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Smart Shopping System with Inventory Control

Prof.Vidya. R. Kulkarni¹, Shruti Bhusare²

Associate Professor, Department of Computer Science and Engineering, KLS GIT Engineering College, Belagavi,
Karnataka, India¹

M.Tech Student, Department of Computer Science and Engineering, KLS GIT Engineering College, Belagavi,
Karnataka, India²

ABSTRACT: In this digital world time is precious resource, making the shopping experience smarter and fast is challenging task. The proposed shopping system comes with smart cart an electronic device for scanning the products that needs to be purchased, and the details are displayed on LCD screen once the shopping is finished final bill will displayed. This system reduces the time of waiting the customers in queue for checking out their punched items. A wireless communication takes place through ZigBee module for transferring generated bill to server where the bill gets printed. This shopping system also does the inventory control, which attracts customers as well as shoppers.

KEYWORDS: Internet of Things (IOT), Arduino, Barcode, ZigBee.

I. INTRODUCTION

Internet of Things is connection of devices consists with electronics components, sensors, actuators and computer networks, these devices are used to collect data and exchange data among themselves. Each device is uniquely identified. Below figure shows the increase in connected devices from 2003 till 2020.

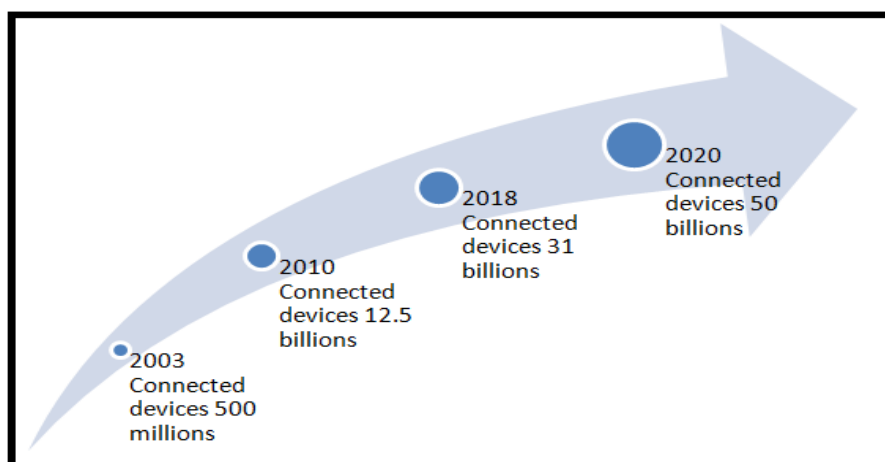


Fig 1: Upward arrow showing growth of connected device

The smart shopping system comes with the smart cart which is an embedded device with barcode scanner for scanning the barcodes of products, an LCD display for displaying the details of items such as name, price and quantity, a microcontroller for manipulation and sending data to server, and a ZigBee module for wireless communication. The

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proposed system helps in speeding the billing process instead of making customers to wait in long queue to check out their shopped items, use of Barcode reader are very popular but practical implementation of these in shopping malls or markets is very difficult, costlier and requires lots of maintains, hence the proposed system uses the barcode which is readily available and requires less maintains. The system also comes with the inventory control such as “ABC inventory policy” for managing frequently sold items less frequent and very less frequent items. The system also calculates the average utilization of cart and shows the graphical display of cart utilization and item sold for 20 days shopping data.

II.LITERATURE SURVEY

A paper entitled “Arduino based smart cart” here group of people designed the smart cart in interesting way; they also implemented the feature of security in it. The design of smart cart was like mail box when item is dropped in it the door used to get closed automatically they will open only when the amount of the product was paid, but this system had many drawbacks such as once the item is dropped and if the customer do not want purchase it the will not open unless payment is done. This system did not gain much popularity because of this drawback [1]. A paper entitled “Intelligent shopping cart” here the shopping cart for speeding the billing process and used the Arduino microcontroller, and RFID tag and reader for selecting the items. Practical usage of these tag in shopping mall is expensive and requires lots of maintains [2]. A paper entitled “Integration of wearable devices in a wireless sensor network for an e-health monitoring” The author in this paper discussed about use of WSN in IoT based application, the use of WSN in-health or human physiological monitoring, this application was used in fire fighting and sports, the user is provided with interface to suggest a series of exercise to improve a sports man’s/women’s condition depending upon their context and profile, the user can interact using different interface [3].

A paper entitled “RFID technology for IOT-based healthcare systems in smart spaces, “The group of authors has explained about the use of RFID for personal healthcare, the device is used for monitoring the users health and gives remote assistances, the users can interact through any wireless communication medium, the sensors are able to detect the physical parameter of environment such as humidity, temperature and presences of toxic agent [4]. A paper entitled “Future internet, the internet of things application, key challenges and architecture”. The author in this paper talked about the existing development trends, the generic architecture of IoT, its distinguish features and future application they also explained about key challenge associated with future IoT such as naming and standardization, information privacy, object security, data encryption and network security. The author also discussed about ubiquitous computing where processing of information is linked with each object that is encountered and IoT Security [5].

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III. PROPOSED SYSTEM

A. User End:

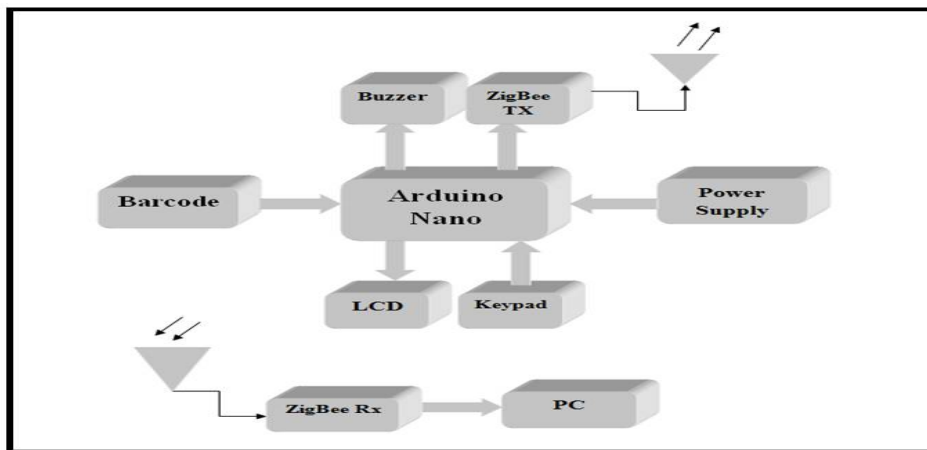


Fig 2: Block diagram of system

The figure 1 shows the architecture of smart shopping cart. In smart shopping cart the Arduino Nano board is used with ATmega368 microcontroller there are many input and output devices which are connected to microcontroller such as a buzzer which is used to give signal when an item gets scanned and final bill is generated, the buzzer gets output from Arduino. The result from Arduino is displayed on LCD screen connected to Arduino. The details of products such as price and quantity are displayed. The smart cart is powered using acid lead battery which is connected to Arduino. The ZigBee TX that is a transmitting unit is connected to cart for wireless communication which transmits the data to receiving end.

B. Server End

The below figure 2 shows the architecture of server side application. The data which is sent from cart through ZigBee transmitter is received at server through ZigBee receiver then the data is sent to personal computer/server where the bill is generated and the data gets stored in database as shopping history, then inventory analysis is done on this data such as ABC inventory management and mean standard deviation, beginning and ending inventory are calculated then the respective graphs are generated.

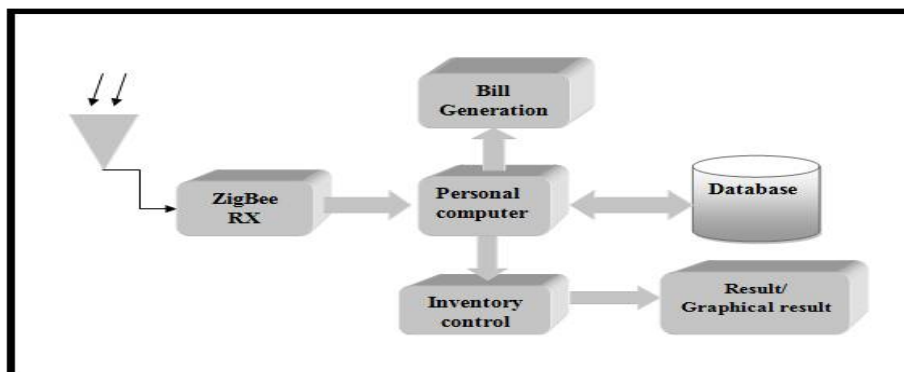


Fig 3: Architecture of server side application

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IV. FLOWCHART

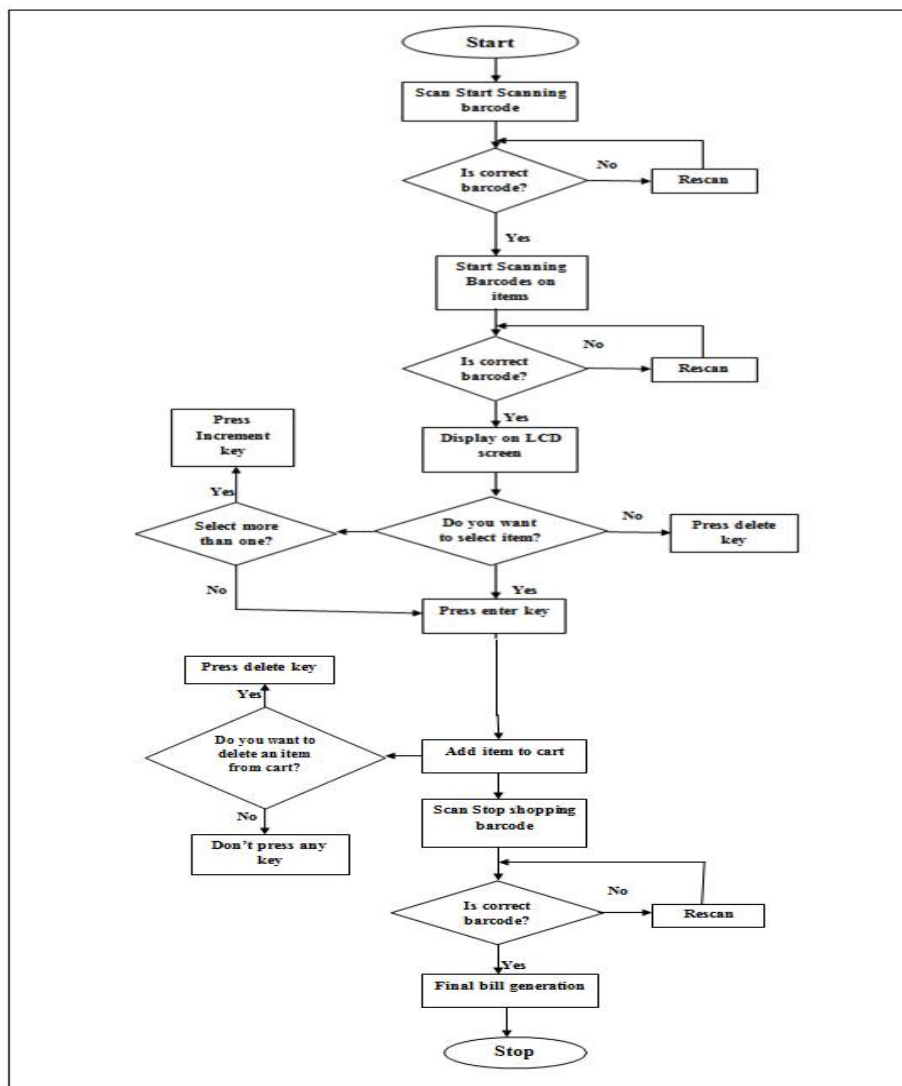


Fig 4: Flowchart of System

The above flowchart explains the execution flow of smart shopping cart, once the executions starts at the beginning we need to scan start scanning barcode, if the barcode is incorrect we need to rescan once it is done proceeds by scanning barcodes of items which we want to purchase. The details of respective item is displayed on screen if we want to purchase the item press enter key, if we want to purchase more than one item press increment key if we want to delete the item from cart press delete key. Once the shopping is finished we need to scan stop shopping barcode after that final bill is generated.

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V. REQUIREMENT ANALYSIS

This chapter explains the requirement analysis such as the software requirement and hardware requirement. Requirement analysis is the initial step of project development, the project with the proper analysis leads to successful completion of the work.

A. Hardware Requirements

- Arduionano with ATmega 326 microcontroller
- ZigBee Communication Module
- LCD display module with 20*4 characters
- Buzzer a pierzo electric buzzer
- Barcode Scanner of TVS BCS 101 model
- Lead acid battery for power supply works at 5 voltage

B. Software Requirements

- Arduino Software 1.8.5 integrated development environment
- Dip Trace for layout design
- Java development kit version 8
- Eclipse IDE mars
- MySQL Database 5.5.38
- Apache Tomcat 8.5.24

VI. EXPERIMENTAL RESULTS

A. Hardware Model



Fig5: System Hardware Model

B. Server Side Interface

The figure 6 shows the welcome page of server side application, it asks to enter the port number to which the ZigBee receiver is connected this done only one time when the device is connected and the link is provided for bill generation page. In the figure 7, we can see the final bill is printed this system also does the inventory control, the goods are categories into three categories A, B and C, different buttons are provided in the interface for adding products in respective categories. A graph generator button generates the graph of quantity sold in 20 days of respective products.

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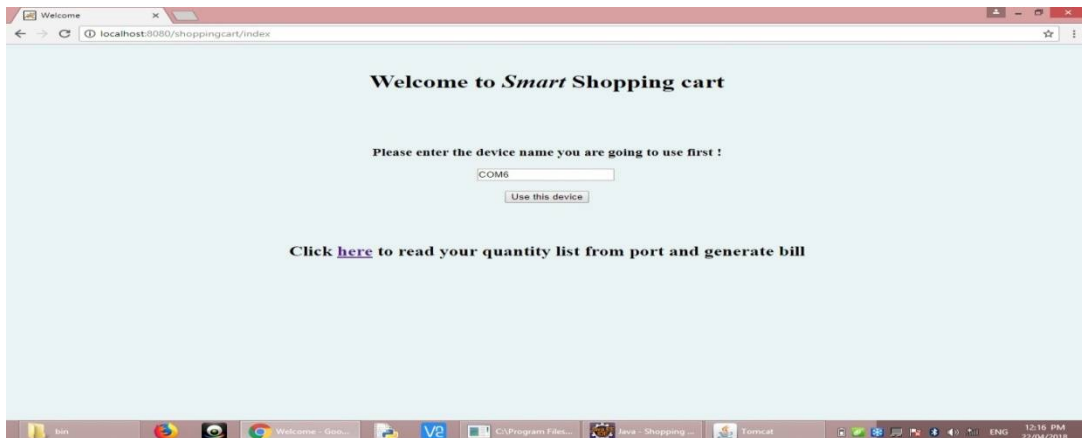


Fig6: Welcome page

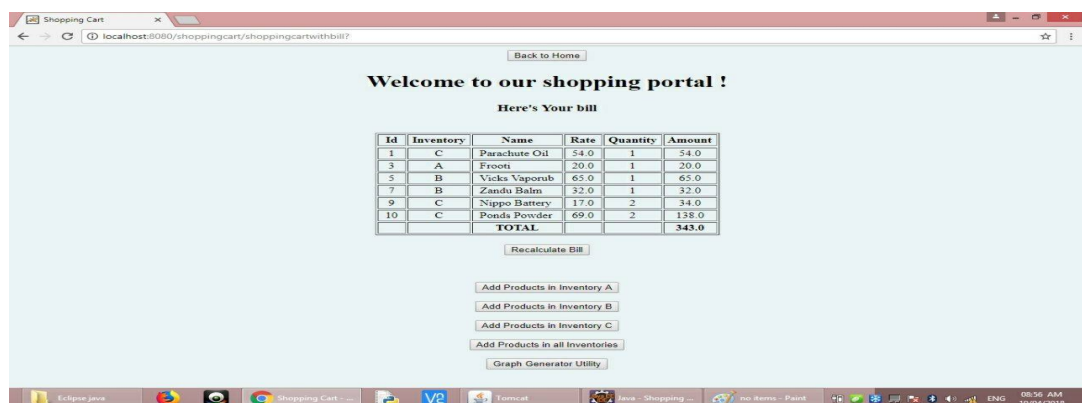


Fig 7: Bill generation

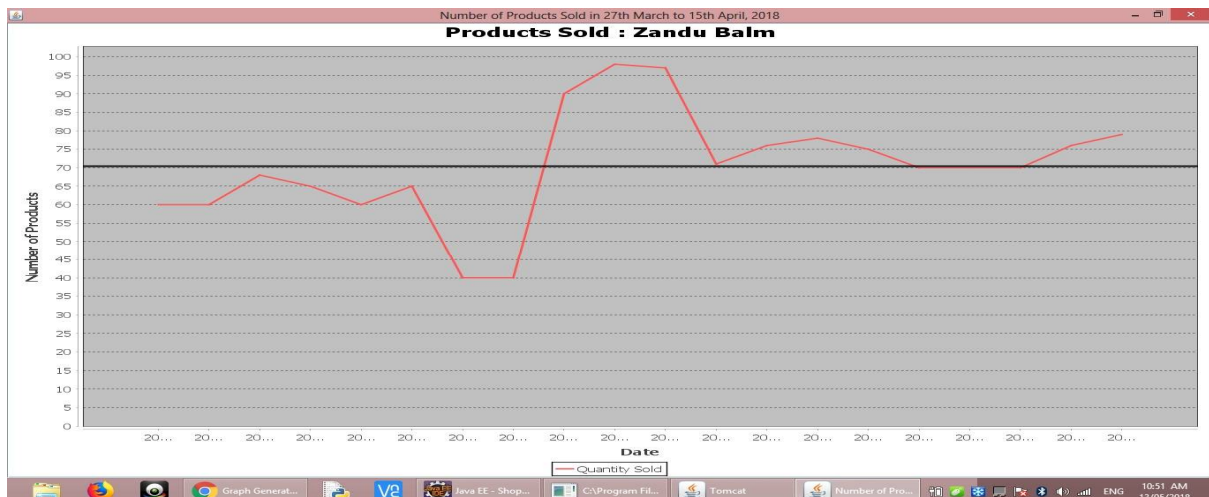


Fig 8: graph of sold products in 20days

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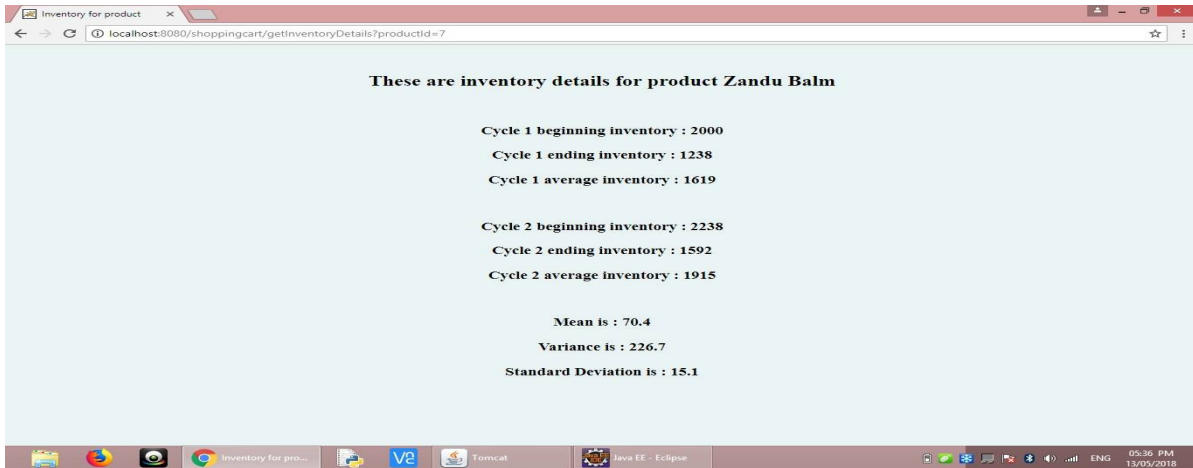


Fig 9: Inventory details

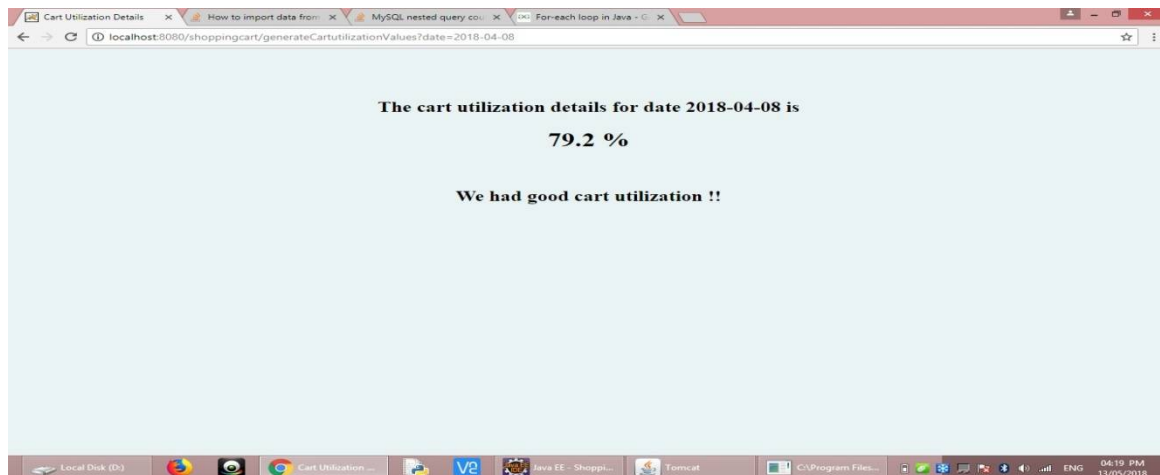


Fig 10: Cart utilization on day 8th April 2018

The figure 8 shows the bar graph of number of quantity sold in 20 days. This graph can be used for analyzing ABC inventory policy that which item sold maximum in 20 days. The figure 9 shows the inventory details such as beginning inventory, ending inventory, average inventory, mean, variance and standard deviation of sold product Zandu Balm. The figure 10 shows the cart utilization on date 8th April 2018, the cart utilization is above the threshold we can say that better utilization of cart.

VII. CONCLUSION

The proposed IoT based smart shopping system can be used in areas such as malls, super markets and other shopping stores. This smart shopping system not just provides the smarter way of shopping but also reduces the time for waiting in queue for checking out their purchased items and also reduces the man power in stores. The smart shopping cart is designed in such a way it is very user friendly and attracts the shopper. The system also has the feature of inventory control with ABC inventory control policy that is managing the goods in store. Generate graph of sold items and

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compare it with mean these values are used to analyze the sales. The system also gives the cart utilization so we can get the performance of cart in each day.

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