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E-BAG Using IoT

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Abstract *- With the rapid growth of shopping malls and retail sectors every year, there is a need to improve the people flow in malls and advance the billing pattern steeply. Product procurement represents a complex process. Each time Customer requires a item of his interest, he has to pull the trolley or bag from rack to rack for collecting the items and simultaneously the expense computation has to be estimated. At the billing counter, each product with the barcode is fed to the scanner and final bill is generated. Large numbers of cashiers are required for this purpose. This process is very tedious and it becomes worst during holidays, weekends or special offers. The product "E-Bag" is an initiative to design an intelligent bag using Advanced RISC machine (ARM) LPC2148, Radio Frequency Identification (RFID) and Internet of Things (IoT). It also includes Liquid Crystal (LCD) to display cost and name of the product with total price of all the products enabling the customers to manage their budget. This information is stored in ARM memory, which will be transferred to main computer using Wi-Fi module. The proposed work has been coded in Embedded C and processed by Keil uVision and Philip's Utility. The product saves time and evades long queues at the billing counter.*

Keywords *— Radio Frequency Identification (RFID), Internet of things (IoT), Liquid Crystal Display (LCD), ARM LPC 2148, Wi-Fi module, Embedded C*

I. INTRODUCTION

Shopping is an agility carried out by most of the people either on a daily or weekly basis to fulfil their necessities ranging from groceries, apparels, household cleaners, pharmacy products to electrical appliances, and others. To meet the need of people, numbers of self-service shops such as shopping malls and supermarkets keep on increasing over the years throughout the globe. The ideology is to provide customer a hassle-free shopping experience by introducing RFID [1] Based Smart Shopping and Billing System. The work aims to develop a modern futuristic electronic product that can be attached to any trolley or bag and communicates with the billing counter wirelessly using IoT (Internet of Things), making the whole affair of shopping comfortable and efficient. The smart trolley will not only help shorten the checkout lines but also help customers to keep track on their budget. Every product in the shopping centre can be tracked with a unique RFID tag. The device comprises a RFID [2] reader with a LCD display on the shopping trolley. Also, ARM memory to store the details of the items purchased, that can be easily accessed by the cashier at the counter on pressing the toggle switch. Each trolley will consist of a similar type of hardware with unique trolley address. The customers would be able to scan products themselves and the LCD screen on the cart will keep updating the total. This makes it easier for the billing [3] counter to keep a count on products in the bag. This will be very beneficial for retail stores as more people will enjoy a effortless shopping experience and come more often to shop.

II. EXISTING SYSTEM

Traditional Billing [4] currently involves the use of barcodes. Products must be scanned through the barcode scanner by the cashier, which gives us the total bill. However, this becomes a monotonous, which, when lots of products are to be scanned will result in long queues, making the billing process slow and time consuming. While doing a survey, we found that most of the people prefer to leave the shopping mall instead of waiting in long queues to buy a few products. Recent years have seen the advent of several new technologies for hypermarket assistance. All such solutions share similar objectives: save consumers time, money and help the retailers to win loyal clients.

Barcodes and RFIDs

RFID and barcodes uses analogous mechanisms in terms of collection of data where they automate the data collection process. RFID technology is much more comprehensive and easier to implement than barcode technology, as barcode system is obsolete.

Barcode scanners are required to be on the same visual horizon with the Barcode whereas RFID tags don't need to be. The range of recognition of a RFID is far greater than a barcode. Accessing information from an RFID tag can be possible to distances around 300ft but a barcode is restricted to 15ft or less. Barcode readers are limited to recognize only one product at a time whereas a single RFID reader is capable of reading multiple tags simultaneously. The success rate of RFID tag reading is much greater than barcodes. Barcodes require a direct line of sight hence making it slower. RFID tags are protected and are usually implanted inside the product. RFID readers can interpret 40 tags in the same time that a barcode scanner takes to interpret one barcode. Wear and tear on an RFID tag is significantly reduced as RFID tags are placed inside products whereas the same cannot be said for a barcode. Barcodes require a straight line of sight to recognize a barcode whereas a RFID reader does not. Barcodes are not re-usable whereas RFID tags can be reused with new information as it has write facility.

Problem Definition

The current scenario of technology used in the retail shops for billing process includes Barcode Scanning[5] which turns out to be a time-consuming procedure. Recent surveys show that customers prefer online shopping than waiting in the queue for small number of products. Each product shopped are scanned by the Barcode Reader in the billing counter. Barcode Readers cannot access the information of a Barcode from a distance more than 15 feet. A Barcode Reader[6], on an average, takes one second to scan two tags, as it requires direct line of sight. The tags are provided on the surface of the product which increases the probability of wear and tear. The product "E-Bag" aims to overcome the problems faced in the current technology and provide a better shopping experience to the customers at shopping malls.

III. PROPOSED SYSTEM

The electronic product is made to display information about the products that are scanned i.e. name and price. Whenever a customer adds a product/item into the trolley, the RFID reader scans the tag and the item's unique product code. The scanned product details will be passed to the microcontroller for further processing which includes retrieving the product details of the scanned item from the existing database. The microcontroller upon receiving the data, displays the name and price of the product on the LCD display present on the trolley for the user. The final information of data is transferred to the main computer. The Internet of Things (IoT) concept is used to achieve this objective. Thus, the final bill is generated after all product details of the customer are transmitted to the main computer and hence the bill is generated.

IV. SYSTEM ARCHITECTURE

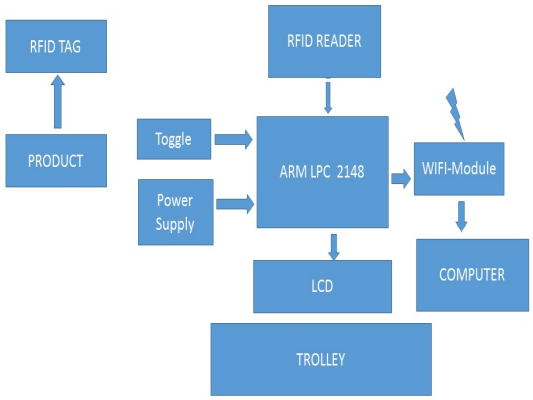

Fig.3.1: Block Diagram of the System

The system architecture in fig.1 defines the behaviour, structure and other properties of a system. It is a representation of a system. The above diagram describes the system architecture of the e-bag system. In the proposed billing environment, each product will have a unique passive Radio Frequency ID which holds a unique product code. This code is used to identify information on the selected product. i.e. name, price etc., When a customer tries to drop in an item in the trolley, the RFID reader scans the tags and the electronic code that is found in it. This code scanned is passed on to the ARM LPC2148 microcontroller which passes on to the main database present in the cashier's system using a Wi-Fi module which is interfaced with the microcontroller at design. Here the electronic code is compared with the data in the database of numerous products through with the product details are obtained. The name and price of the product are displayed on the LCD screen along with the Total price of the scanned items for the user. The scanned data is automatically updates the main database present with the cashier with the scanned information. The final information of the products scanned by the customer will appear on the cashier's screen along with the trolley id where the bill can be generated.

SYSTEM FLOW

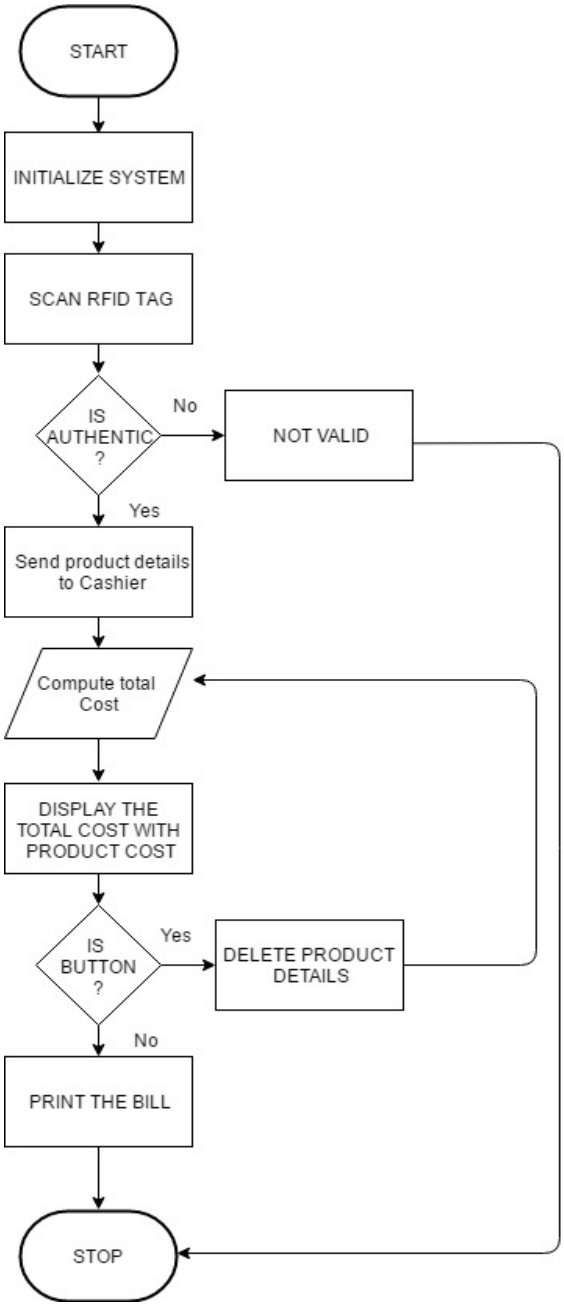

Fig.3.2: Flow chart of system

Algorithm

Step 1: Start
Step 2: Initialize system
Step 3: Scan RFID tag
Step 4: If the tag is Authentic, read data from the RFID tag
Step 5: Compare the data with the one in Database of the Cashier
Step 6: Compute the total cost of scanned products
Step 8: Display the data on the LCD display
Step 9: Press SUB button if you want to don't want to buy a scanned product
Step 10: If the shopping is complete head to the cash counter for your bill
Step 11: Print the bill
Step 12: Stop

V. METHODOLOGY

E-bag is a proposed system which is intended to replace the existing obsolete system of barcode. it is intended to make the process of shopping effortless and time reducing. The system involves 3 major modules these modules are as follows:

i) Customer
ii) E-bag
iii) Cashier

These three major modules are intended to work together to achieve the said objectives. In implementing this product increases the benefits for the store as well as the customer. Fig.3.2 shows the initial process that involves the customer scanning the required products as they are simultaneously stored into database. This can be done by just hovering the product around the RFID reader. As the RFID reader recognizes the product it matches it with the product from the data using IoT Technology. The recognized product details will be directly sent to the cashier and stored in the database. This is achieved using a wireless module. The second module is the product itself, it is made using an ARM microcontroller i.e. LPC2148 microcontroller, RFID reader, Wi-Fi module and an LCD display. These several external components are brought together by the microcontroller board using wires. The final component/module is the cashier. The cashier generally has no work than to print the bills, this not only reduces time but increases productivity in the supermarket. This will increase the number of happy customers.

CONCLUSION

The product developed reduces large queues at the sales and billing counters in Retail bazaars. Various technologies such as RFID technology, Embedded Systems, Wireless module and IoT concepts were used to build the product. The system helps in cost saving at the supply chain level, at the same time substantially reduces the required number of cashiers. Therefore, this method provides a tireless billing procedure at the same time guarantees lower time consumption out of all present billing methods.

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