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IOT Applications on Secure Smart Trolley System

Elizabeth P[1], Harshitha Y[2], Navaneetha V[3], Suhas A Bhayratae[4]

Dept. of IS & E, Atria Institute of Technology, Banglore, India[1,2,3,4]

Abstract: The modern technology has increased the standard of living for the humans. There has been an emerging demand for quick and easy payment of bills in supermarkets. Everyone in their life have craves for a quality in everything they use daily lives. This project describes how to build an automated and time saving system for the world of retail which will make shopping experience impetuous, customer friendly and secure. So, this has resulted in large crowds at shopping malls which have led to long lines at the billing counter because the cashier has to scan every product item and then enter it into the billing record. The prevailing billing system is a bit time consuming. So by thinking of inventing a remedial electronic product to catch-up with this problem. "Automated shopping trolley for billing system" is better approach for the above said problem. This is based on ATmega328 Controller fitted with a LCD and RFID reader and a wireless technology called Zigbee. The LCD and Zigbee modules make the wireless network to work easily between a certain ranges. An innovative product with social acceptance is the one that aids the comfort, convenience and efficiency in everyday life. The brief description of its operation is, when you pick a product and drop it into the trolley, the RFID reader scans the product's unique ID and its price. And it gets displayed on the LCD screen. So after customer has finished with the shopping he/she has to visit the counter and pay the bill as displayed on the LCD screen fitted on the trolley. This will save the time that was earlier being consumed to scan each item.

Keywords: RFID technology, LCD and Zigbee modules make the wireless network, IOT Applications

I. INTRODUCTION

The basic idea of our project is based upon the lines of the ―Secure Smart Trolley System for intelligent Billing with amalgamation of RFID and ZIGBEE used in the Malls and Shopping Centers. Barcodes have been in existence for many years and have been used by departmental stores and supermarkets to manage purchases of merchandise by customers and keep track of inventory. However, the barcode system is no longer the best way to business operation. Customers are tired of waiting in long, slowly moving checkout line in departmental stores, especially, in holidays. With the decrease of prices through efficiencies of technology and large-scale production of semiconductor wireless components, there has been a search for new markets in which semiconductor chips can be used. This has led to the use of RFID also known as smart tags. RFID stands for Radio Frequency Identification. In this project we are using RFID technology for making a Secure Smart Trolley. A device BILLING TROLLEY also called as Data Logger Device is an information storage system. Here the system parameters of a Smart Trolley like products name, products amount, company name etc. are continuously recorded. The system displays as well as announces the name of the product and cost.

Secure Smart Trolley is also applicable for various applications and using proper interface the recorded data can be downloaded on and stored into a computer. The trolley being wireless consist of ZIGBEE module hence free to move in large area. The system is an efficient means for a commercial purpose as it is less time consuming and easy to control. A shopping mall or shopping centres a set of buildings with retail shops with interconnecting walkways enabling visitors to easily walk from floor to floor .The growth was fuelled by rising incomes, greater availability of credit and business lifestyles. Purchasing and Shopping at big malls is becoming daily activity in metro cities. We can see big rush at these malls on holidays and weekends. This crowd becomes huge when there are special offers and discount.

After total purchase one need to go to billing counter for payments. At billing counter the cashier prepare the bill using barcode reader which is very time consuming process and results in long queue at billing counter. The past

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two years have witnessed an explosion of interest in radio-frequency identification and supporting technologies, due primarily to their rapidly expanding using tracking grocery products through the supply chain. Currently such applications monitor Store-Keeping Units (SKUs) rather than individual goods, as the relatively high cost of RFID deployment and the very low profit margin of supermarket products make item-level tagging impractical. Yet, economic and technical concerns aside, it is easy to envision a supermarket in which each item is tagged with an RFID label and all shopping carts feature RFID readers. The carts could potentially include onboard computers that recognize products placed inside and that display information and promotions retrieved wirelessly from the system back end. Item-level deployment of RFID technology would also allow for quick checkout aisles that scan all products at once and thus eliminate queues, which are consistently reported as one of the most negative aspects of supermarket shopping. A simple extension of this system would be to embed RFID devices in consumers' loyalty or frequent-shopper cards to identify individuals. This could expedite system login and charge the shopping cost directly to the customer's account at the point of sale-unless removed at the POS.

II. LITERATURE SURVEY

Literature Survey is an important phase in the system development life cycle as we collect and acquire the necessary information to handle or develop a project during this phase. A literature review is a description of the literature relevant to particular field or topic. It gives an overview of what has been said, who the key writers are, what are the prevailing theories and hypothesis and what methods and what methodologies are appropriate and useful. In this chapter, survey is done prior to taking up the project and understanding the various methods that were used previously. A detailed analysis of the existing systems was performed. This study helped to identify the benefits and drawbacks of the existing systems. Dr. Suryaprasad J in "A Novel Low-Cost Intelligent Shopping Cart“[1] proposed to develop a low cost intelligent shopping aid that assists the customer to search and select products and inform the customer on any special deals available on the products as they move around in the shopping complex.

Amine Karmouche in "Aisle-level Scanning for Pervasive RFID-based Shopping Applications" [2] proposed to develop a system that is able to scan dynamic and static products in the shopping space using RFID Reader antennas. Instead of conducting the RFID observations at the level of individual carts, aisle-level scanning is performed.

Mr. P. Chandrasekar in "Smart Shopping Cart with Automatic billing System through RFID and ZigBee"

[3] proposed to develop a shopping cart with a Product Identification Device (PID) which will contain a microcontroller, a LCD, an RFID reader, EEPROM, and ZigBee module. Purchasing product information will be read through a RFID reader on shopping cart, meanwhile product information will be stored into EEPROM attached to it and this EEPROM data will be send to Central Billing System through ZigBee module.

III. PROPOSED METHODOLOGY

The proposed methodology is the automated billing for a customer during shopping primarily based on RFID supported with other simple technologies. In shopping malls or supermarkets, the products are provided with RFID tags instead of barcodes. The shopping trolleys include the setup containing RFID reader, IR sensor, CLCD, Keypad with a start and end button. Smart shopping carts are given to customers for their unique identification.

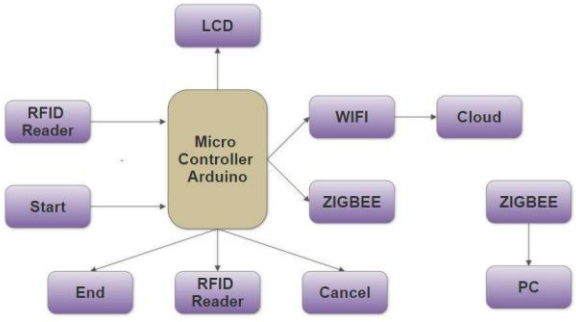

Figure 1: Architecture Diagram

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ID3 Algorithm:
ID3 In decision tree learning, ID3 (Iterative Dichotomiser 3) is an algorithm invented by Ross Quinlan used to generate a decision tree from a dataset. An ID3 algorithm typically utilized in the machine learning and natural language processing domains. Initially, the original set S was taken as the root node in the ID3 algorithm. On each iteration of the algorithm, it iterates through every unused attribute of the set S and calculates the entropy H(S) or information gained IG (A) of the attribute.Algorithm (Id,Set)

//Scan_list::List of Currently Scan Item

//Bill_list::Bill id List

//Find_Newid::Compare two list and find

//new id

//Fetch Data::Get Data from Serve //Delete::Delete item set=1

Repeat While set=1

{ Scan(); Scan_list();

If (Scan_list==Bill_List)then Don't Do Anything Exit();

Else if (Scan_list>Bill_list) then Find_Newid(); Fetch_Data(); Display();

Add_Bill(); Update();

Else if (Scan_list < Bill_list) then Find_Newid(); Delete();

Update();}

Micro-controller: ATMEGA328 is used where it is an eight bit AVR based RISC machine. It operates at 4.5 to 5.5volts DC. It is a forty pin PDIP with thirty-two programmable i/o lines. It consists of non-volatile 32kB of in-system self-programmable flash, 1024B of EEPROM and 2kB internal SRAM. It has features such as timers, A/D converters, PWM and serial interface. Processing speed ranges 0 to 16MHz. So it stores the instructions and process accordingly. Purpose of microcontroller is to control the whole process through the instructions stored.

Figure 2: ATmega328 microcontroller

RFID tags: These tags comprise of a microchip for storage of its unique number and a coil which acts as an antenna for radiating its stored data. It may or may not have a battery depending upon its type either active or passive respectively. Passive tags are used which doesn't have a battery. As soon as the tag comes in the RFID reader coverage range the Reader emits RF signals which gives power to passive tags and it re-emits the signal with data to the reader. Purpose of RFID tags is to uniquely identify products.

RFID reader: EM-18 is used which operates at 5 volts DC and less than 50mA. The frequency at which it works in 125kHz. It can cover a distance of 10cm. It continuously emits RF signals throughout its range and whenever an RFID tag is inside its distance coverage it retrieves the information stored in the tag. Purpose of RFID reader is to retrieve the product information from their RFID tags.

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ALCD: It is a Character Liquid Crystal Display. It consists of two rows and sixteen columns. Each element in a row or a column can display a character which in turn has eight rows and five columns known as pixel. It has sixteen pins where data is fed through eight pins. The supply voltage should be 5 volts. Purpose of CLCD is for displaying information to the customer such as welcome note, product catalogue, product details, invoice etc.

IV. RESULTS AND DISCUSSION

The proposal finally results in an effective outcome where RFID technology replaces barcode due to its drawback where barcode requires the line of sight and should be placed in its exact boundary while scanning, but RFID's only constraint to be considered is its distance coverage. RFID tags are more durable than the barcode which damages due to temperature, water, physical tear etc. This ensures the process of scanning easy and precise. Then the password authentication process aids in avoiding the illegal usage of smart cards and also prevents data sniffing. The door in the trolley doesn't open until a product is scanned which doesn't allow to place a product inside a trolley that is not scanned. The tracking of count of products using IR sensor placed inside the trolley aids in protecting the theft of the products and taking away products that are not billed unintentionally. Removing a product can also be done perfectly with the push button which guarantees customer that products can be removed whenever he changes his mind. The product catalogue display feature enables the customer for easy search of products without any difficulties. The results show that the proposed model is fine to be implemented in current shopping environments.

V. CONCLUSION

In this project, we have implemented & tested Secure Smart Trolley with amalgamation of RFID and ZIGBEE based on RFID and ZIGBEE technology instead of barcode. We would like to highlight that we drew the inspiration and idea of this project after observing large queues at the sales, billing counters at the Retail bazaars and shopping mall. While working on this project we learnt substantially about RFID technology, embedded systems and wireless systems, especially ZIGBEE modules alike. This system would help in cost saving at the supply chain level. At the same time it would also reduce the required number of salesmen. Thus it is truly time saving method and guarantees the less time consumption out of all present billing methods. We are implementing a Smart trolley for intelligent billing by using RFID tag and ZIGBEE.

VI. FUTURE ENHANCEMENT

Future advancement is to use enhanced RFID readers that operate in high frequency which can read multiple tags simultaneously. Mobile application can be developed to avoid smart card and GSM. Inventory management can be incorporated using IOT which in turn helps in automation of stock management. This trolley can be implemented by using RF module instead of RFID. For even better and convenient method of paying cash for the purchased items we can directly implement card swapper for swapping the card which can be embedded inside the trolley of the system module. It can even be implemented further in the dock, shopping mall, airports.

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