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Smart Trolley Shopping System

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Abstract: In this paper, innovative concept of RFID Based Smart Shopping and Billing is introduced. The key idea here is to assist a person in shopping mall in terms to reduce time spent while purchasing a product. The main goal is to provide a technology oriented, low-cost, easily scalable and rugged system for aiding shopping in shopping malls to customers. The developed system comprises of Product Identification Device (PI), Server Communication unit (SCU), User Interface and display unit (UIDU) and Billing and Inventory Management Unit (BIMU). Each product of shopping mall will be provided with a RFID tag, to identify its type. Each shopping cart is designed or implemented with a Product Identification Device (PID) that contains microcontroller, LCD, RFID reader, EEPROM, and RF 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 EEPROM data will be send to Central Billing System through RF module. The central billing system gets the cart information and EEPROM data, it access the product database and calculates the total amount of purchasing for that particular cart. The customers will be able to scan the items themselves and the LCD screen on the shopping cart will keep updating the total. Main aim of this system is to provide an automatic billing to avoid queue in malls and super markets.

Keywords: Embedded System, Microcontroller, RFID, MYSql, Java, Eclipse.

I. INTRODUCTION

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 technology. Smart Shopping system, consists of two sections one is Shopping cart section and another is Server section. Each RFID tag is attached to respective products and when RFID Reader reads the RFID tag this information is transmitted to AVR Atmega 16 microcontroller (database gets updated from the server continuously controlled by system Admin). The RFID tag number is compared with data available, if it is present in the database then it displays product details like name of the product, cost, and total amount of bill to be paid. As u keep on adding the products into your cart, the total cost is also updated at the same time. This process will be repeated till end of shopping.

At the end the total billing information will be transmitted to Admin server side using RF module and bill is generated and after payment consumer can leave the counter. In Cart section we are going to place the proposed model. As we know, in Mega marts and Shopping places, there will be many trolleys or carts.

Product can be of any type as for every product RFID tag is attached which contains RFID unique number which has been already stored in database. When consumer drops the product into the cart, RFID reader reads the RFID tag and passes the RFID tag number to the processor.

The proposed system comprises dedicated website which will list all the items available in the shop for the customers. A database has been created which will have all the product details.

Final bill will be generated when the customer finalizes his shopping. The bill will be verified by the admin and once admin gives permission the customer can go ahead with the payment.

II. GOALS AND OBJECTIVES

- A. Enhance shopping experience of customers in shopping malls.
- B. Minimize shopping time.
- C. Reduce the checkout time while eliminating the time taken to wait in a queue.
- D. On dropping each product into the cart, the number of products and its total cost is displayed on to the LCD screen.
- E. Automatic billing as and when the products are dropped in the cart.
- F. Update entries in the central system upon each purchase of a product.
- G. Display the bill on the LCD screen as well as on users mobile.

III. LITERATURE SURVEY

- 1) The proposed system makes the use of ultra high frequency (UHF) RFID technology in the smart shopping system, as UHF passive tags have a longer range, from 1 to 12 meters. Previous research on the design of smart shopping systems mainly focused on using low/high frequency RFID, which have inadequate ranges, and leave customers to manually scan items with a RFID scanner. In proposed system, each smart cart is equipped with a UHF RFID reader, a microcontroller, an LCD touch screen, a Zig-Bee adapter, and a weight sensor. The smart cart is able to automatically read the items put into a cart via the RFID reader. A micro controller is installed on the cart for data processing and a LCD touch screen is equipped as the user interface. In order for the smart cart to communicate with the server, they have chosen Zigbee technology as it is, low-power and inexpensive. We also have a weight scanner installed on the smart cart for weighting items. The weight scanner can also help do a security check, for example, if a malicious user peels off one items RFID tag and puts it into the cart, extra unaccounted weight will be added. When a customer finishes shopping, they pay at the checkout point using the generated billing information on the smart cart. We also set a RFID reader before the exit door to check that all the items in the cart have been paid for.
- 2) Hsin-Han Chiang et al, proposed a preliminary development of the smart shopping cart (SSC) that can be integrated into the smart mall system. With the use of radio-frequency identification (RFID) tags, the SSC can automatically detect the various products which are being added in the cart and show the related information on the user interface. Finally, the automatic billing service can be done by the SSC and the stored shopping data will be transmitted to the cloud server of shopping mall.
- 3) Ala Al-Fuqaha et al, proposed the concept of the Internet of Things (IoT) with emphasis on enabling technologies, protocols and application issues. The IoT is enabled by the latest developments in RFID, smart sensors, communication technologies and Internet protocol. In this system an overview of some technical details that pertain to the IoT enabling technologies, protocols and applications is provided. Moreover, the relation between the IoT and other emerging technologies including big data analytics and cloud and fog computing is explored.
- 4) This paper provides a non-exhaustive, rather earlier than recent, overview of contributions in the field of Radio Frequency Identification technology (RFID), and its use in several sectors. The multidisciplinary nature of this emerging technology requires skills from various engineering fields. Due to the growing use of RFID in various economic sectors, it seems essential to educate engineers, and technicians, to better master this technology. For this purpose, an RFID engineering technology curriculum may be established using different approaches. This paper discuss an approach to integrate RFID technology within usual engineering curriculums by stressing its link to usual disciplines such as industrial, electrical and computer engineering. A case of an RFID laboratory established at the University de Moncton (UdeM) is shown. An RFID-based automation of a flexible conveyor system application, carried out in this laboratory, is also described.
- 5) In the last few years, SMS (Short Message Service) has made a big impact on the way we communicate. Instead of communicating over the phone using voice, people rather prefer SMS not only for messaging but also for information exchange. This paper proposes a method of building an extendable generic application which can be used to provide various types of information services using mobile SMS. Mobile users send required information through an SMS to a mobile gateway that forwards it to the generic application. Given the user-provided information, the generic application automatically generates an appropriate query.

IV. PROBLEM STATEMENT

The existing barcode system which is very tedious technology that scans only two items per second, with the help of RFID tags and Readers we can scan up to 40 tags per second thereby saves time. So we are going to design a microcontroller and RFID based smart shopping and billing system.

V. SYSTEM ARCHITECTURE

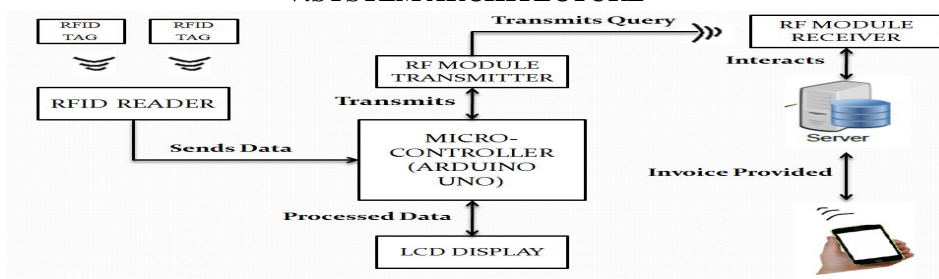


Fig. System Architecture

A. RF Module

RF module consists of RF transmitter and RF receiver. It is a small electronic circuit used to transmit and receive radio signal. It selects one out of a number of carrier frequencies. Types of RF module are:

- 1) Transmitter module
- 2) Receiver module
- 3) Transceiver module.

It is capable of transmitting and modulating a radio wave that carries data. Transmitter modules are implemented alongside a micro controller which will provide data that can be transmitted to the module.

B. RFID Tags

Tags are of two types: passive tags which have no battery life and active tags which have battery life. RFID tags released for automatically identifying a person, a package or an items. These are transponders that transmit information. RFID tag contains two parts. One is integrated circuit for modulating, storing and processing information and demodulating radio frequency (RF) signal. The second is an antenna for receiving and transmitting signal.

C. RFID Reader

RFID reader consists of an RF module that acts as a transmitter and receiver of radio frequency signal. Transmitter consists of an oscillator to create the carrier frequency, a modulator make impact on data commands upon this carrier frequency; a modulator to make impact on data commands upon this carrier signal and a receiver that contains demodulator to extract the data returned.

VI. CONCLUSION

The proposed system intent to simplify the billing process, make it swift and increase the security using RFID technique. This will take the overall shopping experience to a different level. It is truly time saving method and guarantees the less time consumption out of all present billing methods.

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