

Implementation of Secure Smart Shopping System using IoT

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Abstract— In today's life supermarkets shopping are increasing rapidly as the technology and generations in people life. Generally in supermarket bazar people will purchase what they need and put those product into trolley. After shopping they wait in the billing section. Where it takes more time to billing for each individual customer and some people will get frustrated and go without purchasing. To avoid this time consuming we proposed an RFID based Technology. So the RFID Reader which reads the tag information when the product put into trolley. Then this information sends to the server which sends information to main billing section and to customer mobile which calculates the product total amount to both customer and to billing section and also display the product information in a tablet phone which will be attached to the trolley. This trolley application is based on trolley product information calculating and scanning information of the products which will be in trolley.

Keywords: RFID, IoT, PID

I. INTRODUCTION

INTERNET OF THINGS (IOT) is the network of physical embedded with radio frequency identification (RFID) embedded systems, sensors, network, and software that enable physical objects to collect and exchange data for a common goal.

Now a days every objects can be equipped with computing power and communication functionalities, allowing objects everywhere to be connected. This is a new revolution in an IT industries, financial and environmental systems and great challenges of data management systems, wireless communications and security with fast access. So the technology is growing and where the common man can also use it. Which can make a digital technology.

In this paper, we focus on smart shopping system based on radio frequency identification (RFID) technology, which is not came into existence in past. In the supermarket all the products will be attached small RFID UHF Active tags which will be in 1 to 12 range of frequency and placed in racks. In trolley there will be an RFID Tag Scanner which will be connected to the server and the programmed shopping mart application and small mini tablet will be provided to the trolley for customer login section after customer logging then the trolley will be active and scan the product and calculates the amount which will be sended to both customer and billing section after customer at the end by this the customer can save time and every details of product will be get by customer.

A. Existing System

In previous research on the design of smart shopping systems mainly focused on to save time of billing section and the customer product should be checked once again after billing. They only focused on calculating the amount of the customer product.

B. Proposed System

In our proposed system, each trolley is equipped with a UHF RFID reader, a micro controller, an mini tablet, a beep sound buzzer, a ZigBee adapter, and a weight sensor. This trolley will be known as smart cart where it is automatically able to read the products through RFID reader. And a micro controller is used for data processing and a mini tablet is used for an user interface and beep buzzer is used to make a sound if the product is not valid while RFID reading and which doesn't allow to purchase that product. ZigBee technology is used to communicate with server and data exchange purpose. And weight sensor used for weighing items. And we also set a RFID reader before the exit door to check all the items in the cart are paid or not. Which will consider as a security.

II. ARCHITECTURAL DESIGN

A. System Architecture

Each trolley is attached with product identification device (PID). Through ZigBee communication, PID device sends its information to automated central billing systems and mini tablet which will be a user interface. Where the net price will be calculated and displayed to customer and this mini tablet also provides a paying option trough banking application and third party paying apps. And while exiting the RFID scanned fixed at door will be scanned automatically if the bill paid it opens the door. In trolley if the customer take back product from trolley automatically RFID reader will remove its price and if the customer cheats by exchanging product RFID tag. RFID TAG will automatically makes a Beep sound from the beep buzzer and that product would not be scanned and rejects it shows error. And the weighing products will be automatically weighted by the weight sensor and all these data will be collected and sends to the billing department and to the customer where he logged in trolley application. Finally ZigBee transceiver and server system connected to access product database.

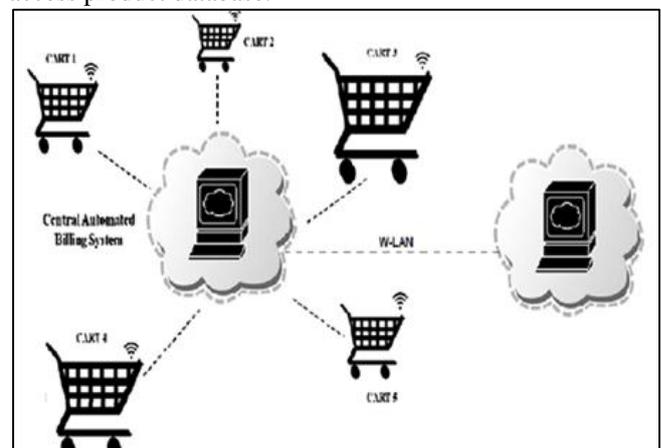


Fig. 1: System trolley architecture

B. Hardware Architecture

Every trolley in the supermarkets is attached one device which consists of hardware components with RFID reader, microcontroller, sound buzzer, mini tablet (palmtop) and weigh checker, ZigBee.

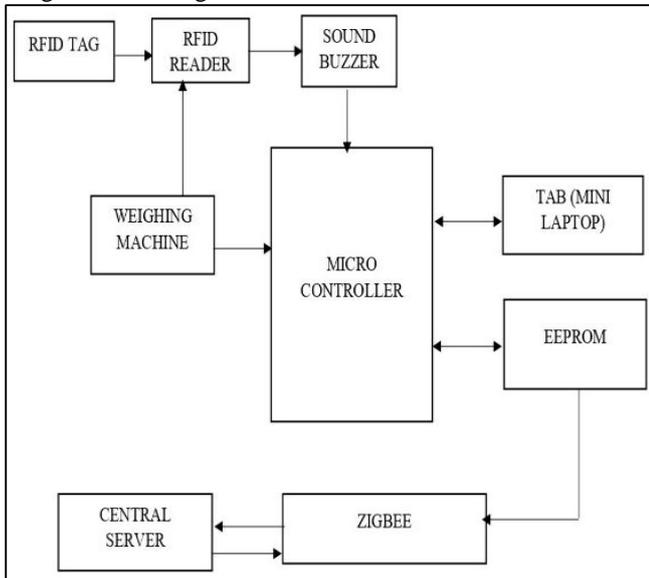


Fig. 2: Hardware architecture of system

III. SYSTEM WORKING

All trolley in supermarkets will be attached mini palmtop or mobile tablet phone which the user will sign up and login. After login there will be attached RFID reader to scan the RFID tag which will be connected sound buzzer. If the customer doesn't need the product when he take back from trolley that product amount will automatically removes. The sound buzzer is used in this concept for the security purpose. The RFID tag may exchange in the product so to avoid and get to know the theft the buzzer is used and it will be connected to the microcontroller and after it is verified it sends data to the eeprom and next it sends the data to the ZigBee next it sends the data to the central server. after verification it sends the total amount of the purchased items and generates the bill to the customer and also for billing section and then in the same reverse position to the ZigBee and microcontroller to the display user interface tablet android application.

There will be provided payment option from third party payment application like paytm, phone pay, citrus and others. This application payment gateway will be connected to the central server and the customer can pay through his debit card also and he get the bill from message softcopy to his mobile and also the payment bill will be displayed in the billing section.

The android application will be same as in the below mentioned diagram which will be display in the trolley mini palmtop as a user interface.

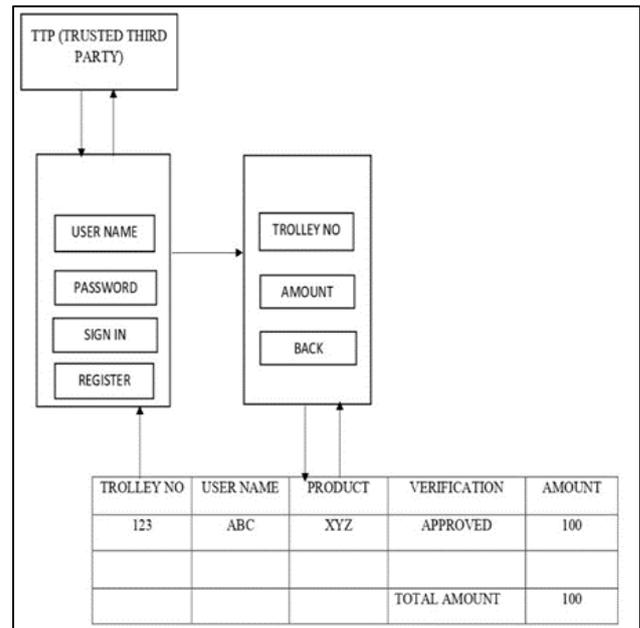
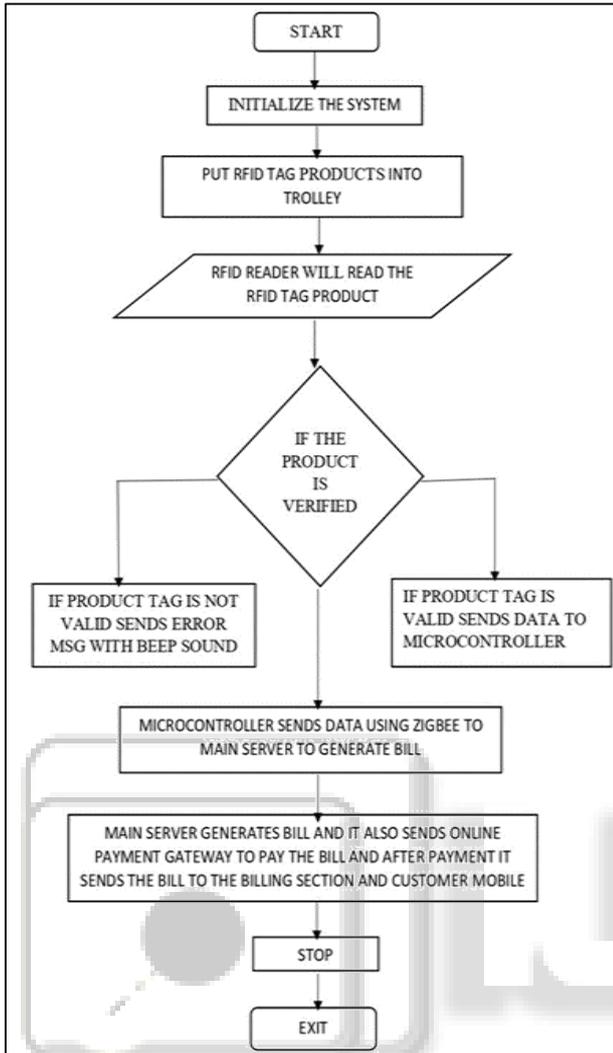


Fig. 3: Android shopping application

A. Algorithm

- 1) STEP1: Start
- 2) STEP2: Initializing system (sign in method)
- 3) STEP3: Put the RFID tagged product into the trolley. If the customer wants to remove the product the trolley will remove the cost of it.
- 4) STEP4: RFID reader reads the information of the RFID tag and sends data through microcontroller into EEPROM
- 5) STEP5: After RFID Scan the Sound buzzer will help to confirm the RFID tag matching the same tagged product. If the product and RFID tag is different than the sound buzzer makes beep sounds and won't allow the product inside trolley.
- 6) STEP6: weigh machine used to calculate the unweighted product and sends the data through microcontroller to the EEPROM.
- 7) STEP7: Next the data from Microcontroller and EEPROM will be received by the ZigBee and sends the data to the central server.
- 8) STEP8: Next the central server calculates the bill received from the ZigBee and generates the bill.
- 9) STEP9: Next server generates bill and will be displayed in the display of trolley. If the customer wants to pay the bill he can pay through online payment apps and through debit card from the attached palmtop.
- 10) STEP10: After payment confirmation customer gets the bill to his registered mobile and the data will be sends to billing section
- 11) STEP11: Stop

B. Flowchart



IV. CONCLUSION

Our aim is to provide a fast and secured purchase in a supermarket by using RFID based technology which works with the data analysis and internet of things concept. so this project not only saves time of the customer and reduces the man power and also secured selling and buying of a product. If this project came to existence means our country India will move to upper stage of digital India.

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