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Inventory Control and Theft Detection in Mall Using RFID

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Abstract—

On holidays, the malls in metro cities are crowded. People purchase different items in the malls and put them in the trolley. At the cash counter, billing process is done using bar code scanner. This is very time consuming process. To overcome this, the system is developed using RFID Technology in malls.Other purpose of developed project is to provide inventory control in malls and theft detection. As the items will be purchased and taken by the consumer from the display rack, the rack must be again filled up with the vacant items. It should be notified to the store section against the billing of the items. This updatation information is sent to the store section via Zigbee module. Because of this there is no waiting period for customers. This project will save time and efforts of the workers for housekeeping in mall. The theft detection is done at the time when consumer comes for billing. For this purpose, consumer has to enter through the specific door.

Keywords—RFID Technology, inventory control, display rack updatation, Zigbee module, theft detection.

I. INTRODUCTION

In Previous days, all the records of stores were kept on paper. It was tedious as well as time consuming job to maintain all the records on paper. There is no advanced system for theft detection. For this purpose, man power is required. But now a day this scenario has changed and it is taking help of new technologies like Barcode, RFID etc. for this purpose. A barcode is an optical machine-readable representation of data relating to the object. This barcode is printed on the object. It requires scanner which reads one item at a time. For this purpose, object is to be placed in line of sight of the reader. The readability of the barcode can be impaired by dirt, moisture, abrasion or packaging etc. Even though it is less expensive, there is limit to hold the data as well as its readability is limited by the range in which that object is placed. But this technology is becoming old and out-dated. CCTV cameras are used for detecting thefts in malls. With the use of RFID it is possible to overcome these disadvantages and quick theft detection is possible.[6]

II. LITERATURE REVIEW

In the paper entitled as "Anti-theft Security System Using GSM, GPS, Radio Frequency Identification Technology Based on ARM 7", published by author Maheshwari V. Chandrawar . An embedded system based on the Global Positioning System, the GPS, and Radio frequency identification technology is developed to prevent automobile from theft.[4]

The paper entitled as "Product Management & Shopping Guidance System using GSM & Object Oriented Programming", published by Payal Laljibhai chhatrola. Main aim behind this system is guiding a consumer for shopping by sending one SMS to supermarket inquiry number toinquire about goods information from anywhere and at any time like quantity, price whether item is available in stock or not.[7]

The paper entitled as "Data Storage on Radio Frequency Identification Tag for a Distributed System " published by Sarita Pais discusses about the current research study explored the applications using data-on-tag approach. The theoreticalconcept of data-on-tag approach is impressive. However the viability of data-on-tag approach is dependable on the RFID technology. [8]

The paper entitled as "Futuristic Billing Trolley Using RFID module and ZIGBEE module". In this system, RFIDtags are used instead of barcodes. This RFID tags will be on the product. Whenever the customer puts a product into trolley it will get scanned by RFID reader and product price and cost will be display on LCD display. [6]

III. SYSTEM DESIGN

This system consists of two sections i.e. billing section and store section. The implementation of these two modules which are placed at different places is represented in fig. 1 and fig. 2.

A. Block Diagram for Billing Section:

The fig. 1 shows block diagram of billing section. It consists of computer for processing of data, RFID reader for performing billing action and another RFID reader at the door for theft detection. These both are connected to computer via RS 232 for comparing sold item code and actual stored item code in database. Zigbee module is used to transfer data from billing to store.

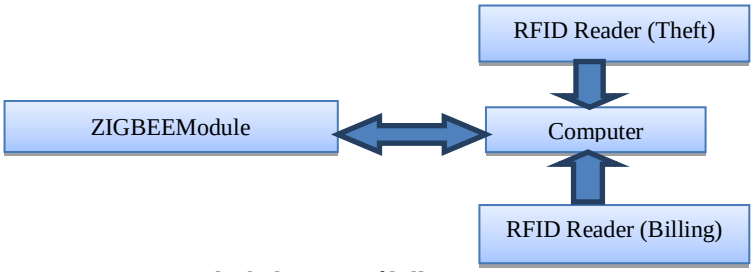

Fig.1 Block diagram of billing section

B. Block Diagram for Store Section:

The fig. 2 shows block diagram of store section. It consists of computer to store database of products available at store. The provision to add new products is also provided here. The store computer is connected to Zigbee via RS 232 which acts as a media to transfer information from billing to store section. The updated information is transmitted and received using this Zigbee between stores and billing computer.

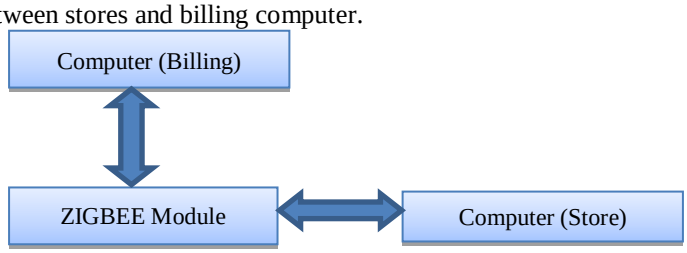

Fig.2 Block diagram of store section

C. System flowchart:

Even though two modules are placed at different places, working of these modules goes hand in hand. So these modules are combined in single system flow chart.The complete system work follows the system flowchart shown in fig. 3. The systems at store and billing section are initialised. RFID reader at billing scans the tags which are attached to the products. Simultaneously, it checks whether the tag is detected or not at the door. If tag is detected, message theft detection is done. If tag is not detected at door, billing action is performed and updated information is transferred to store section.

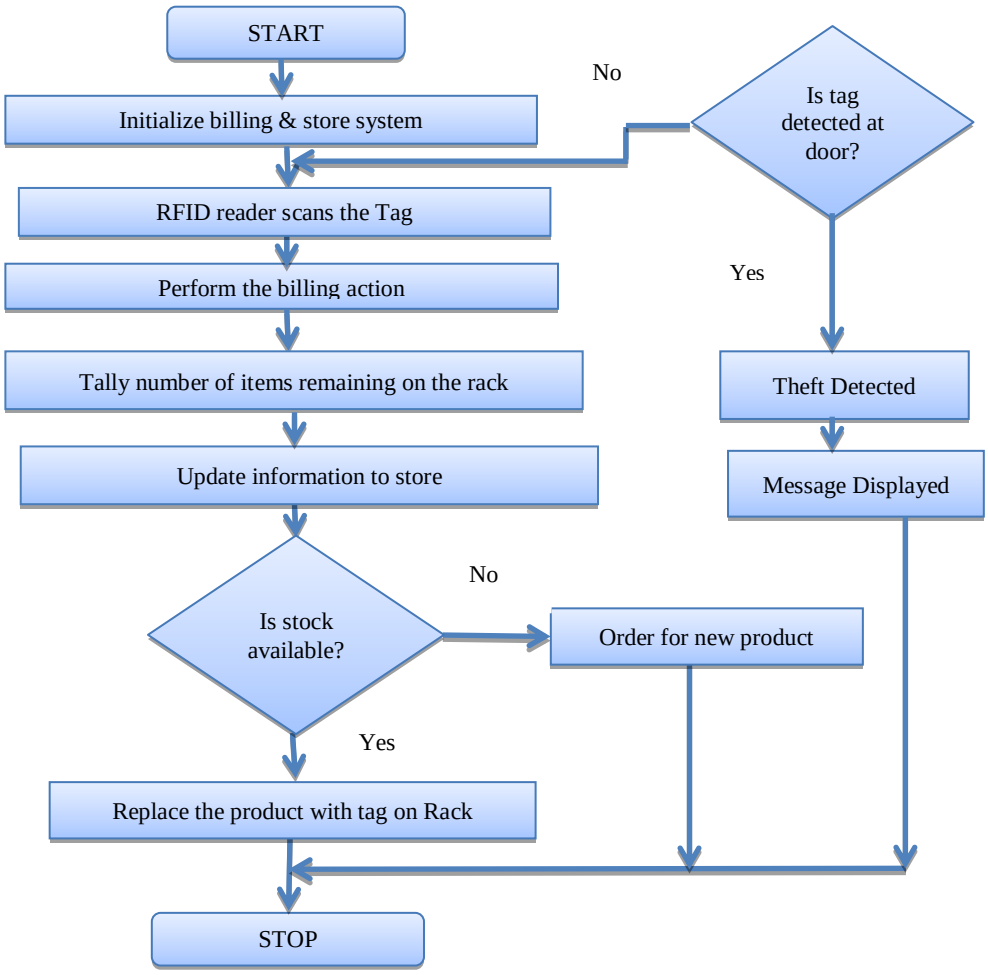

Fig. 3 System flowchart

IV. WORKING

This project is mainly divided into two sections, billing and store section. In the mall RFID tag attached products are placed on the rack. Here, passive RFID tags are used which are powered by RFID reader. [3]

After collecting the products, customer arrives at billing section. Before performing the billing action, customer will go through door. There is RFID reader placed at door. If tag is detected at door, that particular customer will be defined as thief. Theft detection will be indicated by beep as well as message will be displayed at billing computer. If tag is not detected at door, then that customer goes through billing process.

The collected products are scanned by RFID reader (EM 18), which has range of 10cm. RFID reader works with the frequency of 125 kHz. It works on DC 5 volts and less than 50 mA current. RFID reader is connected to billing computer via RS232 cable.

In this project, Visual studio 2008 software is used to display information related to products such as name, quantity, cost and product ID. Database is stored in Microsoft access at backend. This information is updated to store via ZIGBEE module (series 1) which is connected to billing computer via RS232. ZIGBEE module which is having range of 40 m, is operates at 3.3 mv with 40 mA current.[6]

The data transmitted from ZIGBEE connected to billing section is received at store section via another ZIGBEE module. This module has same specification as that of billing module. According to updated information from billing, store will check available remaining stock. If required, it will add new products and update the information to store as well as billing section. The information at store will also help to order new products.

V. RESULTS AND DISCUSSIONS

When proposed module is implemented at store and billing section, observed screenshot windows are presented in this section.

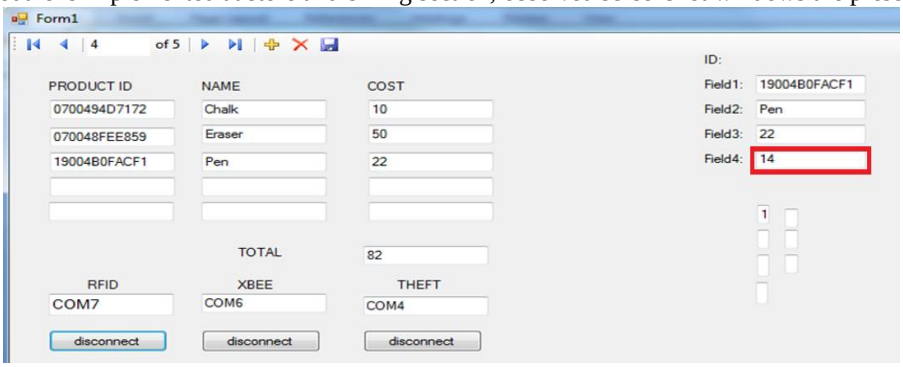

Fig. 4 Window for multiple products scanning at billing section.

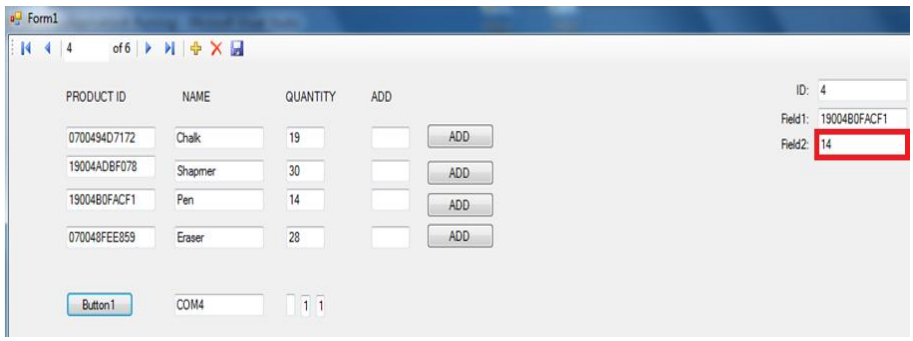

Fig.5 Window for multiple products scanning at store section

This fig.4.shows window after scanning multiple products. In this figure the COM port is initialized to activate the process. Three connect buttons are used for this purpose. Along with product ID, name of products, cost and quantity, it shows total cost. This data is transferred from billing to store section via ZIGBEE. As shown in fig. 5 the received data is displayed in field 1 and field 2 at store section. Field 1 contains product ID and field 2 contains quantity. As highlighted in fig 5, after scanning a single pen, the quantity is 14.

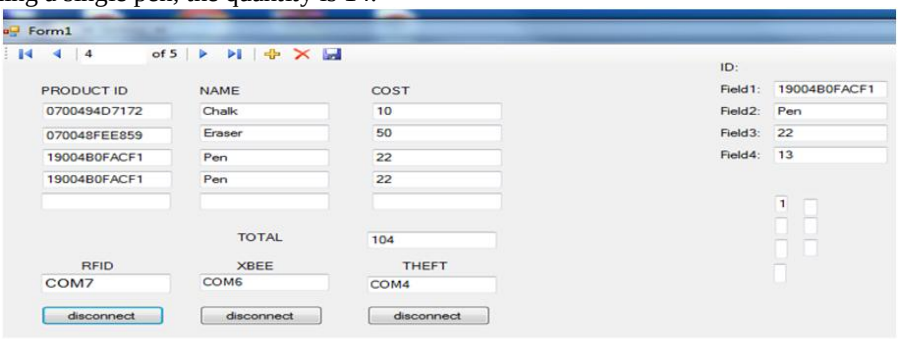

Fig. 6after scanning same products, quantity gets reduced at billing section.

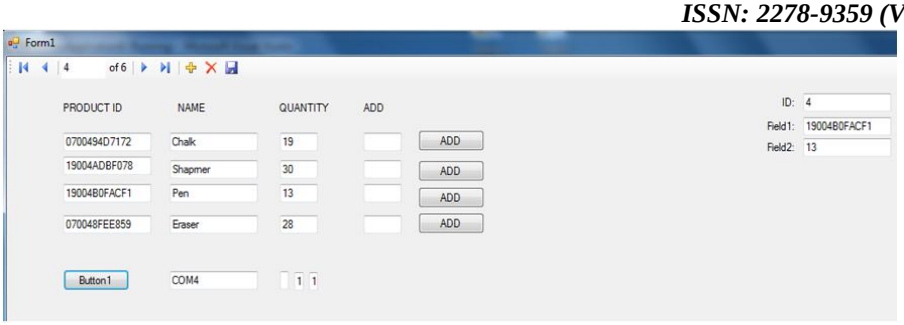

Fig. 7after scanning same product quantity gets reduced at store section.

This fig. 6 shows after scanning same product i.e. Pen, quantity gets reduced from 14 to 13. This data is transferred to the store via ZIGBEE which is shown in fig.7

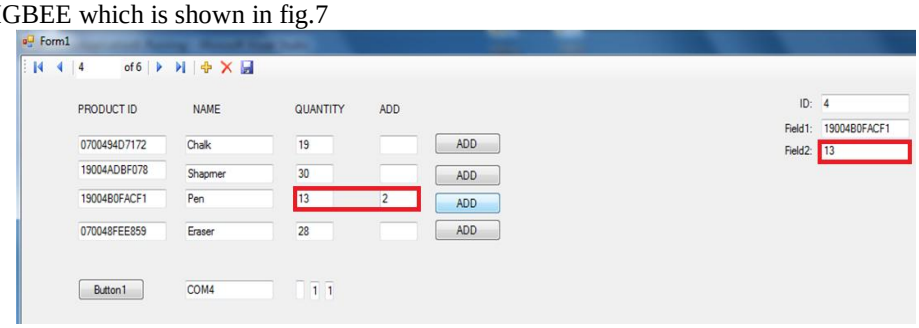

Fig.8 before adding product named as Pen.

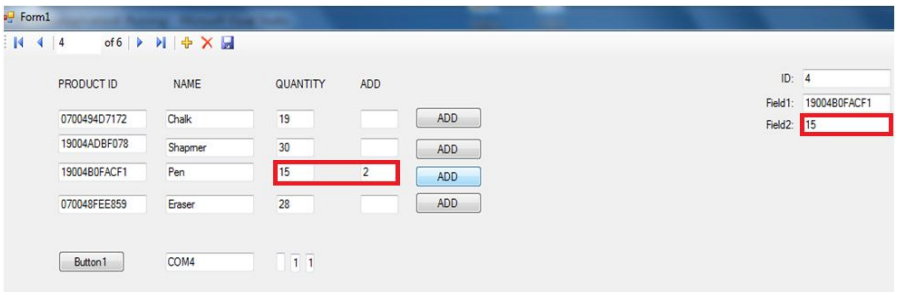

Fig. 9after adding product named as Pen.

As shown in fig.8 there is provision to add new products at store section. Before adding product named as pen, its quantity is 13. After adding 2 new pens, its quantity gets changed to 15 which are highlighted in fig. 9.

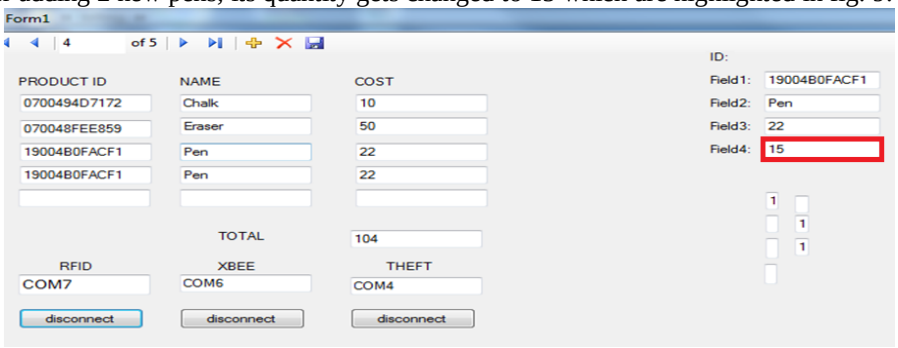

Fig. 10after adding product, data at billing updated

After adding products at store section, updated data is transferred from store to billing via ZIGBEE which is highlighted in fig. 10

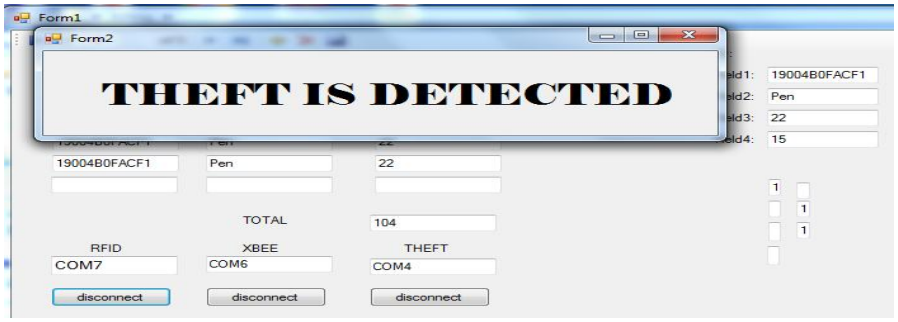

Fig. 11after theft detection

Fig.11 shows window after theft has been identified. If tag is detected at door, the message "THEFT IS DETECTED" is displayed at billing section.

VI. CONCLUSION

In previous days, maintaining records along with the details of items, cash memos, billing action was done manually for inventory control operation in a shop or mall. With advancement in technology it was replaced by barcode and RFID tags. It was seen that the barcode were getting damaged so scanning of it was not possible. The basic drawback of barcode was line of sight reading was essential.

To overcome this, the current system is developed using RFID technology in malls. RFID is a versatile technology, capable of being used by business. It facilitates inventory control along with accurate billing operation. Along with the operational time reduction, the man power requirement will be reduced. An additional advantage of the system is theft detection. It is possible to detect and indicate the theft in malls only with the usage of RFID. Simultaneous data updatation regarding the items will be done at the store when billing of the products will be done. So the cost involved in the management of all supply chains can be drastically reduced. Only initial cost for manufacturing the packaging material with RFID tags, reader, communicating media, two PCs will be required

A tag can be attached to product while manufacturing itself. This will help to segregate products easily at various stages of dealing. The correct count can be determined and the man power required for it also can be reduced. RFID reading range will be improve, hence distance will also increase. This will help for housekeeping the entire mall more efficiently. It is also possible to pass the collected objects by the customer at the billing section using conveyor belt thus providing automation.Thus, using RFID reader with high frequency and attaching tags to products during manufacturing is beneficial in future.

VII. FUTURE SCOPE

RFID reader is limited by its frequency. If the frequency of RFID reader is increased the range for detection of tag is increased. And multiple scanning of products is possible.In today's era the products manufactured by the companies are packed and dispatched to dealers. For this purpose, the human resource is involved to mark and identify the products along with its quantity. This is a time consuming process. There is a possibility of miscount of products by the workers.

To prevent these problems, a tag can be attached to product while manufacturing itself. This will help to segregate products easily at various stages of dealing. The correct count can be determined and the man power required for it also can be reduced.

RFID reading range will be improve, hence distance will also increase. This will help for housekeeping the entire mall more efficiently.It is also possible to pass the collected objects by the customer at the billing section using conveyor belt thus providing automation.Thus, using RFID reader with high frequency and attaching tags to products during manufacturing is beneficial in future.

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