

Implementation of Smart Shopping Cart Using RFID

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ABSTRACT

Supermarket is where the customers come to buy their daily products and pay for the same. Hence there is need to calculate the number of products sold and their product price to generate the bill for the customer to be paid. Cashier's desks are placed so as to collect the bill. Currently there exists many supermarket chains who are attempting to reduce costs like labor costs and also time of the customers. This can be achieved by replacing the existing system where many people work to collect the amount by new self-service check-out machines. Such machines involve only a single member who can handle many different machines at a time. The system provides centralized and automated billing system that uses RFID and Bluetooth communication modules. Each product of shopping mall or super markets will have a RFID tag which will help to identify the product type. Each shopping cart will be designed or implemented with a Product Identification Device (PID) which contains microcontroller, LCD, an RFID reader, EEPROM, and a Bluetooth module. Information of the product that is to be purchased will be read through a RFID reader on shopping cart, in the mean while that product's information will be stored into EEPROM which will be attached to the cart and that data will be send to Central Billing System through the Bluetooth module. When the central billing system receives the cart information and data stored in EEPROM, then the system will access the product database and calculates the total amount to be paid for that particular cart. Main aim of the project is to generate automatic billing to avoid huge crowd or large queues in shopping malls and super markets.

Keywords

Product Identification Device, EEPROM, RFID, Bluetooth device, Central Billing System.

1. INTRODUCTION

The transactions which carried out in retail sector have huge amount of data. This data requires data mining tool to extract hidden patterns which may be used by the organization to expect or study the future trends and behaviors. Data Mining or Knowledge Discovery in Databases is an advanced approach which refers to the extraction of previously unknown and useful information from large databases. Association Rule Mining is an important technique of data which utilizes the multiple core of processor, for finding the association among the sets of item. The current Shopping environment can be simply classified it into two categories:

- (1) Shopping in presence of the person and
- (2) Shopping in absence of the person.

Shopping in absence is supported in numerous ways including online shopping, teleshopping, etc. wherein a customer does not have to be physically present in the shopping area. Shopping in presence involves a personal visit to the place of shopping and selecting the product/s based on various factors including need, interest, brand, convenience etc. The proposed Smart Shopping Cart system intends to assist shopping in-person that will minimize the time spent in shopping as well as locate the desired product with ease. It is also aimed in aiding the store management with real-time updates on the inventory. The proposed system is based on four important technologies:

- (i) Infrared sensors – these are used in an intellectual manner for dynamic location detection and tracking
- (ii) RFID tags which are used for product identification
- (iii) Bluetooth is used for creating wireless communication with the Server
- (iv) The System will be integrated with a display unit for billing and also for the inventory management.

The system helps the management system by providing an automatic update of the inventory when each and every product is purchased. The Smart Shopping Cart has the flexibility to make the customer's shopping experience more pleasurable and well-organized for the customer and also make the inventory control easier for the store management.

2. LITERATURE SURVEY

Nowadays shopping involves searching of products then waiting in a queue to get them scanned and determine amount to be paid. This leads to great wastage of time of the customers. Therefore, technologies have been developed to save a lot of time of the customers and avoid waiting in a queue. Such technologies are RFID scanner, barcode scanner, QR code scanner, etc. These days you may see that barcodes are found almost on each and every item. They are the technology for retail products, stores, etc. The observation depicts that stores who own Barcode scanner or reader can process barcodes and imprint on the products. Barcode scanning includes an important factor that the product must be in the Line of Sight (LOS) of the scanner or reader so that the barcode of that particular product gets imprinted on the scanned product[1].

Around 15 billion pairs of fashion apparel items and 10 billion shoes or electronic devices are shipped from different

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manufacturers every year across the world. The costs involved for conducting manual management of the item records, managing items which out-of-stocks and also preventing theft of the items or products continue to rise high. The retailers of Apparel, shoes, other products are rapidly inculcating the tracking at the item-level such that accurate visibility of each product may be visioned. Long-lasting inventories are running at a rate of 60-70% in real-time which makes the business decisions about the store becomes difficult. Many of the retailers who design items, buy or sell their own brands are experiencing great rise in the sales and also require less amount of time to track the stock items or inventory weekly[3].

Authors described the accomplishment of a system which offers the customer a new method of shopping in the paper 'RFID Based Automatic Shopping Cart'. When new customer arrives at the supermarket, he/she look forward towards a shopping cart that has a scientific system on its handle-bar which comprises of a touch-screen monitor, a customer card automatic reader, a positioning transmitter and a product reader. On the other hand, all the technologies also become crystal clear to the customer since only monitor communication will occur [6].

Community alertness of RFID was finely tuned in recent years when the U.S. Department of Defense (DoD) and retail monster Wal-Mart required that their suppliers must use RFID technology. In January of 2005 Wal-Mart's CIO declared that by means of RFID there has been a 26 percent reduction in out of stocks in the stores and the out of stock items are added to the stocks three times faster than those items which not RFID tagged [4].

3. PROPOSED SYSTEM

To proposed system develops a shopping aid that assists the consumer to locate and select products and inform them on the product/s details in the shopping arena. Additionally, with each product identified uniquely and support billing and inventory updates. System aims to create an automated central bill system for supermarkets and mall. Using PID, customers need not wait near cash counters for their bill payment. The system will be designed such that purchased product information is transferred to central billing system where customers can pay their bill through credit/debit cards.

4. ARCHITECTURE

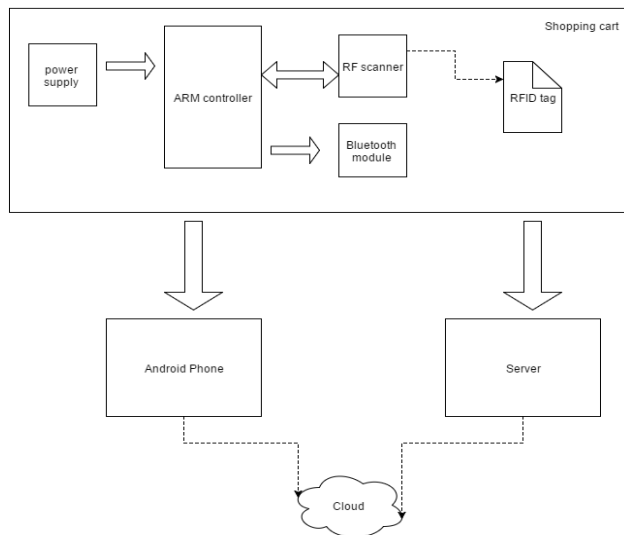


Figure 1. Smart Shopping Cart Architecture

The architectural implementation of the system and the main end of the system is to allow the consumer a new enhanced way of shopping. The normal shopping experience till date, after the invent of various supermarkets is:

- 1] Move into the store
- 2] Carry a trolley and push it around the entire store in search of the products needed
- 3] Put them into the trolley
- 4] Wait in a queue
- 5] Pay the bill
- 6] Exit from store.

The proposed model encompasses that the usage of RFID describes benefits such as reduction in cost of the product, reduction in human intervention and also in the cost of labor, along the availability of achieving the real time information about the dissimilar products inside the shopping cart.

In the proposed system we assume that shopping area is organized in aisle and IR transmitters are placed on both the aisle and the cart to collect information on entry/exit status of the cart and bay. We will record the aisle number for a particular product as the projected location resolution of the product would be the aisle number. RFID tags are used to uniquely identify products. Each subsystem is interfaced carefully to form a whole unit. This system consists of a microcontroller interfaced with RFID, IR, Bluetooth, RFID Tags, EEPROM forming the hardware unit and Bluetooth interfaced to the server forms the software unit. There are IR transmitters which are placed on the entry and exit of each aisle. The IR receivers are positioned on the shopping carts. Whenever the IR receiver receives an IR signal, it indicates that a shopping cart is in that aisle. As and when the cart location and entry/exit status is detected, the information is then sent to the main server using the wireless Bluetooth unit. As the products are selected and added into the cart, the RFID reader will identify the product and the price will be added to the temporary bill. After completing the shopping, the customer has to select the "End Shopping" button. It then enables the total bill to be generated after confirmed purchase of all the selected products in the shopping cart. Simultaneously, the information is sent to the database server through the wireless Bluetooth unit. The existing stock available after deducting the number of products purchased is reflected so that the server database is updated. This ensures a smooth inventory management.

5. CONCLUSION

We conclude that proposed application creates an automated central bill system for supermarkets and mall. Using PID, customer need not wait near cash counters for their bill payment, as their purchased product information is transferred to central billing system. Customers can pay their bill through credit/debit cards. The system will be designed such as, when a customer with the cart enters a shopping aisle, the cart is brought in range of the IR Receiver and the microcontroller checks for the information code available from the aisle. The aisle information code is transmitted over the wireless Bluetooth from the cart to the server. Bluetooth module queries the database based on the aisle number to retrieve and transmit information to the cart. The information is stored in EEPROM present on the cart which serves as a temporary storage until the customer exits the aisle he/she is in. Every product has a RFID tag, which are fed in database assigned to corresponding products. If there needs to be a purchase done, then that product can be dropped in the cart where the RFID reader scans the tag. The information of the product is extracted and displayed on the LCD screen. Simultaneously the billing information is also updated and displayed on the cart. On the exit

of the aisle, the information of the aisle is sent to the server with details of purchase. The details are stored by the server in database.

REFERENCES

- [1] P. Chandrasekar, T. Sangeetha, "Smart Shopping Cart with Automatic Billing System through RFID and Zigbee", ISBN No.978-1-4799-3834-6/14/\$31.00©2014 IEEE
- [2] A.Sarac,N.Absi, S.Dauzere-Peres, "A Literature Review of impact of RFID technologies in Supply Chain Management", France, March 2009.
- [3] ABI Research, "RFID Item-Level Tagging in Fashion Apparel and Footwear", 4Q, 2009.
- [4] Ferguson, Renee Boucher, "Wal-Mart's CIO Dishes on RFID at NRFTech Conference", E-Week.com,Aug. 9, 2006.
- [5] Bill McBeath, "The Explosion of Retail Item-Level RFID: A Foundation for the Retail Revolution", April 2013.
- [6] Ankit Anil Agarwal, Saurabh Kumar Sultania, Gourav Jaiswal, Prateek Jain, "RFID Based Automatic Shopping Cart", Control Theory and Informatics Vol 1, No.1, 2011.3
- [7] Y. J. Zuo "Survivable RFID systems: Issues, challenges, and techniques", IEEE Trans. Syst., Man, Cybern. C, Appl. Rev., vol. 40, no. 4, pp.406 -418 2010
- [8] G. Roussos and B. College, "Enabling Rfid in Retaill, Computer", IEEE,vol. 39, no. 3, 2006.
- [9] F. Gandino , B. Montrucchio , M. Rebaudengo and E. R. Sanchez "On improving automation by integrating RFID in the traceability management of the agri-food sector", IEEE Trans. Ind. Electron., vol. 56, no. 7, pp.2357 -2365 2009
- [10] T. M. Choi "Coordination and risk analysis of VMI supply chains with RFID technology", IEEE Trans Ind. Informat., vol. 7, no. 3, pp.497 -504 2011
- [11] J. D. Porter and D. S. Kim "An RFID-enabled road pricing system for transportation", IEEE Syst. J., vol. 2, no. 2, pp.248 -257 2008
- [12] H. H. Bi and D. K. Lin "RFID-enabled discovery of supply networks", IEEE Trans. Eng. Manag., vol. 56, no. 1, pp.129 - 141 2009
- [13] K. Finkensteller RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification, 2003 :Wiley
- [14] J. Z. Gao , L. Prakash and R. Jagatesan "Understanding 2D-BarCode technology and application in M-commerce-design and implementation of a 2D barcode processing solution", Proc. Comput. Softw. Appl. Conf., pp.49 -56 2007
- [15] D. Hahnel , W. Burgard , D. Fox , K. Fishkin and M. Philipose "Mapping and localization with RFID technology", Proc. IEEE Int. Conf Robot. Autom., pp.1015 -1020 2004
- [16] J. Y. Zhou , J. Shi and X. L. Qiu "Landmark placement for wireless localization in rectangular-shaped industrial facilities", IEEE Trans. Veh. Technol., vol. 59, no. 6, pp.3081 -3090 2010
- [17] S. S. Saad and Z. S. Nakad "A standalone RFID indoor positioning system using passive tags", IEEE Trans. Ind. Electron., vol. 58, no. 5, pp.1961 -1970 2011