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IOT BASED SMART CART BILLING SYSTEM

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ABSTRACT
Due to special offers or seasonal discounts, there is a huge rush in the mall for shopping and shoppers end up purchasing many product items without knowing the final bill amount. After realizing final bill amount at the bill counter is over the budget, it becomes cumbersome job to remove the unwanted product items at that time. This results into a hectic job and queue gets longer due to such delay. So to avoid that, fully automated smart cart billing system is developed for shoppers to keep the track of total bill of purchased product items and pay the bill in most quick and easy way.
The IoT based smart cart billing system consists of barcode scanner, microcontroller, display & trolley unit. In this system, scanning of barcode is totally done by shoppers with the help of smart trolley and it immediately gives an idea to shopper about the final bill amount after inclusion of every product into the cart. In this proposed system, shopper just need to visit billing counter to pay the final bill amount only.

KEYWORDS: Smart Cart Trolley, Barcode Scanner, Arduino, WI-FI, Bluetooth, Microcontroller

INTRODUCTION
Recently purchasing of products in malls is becoming a daily activity. Sometimes on some products special offers or seasonal discounts are offered which attracts huge rush in the mall. According to special offers & discounts shopper purchase many product items.
In every supermarket/mall, baskets or trolleys are provided to shoppers for shopping. Shoppers choose and put the products into trolley/basket which they wish to purchase. After shopping all the products, shoppers proceed to the billing counter to pay the bill amount. Let's take a view that is observed in every shopping mall/ supermarket for bill payment at bill counter. Figure 1 shows scenario at billing counter in shopping malls/supermarkets.
At the billing counter the cashier prepares the final bill by scanning barcode of every product which is added in the trolley. This billing process is quite hectic and highly time consuming which results in long queues at billing counters. To save time shopping mall/super market need to employ more human resource & billing counter that is not possible every time and also not economical during weekdays. There is another problem faced by shoppers while shopping that whether the amount of money brought is sufficient or not for bill payment, as shoppers get to know the total bill at the end when shoppers come to billing counter for final payment.

Figure 1 : Scenario at billing counter in shopping malls/supermarkets

IoT based smart cart billing system is introduced to reduce the total waiting time of shoppers, botheration of insufficient money, requirement of extra manpower and ultimately expenses.

REVIEW OF LITERATURE

Mohit Kumar, Jaspreet Singh, Anju, Varun Sanduja[1] reviewed "Smart Trolley with Instant Billing to Ease Queues at Shopping Malls using ARM7 LPC2148: A review" smart & faster embedded billing system by interfacing RFID and ZIGBEE module with the microcontroller.

Janhavi Iyer, Harshad Dhabu[2] introduced innovative, low-cost, scalable "Smart Trolley System for Automated Billing using RFID and ZIGBEE". This system provides a smart way for billing by using RFID tag and RFID instead of barcode scanner. To reduce long waiting time at billing counter Zigbee transmitter to wirelessly transfer final bill details of the items that are added in the trolley.

Anjali Verma, Dr.Namit Gupta[3] proposed "RFID based Smart Multitasking Shopping Trolley System". Proposed system evaluates many strategies to assist shopper to minimize the overall shopping time required in the mall. This system also provides real-time updates based on the inventory to the store management.

Vrinda Gupta, Niharika Garg [4] developed "Analytical Model for Automating Purchases using RFID-enabled Shelf and Cart". The developed model consists of shopping cart, weight-sensing mat integrated with an RFID reader, and ZigBee transceiver. Shopping cart detects an item when the customer picks and drops it and calculates & displays amount of the bill of their purchased items.

S. Sainath, K. Surender, V. Vikram Arvind, J. Thangakumar[5] developed a automated model "Automated Shopping Trolley for Super Market Billing System". This model is a integration of a raspberry pie embedded chip with two barcode scanners that are placed at entry & exit checkpoints for self check out.

Ankush Yewatkar, Faiz Inamdar, Raj Singh, Ayushya, Amol Bandal[6] introduced ¨Smart Cart with Automatic Billing, Product Information, Product Recommendation Using RFID & Zigbee with Anti-Theft"system This smart shopping cart system keeps the track of all purchased products using RFID & Zigbee. For final billing online transactions are recommended. The system also give suggestions to shopper about offers/discount based on purchase history of a particular shopper with the help of centralized system. One of the important feature this system introduced for anti-theft by attaching RFID reader at the exit door.

Mr.Yathisha L, Abhishek A, Harshit R, Darshan Koundinaya S R, Srinidhi K M[7] proposed "Automation of Shopping Cart To Ease Queue in Malls By Using RFID". In the proposed system RFID tags are used instead of barcode readers to scan product price and that is displayed on the LCD. For communication Zigbee transmitter & receiver is used at trolley & central computer respectively.

Jadhav Rahul Shankar, Avale Pradeep Nandkumar, Tarali Shivkumar Vaijanath, Prof. Pawar S. U[8] evolved "RFID based Automatic Billing Trolley" technology. In automated billing technology, each shopping trolley is attached with RFID reader & LCD display and every each product is RFID attached with RFID tag to provide better solution to the manual billing method in shopping mall.

Udita Gangwal, Sanchita Roy, Jyotsna Bapat[9] developed "Smart Shopping Cart for Automated Billing Purpose using Wireless Sensor Networks". This system used WSN combined with a highly reliable Image Processing technique to automate entire billing process and to reduce entire communication requirement only one Passive sensor (load-cell) is used.

Kalyani Dawkar, Shraddha Dhomae, Samruddhi Mahabaleshwarkar[10] proposed "Electronic Shopping Cart For Effective Shopping based on RFID". Introducers focused on self scanning billing process to reduce time requirement and keep eye on important details of product like expiry date, cost etc to get aware about product quality & total amount.

Raju Kumar, K. Gopalakrishna, K. Ramesha[11] developed "Intelligent Shopping Cart" system. It consists of three modules- Server Communication Componentfor connection of the shopping cart with the main server, User Interface and Display Component to provide the user interface, and Automatic Billing Component handles billing section.

G.S.Rajagopal, Mr.S.Grout, M.Janarthanan[12] reviewed "Smart Intelligent System For Shopping And Billing". In this paper smart shopping cart equipped with RFID tags is considered, to verify the purchase details. Centralized billing system to automatically bill the shopper for the purchases.

IOT BASED SMART CART BILLING SYSTEM

Now a day's people spend much of time superfluously in shopping mall/supermarket. Basically during shopping period shoppers faced many problems. Sometimes some of the product items do not contain the price tag. Because of that shoppers does not know the actual cost of that product item. Currently most of the shopping malls/supermarket used general barcode scanning method for billing. At bill counter cashier scans the product items using the barcode scanner and gives the total bill to the shopper. Many of the times shopper adjust this generated bill according to their budget which results in long queues at billing counter. It is observed that most of the shopper leave the shopping mall/supermarket instead of waiting in long queues to buy a few products.

To try to solve these identified problems, "IoT Based Smart Cart Billing System" is introduced. This system eliminates overall time required for paying the final bill at billing counter. Proposed intelligent shopping basket/trolley uses barcode scanners to allow the shopper to self-checkout.

ARCHITECTURE OF IOT BASED SMART CART BILLING SYSTEM

In this system microcontroller and arduino plays an important role to transfer information as shown in figure 2. It is programmed and attached to a barcode reader. As the shopper puts the product items in the trolley/basket the barcode reader attached on the it reads barcode tag and sends an information to the microcontroller. The microcontroller then stores it in the memory and also shows same information on LCD. In advance LCD also displays product id, total number of items purchased & its grand total. The shopper can remove the unwanted product items with the help of toggle switch. According to the product items added/removed into/from the smart trolley/basket final bill is generated automatically.

As soon as the shopping is over, the shopper can print their shopping bill by pressing print button. Instead of waiting in a long queue shopper can easily & quickly pay their bills at payment counter as the lengthy scanning process of barcodes is done by smart trolley/basket. The same final bill is also gets transferred to the billing counter by using bluetooth module. At the end the shopper pays their bill at the billing counter by using any payment method.

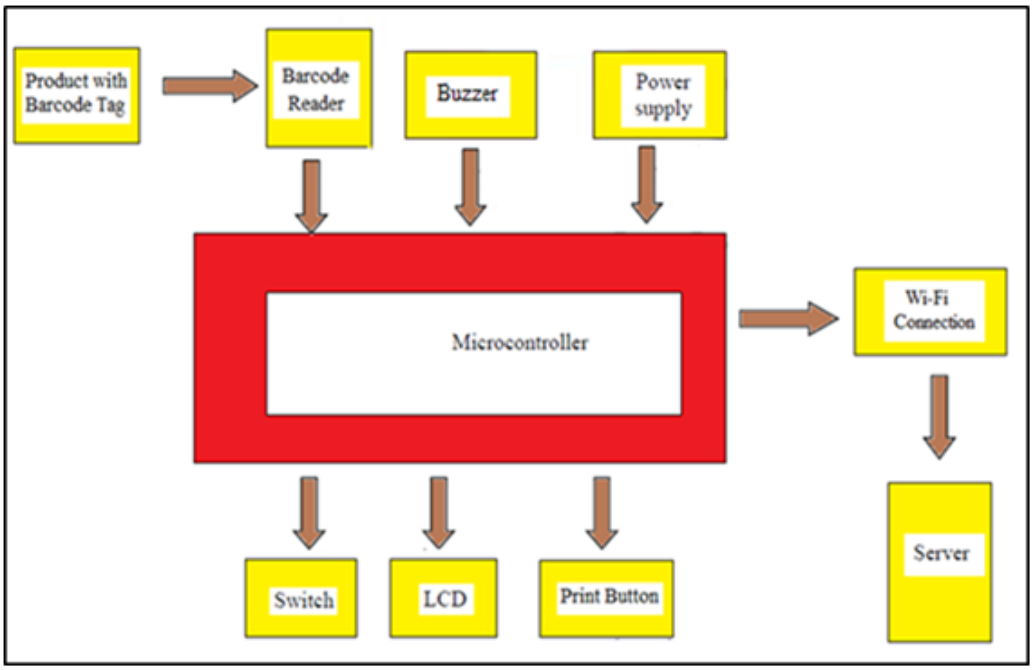

Figure 2 : Architecture of IoT Based Smart Cart Billing System

RESULTS AND DISCUSSIONS

Every product item is gets scanned whenever shopper add/remove product item into/from trolley/basket. Barcode reader reads unique barcode tag of each product item. After reading product item, details of each product item is temporarily stored in the memory & displayed on the LCD. Figure 3 shows details of some sample scanned product items which is displayed on LCD and same information is plotted in table 1.

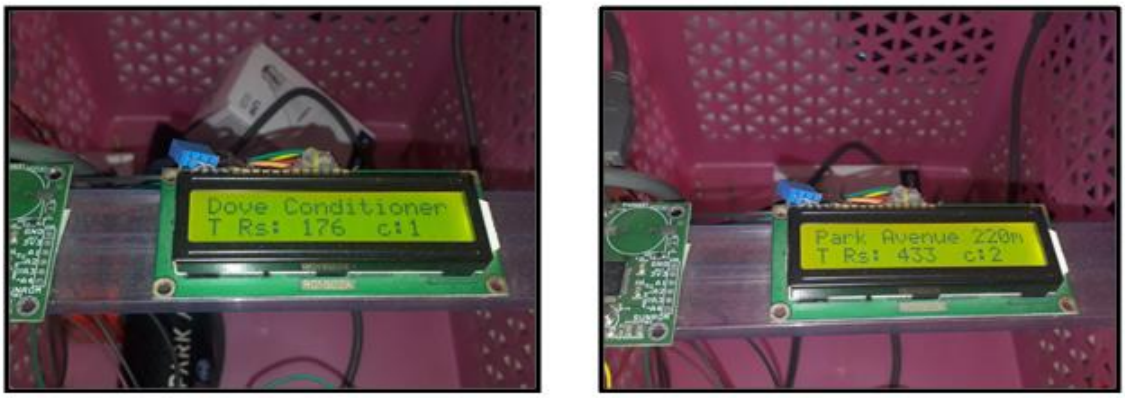

Figure 3 : Sample of scanned product items on LCD

Table 1 : Details of scanned product items

Sr. No.	Product ID	Name of Product	Toggle Switch	Total Price	Product Count
1	Pr. #2	Dove Conditioner	Not Pressed	176 Rs	1
2	Pr. #3	Park Avenue	Not Pressed	433 Rs	2

If shopper removes unwanted product item from smart trolley/basket then prize of same product item is deducted from the final bill. Once the shopping is completed shopper pressed print button to generate a hard copy of final bill and at the same time same bill information is sent to the server for final bill payment. Figure 4 shows printed copy of final shopping bill according to the product items added/removed into/from smart trolley/basket. Bill shows details of scanned product item such as product id, name of product item, its prize, and quantity of same product.

Figure 4 : Printed copy of final bill of product items

It is estimated that the architecture of the system that can be used in the proposed smart cart trolley system for smart and easy shopping in the malls/center to save time, energy and money of the shoppers.

CONCLUSION & RECOMMENDATION

By considering latest trends in shopping center/mall, proposed work system comes to a conclusion that the "IoT Based Smart Cart Billing System" is essential for the shopping centers/malls. The proposed IoT based smart cart billing system is accurate, user friendly, economical and does not need much hard work.

It reduces manpower required at billing counter and ultimately results into lesser management expenses. This system makes shoppers aware about final bill amount during the time of purchase. Hence time spent at billing counter is reduced which results into increase customer satisfaction.

Though the proposed system showcases the proof of concept, some aspects can be included to make the smart shopping cart more atomic. In this system the latency time of the wireless communication with the server, micro-controller and larger display system may need to be considered. Further, a tracker for tracking the product items can be used to make smart cart more advance.

REFERENCES

I. Mohit Kumar, Jaspreet Singh, Anju, Varun Sanduja. Smart Trolley with Instant Billing to Ease Queues at Shopping Malls using ARM7 LPC2148: A review. International Journal of Advanced Research in Computer and Communication Engineering, Vol. 4, Issue 8, August 2015, 39-42.

II. Janhavi Iyer, Harshad Dhabu, Sudeep K. Mohanty. Smart Trolley System for Automated Billing using RFID and ZIGBEE. International Journal of Emerging Technology and Advanced Engineering, Vol. 5, Issue 10, October 2015, 112-116.

III. Anjali Verma, Namit Gupta. RFID based Smart Multitasking Shopping Trolley System. International Journal for Scientific Research & Development, Vol. 3, Issue 06, 2015, 1389-1392.

IV. Vrinda Gupta, Niharika Garg. Analytical Model for Automating Purchases using RFID-enabled Shelf and Cart. International Journal of Information and Computation Technology, Vol. 4, Number 5, 2014, 537-544.

V. S. Sainath, K. Surender, V. Vikram Arvind, J. Thangakumar. Automated Shopping Trolley for Super Market Billing System. International Journal of Computer Applications, 7-9.

VI. Ankush Yewatkar, Faiz Inamdar, Raj Singh, Ayushya, Amol Bandale. Smart Cart with Automatic Billing, Product Information, Product Recommendation Using RFID & Zigbee with Anti-Theft. International Conference on Communication, Computing and Virtualization, 2016, 793 - 800.

VII. Mr. Yathisha L, Abhishek A, Harshith R, Darshan Koundinya S R & Srinidhi K M. Automation of Shopping Cart To Ease Queue in Malls By Using RFID. International Research Journal of Engineering and Technology, Vol. 02 Issue 03, June 2015, 1435-1441.

VIII. Jadhav Rahul Shankar, Avale Pradeep Nandkumar, Tarali Shivkumar Vaijanath, Prof. Pawar S. U. RFID based Automatic Billing Trolley. International Journal for Scientific Research & Development, Vol. 3, Issue 02, 2015, 2297-2299.

IX. Udita Gangwal, Sanchita Roy, Jyotsna Bapat. Smart Shopping Cart for Automated Billing Purpose using Wireless Sensor Networks. International Conference on Sensor Technologies and Applications, 2013, 168-172.

X. Kalyani Dawkhar, Shraddha Dhomase, Samruddhi Mahabaleshwarkar. Electronic Shopping Cart For Effective Shopping based on RFID. International Journal of Innovative Research in Electrical, Electronics, Instrumentation And Control Engineering, Vol. 3, Issue 1, January 2015, 84-86.

XI. Raju Kumar, K. Gopalakrishna, K. Ramesha. Intelligent Shopping Cart. International Journal of Engineering Science and Innovative Technology, Volume 2, Issue 4, July 2013, 499-507.

XII. G.S.Rajagopal, Mr.S.Grout, Prof. M.Janarthanan. Smart Intelligent System for Shopping and Billing. International Journal of Advanced Research Trends in Engineering and Technology, Vol. 3, Issue 19, April 2016, 339-343.