Smart Trolley for Shopping Malls

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Abstract: **Electronic Commerce has become extraordinarily popular the increase in wireless technologies and different communication techniques. Getting and shopping at massive malls is turning into daily activity in metro cities. There's a large rush in such places throughout weekends and holidays. People purchase completely different things and place them in the trolley. When completion of purchases, one must head to bill counter for payments. At the billing counter, the cashier prepares the bill victimization bar code reader that is incredibly time intensive process and ends up in the long queue at the charge counter. Also, individuals encounter a retardant of paying an excessive amount of their time waiting in queues for charging their purchases in numerous shopping centers or supermarkets. The billing method is kind of tedious and extremely time intensive and has created the requirement for retailers to use more and more human resource within the billing section, and yet waiting time remains considerably high. The most goal is to supply a technology-oriented, economical, simply scalable, and rugged system for aiding shopping in person.**

Keywords: **barcode scanner, raspberry pi, central billing system, ZigBee wireless module, security database, central server.**

1. Introduction

Humans have continuously invented and developed a technology to support their needs ever since the beginning of humans. The essential purpose of advancement in technology has been in minimizing tasks and creating everyday chores easier and quicker, regardless of the assorted domains obtainable. A significant task on that person's area unit found spending a substantial quantity of time is shopping. According to a Survey, just about most of the humans pay 1.5 hours daily on shopping. many purchasers can continuously tend to run out of a queue if the queue is extremely long. this shopping atmosphere will merely be classified into 2 classes (1) shopping in-person and (2) shopping in absentia. shopping in-absentia is supported in many ways as well as online shopping, tele-shopping, etc. wherever during a shopper or a client doesn't get to be present physically within the shopping arena. shopping in-person involves a private visit of an individual to the shopping malls or centers and choosing the product/s supported the assorted factors as well as need, fashion, convenience, brand, etc. In recent years a deep structural modification has occurred, with consequences of economic process and society, particularly in factors like territorial occupation, urbanization, openness to Global markets, demography, family structures and cultural and intense patterns. Innovation in communication and knowledge technologies have caused a revolution in values,

data and perceptions all told areas. This sector is these days extraordinarily necessary in a worldwide economy, with its recent evolution in technological, political, social and economic terms creating it one of the foremost convenient and numerous businesses across the world. The challenges and opportunities created by electronic business has caused the sharing of knowledge between business partners to enhance operational performance, shopper service and solution development The emergence of recent technologies, like radio frequency Identification (RFID) and wireless networks, makes the normal retail processes quicker, clear and economical. The most objective of the planned system is to produce a technology-oriented, low-cost, simply scalable RFID system for shopping. The target of this project is to enhance the speed of purchase by victimization RFID. This project is designed to use the safety system application within the shopping trolley. If the product is put into the trolley then it'll show {the quantity |the quantity |the number} and also the total amount. RFID card is employed for accessing of the products. thus, this project improves safety performance and additionally the speed. Customers can purchase several things and place them into the trolley. Once customers were done the acquisition, they have to travel to bill counter for payment. At the billing counter, the client can prepare the bill using bar code reader that could be a time intense method and can create the long queues at asking counters. All the products within the look area unit connected with RFID tags. Once a client places any merchandise within the trolley, its distinctive code is detected and therefore the worth of these merchandises are obtaining keep in memory. As we have a bent to place the merchandise into the trolley then costs will automatically get added to the total bill. So, the asking has drained the trolley itself. Total bill information is transferred to the laptop by wireless Transmitter and receiver modules at the billing counter. Once the client purchases a product, she/he 1st scans the RFID tag of the product using the RFID reader then place it into the trolley. Whereas getting the products customer has to scan the RFID tag of the product, worth of the product is taken and keep within the system's memory. The main objective of the proposed system is to provide a technology-oriented, low-cost, easily scalable RFID system for shopping which is able to improve the speed of purchase. This project is intended to use the safety system application within the shopping trolley. Here RFID card is employed for accessing the products. Therefore, this project improves safety performance and conjointly speed. The system

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of machine-controlled sensible trolley using RFID will be helpful in many alternative places. It's terribly helpful in searching malls, native marts in several cities, mega-marts, book stores, stationery stores, grocery stores, airports, etc. to help someone in shopping regarding reduced time spent whereas billing at the counter. Goals of this project are as follows,

1. Reduces hands needed in billing section.
2. Reduces the expenses incurred by the management.
3. Users will be attentive to the overall bill quantity throughout the time of purchase.
4. Reduces time spent at the billing counter.
5. Increases customer satisfaction.6 Easy stock management.
6. Customers don't need to wait in long queues for searching.

2. Literature survey

A. Existing systems

- *LiFi Based Automated Smart Trolley Using RFID:* In this system RFID tags are used rather than barcodes. every and each product has RFID tag. Whenever the client puts a product into the trolley, it'll get scanned by RFID Reader. The name and value of the product are going to be displayed on the digital display. visible light Communication (VLC) technology is employed to transfer the info to the most computer. At the billing counter, LIFI receiver are going to be placed, which can receive the data from the transmitter.

- *Smart Shopping Trolley Using RFID:* The sensible shopping trolley would comprise a microcontroller, android Device, RFID Reader and an Electronic display. The product in the shopping centers can have RFID tags to retrieve/access data concerning it. once a client places a product within the sensible trolley, the RFID Reader can scan the product ID and also the data associated with it'll keep in the controller. There'll be communication between the Android device, main server and request system (gate system) via a ZigBee module. The entire quantity of the product within the trolley is going to be calculated using an Android device and can be updated on the server and also the Central Billing System.

- *Automated Shopping Trolley for Super Market Billing System:* The Automated Shopping Trolley is a Smart Trolley which integrates a Raspberry Pie Embedded Chip with two Bar code Scanners and a Battery kit to allow users to self-checkout at Super Markets. In this paper, "Intelligent Shopping Basket" is proposed which aims to reduce and possibly eliminate the total waiting time of customers, lower the total manpower requirement and expenses for markets and increase efficiency overall.

- *RFID based smart Trolley for Automated Billing System:* In this paper, the "Smart shopping cart System" is proposed, which will save the track of product that is purchased and calculate the bill using RFID reader and Transmitter and Receiver. The system will offer suggestions for a product to shop for supported user purchase history from a centralized system. In "Smart shopping cart System" each product in the marketplace are connected with RFID tag, and each cart is having RFID Reader, liquid crystal {display| LCD| digital display |alphanumeric display} display and Transmitter and receiver connected to it.

- *Shopping and Automatic Billing Using RFID Technology:* In this paper an architecture is presented that blends radio frequency identification (RFID) and wireless technology to produce 'on spot' billing in super markets. It uses the RFID based system application within the shopping trolley and therefore the RFID card that is used as a security access for the product. The liquid crystal display (LCD) that's mounted to the trolley displays the product name, value and therefore the total value of all purchased product. The bill is transmitted to the server finish through the zigbee technology. The software system simulation is completed using Proteus software system and hardware is implemented using 18F46K22 microcontroller. This promotes fast shopping and immediate pay without any queuing method. It reduces labor efforts and will increase potency by minimizing errors.

B. Disadvantage of existing work

The disadvantage of the system is their uses both the reader RFID and Barcode Reader because of that the system becomes more complex.

3. Proposed work

The Current Shopping system in malls and supermarkets is as follows. The customer has to take the items to be purchased and put them in trolley. After he is done choosing the items, he has to go to the billing counter and wait in the queue till his turn comes. After waiting in long queues when he reaches the counter, all the items are to be scanned by the barcode reader in order to prepare the final bill. This is very time consuming and tedious task.

To make the shopping experience of customers quick and easy, we have proposed our system which works as follows. A unique RFID tag will be attached with all the item in the shop. When customer chooses the items to be purchased and puts them in trolley, the RFID reader attached with the trolley will automatically read the tag which will recognize the item for billing. The name and cost of that item will be displayed on the LCD screen fitted on the trolley. When customer is done, he will press the submit button on trolley. Then all the data about

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purchased items will be sent to the billing counter for final billing. When customer goes to the billing counter, all he has to do is provide the unique trolley number of his trolley and he will get his printed bill. He can immediately pay the bill and leave the shop to continue his work.

Our system will consist of:

1. An application system with billing and database management facilities
2. Database to store the stock inventory and bill submit queue.
3. RFID Tags with unique RFID Number attached to the products
4. RFID reader to read the RFID tags on purchased product
5. Microcontroller to store RFID data
6. Wifi Module to transmit data to the Application System
7. LCD Display to show purchase details
8. Different Buttons for operations to be performed

Advantages of proposed work:

- Reduces manpower required in billing section.
- Reduces the expenses incurred by the management.
- Users can be aware of the total bill amount during the time of purchase.
- Reduces time spent at billing counter.
- Increases customer satisfaction.
- Easy stock management.
- Customers do not have to wait in long queues for shopping.
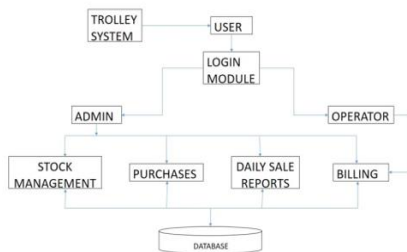
4. System architecture

Fig. 1. System architecture

This is the System architecture of our system. It is overall schematic of project. It defines the modules and working of all the components of the project.

This is the Use Case diagram of the system in which the interactions of several users with system are shown. In this actor represent the users and ellipse represent the processes. There are three types of users who will access the system. They are customer, Administrator and operator. Administrator can access overall Application system, whereas operator at the billing counter can only access the billing module of the system. Customer will only be able to access the trolley module while purchasing items.
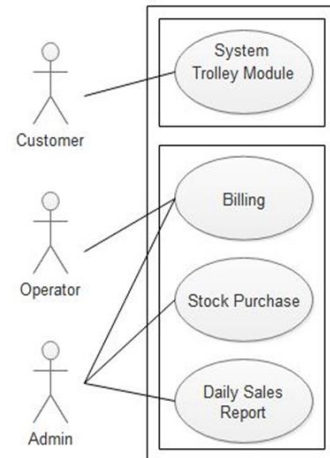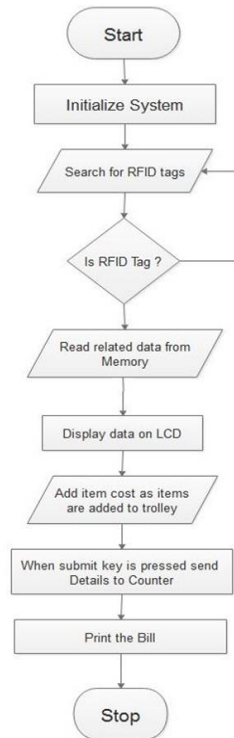

Fig. 2. System module

Fig. 3. Flow chart

Above is the Flowchart which shows the complete working of the billing system the is the working of hardware on trolley and application software's printing module

A. Algorithm

1. Start the process
2. Initialize the system
3. Scan an item in RFID tags
4. Check the RFID tags
5. If the tag is registered or scanned, RFID reader can read the data related from memory.
6. Display the data and cost with help of LCD

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7. The item is added automatically the item cost also add and produce the total cost
8. If any item is removed, the total cost is subtracted by the particular removed item and again the process will be continuing
9. Send the total amount in the billing system
10. Print the bill xi.
11. The process is end.

5. Implementation details

Implementation details consist of the hardware and software requirements used to make the proposed system. the following list of modules defines the system implementation of the smart trolley for shopping malls.

A. *List of module*
1) *Hardware design*
   - *PCB circuit design:* The circuit for microcontroller and other hardware components is designed with the help of Proteus 8 software. After designing the circuit, PCB layout of that circuit is prepared.
   - *Connecting hardware components on the PCB:* Referring the PCB layout designed with Proteus 8 the circuit board is printed. All the hardware components are mounted and soldered on that Printed Circuit Board (PCB).
2) *Design of application software*
   - *Database design and connectivity:* For keeping a record of stock available in the mall, past bills, stocks purchased, information about administrator and operators, etc. database is used.
   - *Implementing the billing system:* This system is designed such that, it will accept the data string from trolley unit and prepare the final bill for customer. It will also
   - *Implementing sales report generation:* The system is designed to analyze the sales of particular day or time period and generate report for that day or period of time.
   - *Implementing Stock purchase management:* The system is designed to communicate with the database and give information about available stock. Also, after purchasing new stock for the shop, the administrator will be able to alter the inventory accordingly
3) *Interfacing of Microcontroller with barcode scanner*
   1. Design of trolley
   2. The hardware units like PCB, LCD display, RFID reader are mounted on the trolley.
   3. Configuration of hardware using Embedded C

All the hardware mounted on the trolley are assigned their desired functionalities using Embedded C and Keil compiler.
4) *Interfacing of Trolley unit with Application Software*
   - Installation of Wi-Fi module with 8051: The PCB design for Wi-Fi module is designed and printed. The

hardware components necessary for Wi-Fi connectivity are mounted on the PCB.
- Configuration of Wi-Fi module: The Wi-Fi module hardware is assigned its functionality of connecting the trolley unit to application software.

6. Final resultant model

First user will see the Home page of the Shopping Mall if user wants to start shopping by clicking on the image user will get to see the shopping Index.
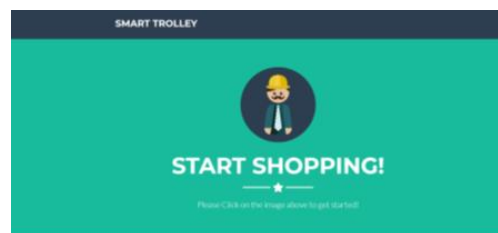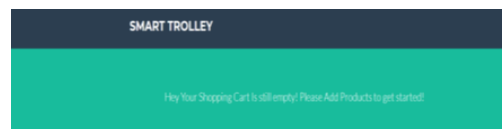

Fig. 4. Home page

Initially the cart is empty

Fig. 5. Empty Cart

When customer adds the product in trolley then system will show the description of purchased product.
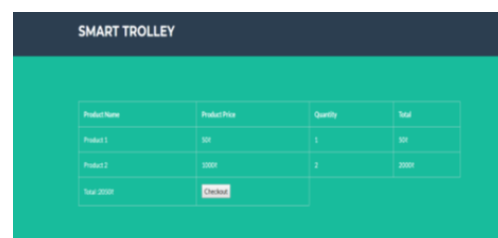

Fig. 6. Generated product details

After completing the shopping customer will click on checkout button then order will be successfully completed.
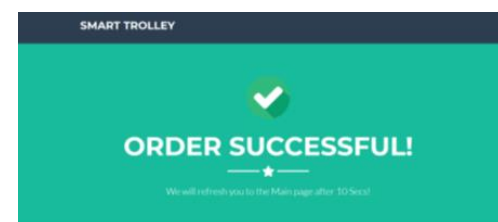

Fig. 7. Order confirmation-checkout

7. Conclusion

Taking into consideration the changing trend in retail shopping, we to tend to come to a conclusion that the "Smart

trolley using RFID" is most actually an explicit necessity for the Retail marketing industry to improve their portfolios, cope up with the advancement in technology and save time and manpower. Also, technologies that capture information regarding interactions between physical objects don't seem to however mature enough for the consumer market as they're comparatively pricey. Even once such knowledge becomes on the market the task of decoding it's usually as difficult as its registration, since no standardized classification scheme or applicable taxonomy exists. Many efforts to make standards are underway however are still at least years away. A related problem is that new systems should be integrated in existing retail infrastructures, which regularly operate using legacy and incompatible systems. Moreover, the preparation of retail causes important growth in electronic transaction loads which current systems are unable to deal with.

8. Future scope

The proposed Smart Shopping Trolley System intends to assist shopping in-person which will minimize the considerable amount of time spent in shopping as well as to the time required in locating the desired product with ease. The customer just needs to type the name of the product he/She wants to search on the Android device, and the cart will automatically guide him/her to the product/s locations

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