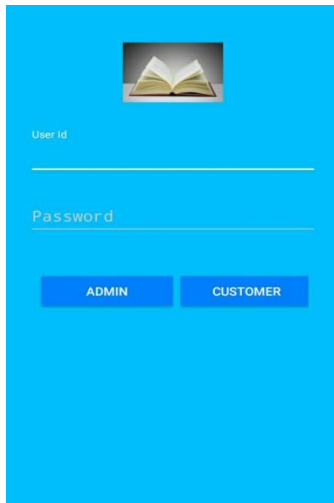


Fig 3. Admin and customer login

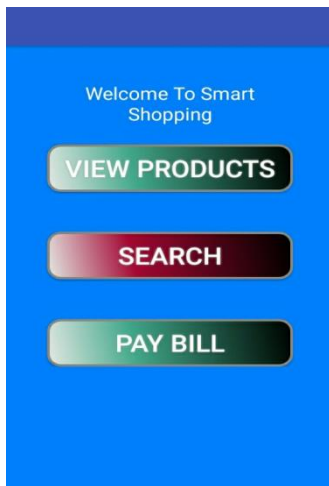


Fig 4. Welcome message displayed along With option to search, view & billing

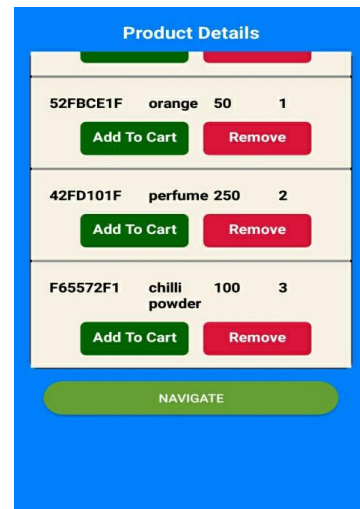


Fig 5: Customer can add and remove the products to & from the cart

### VII. CONCLUSION

The proposed work brings a new revolution in the whole shopping experience where the major issues like remembering and recalling the shopping list, searching for the product in the supermarket and the time wasted in billing queues are overcome. In this work, by displaying the product list and the purchase history, recalling the shopping list is made more convenient for the customers. The real-time system designed for concurrent billing and the updated balance helps customer to make clever decisions on planning their budget for shopping depending on their wallet balance. The software developed for cash transactions reduce the manpower and time spent in billing queues. Automatic routing saves the customers time spent in searching the product of interest. Thus the overall experience of shopping can be experienced better by implementing the Smart-Cart.

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