RFID, ZigBee and GSM Based Automatic Billing Trolley For Shopping Mall

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Abstract : One of the important aspects of modern electronic technology is embedded systems based on micro controllers. The main aim of science has always been to make our lives easier. We observed that the main cause for long queues at the billing counter is not the crowd but the time spent in scanning each and every item using the Bar code Technology. The RFID reader scans all the items as and when they are put in the trolley. The record of the items bought is stored in the micro controller memory along with their individual costs as well as the total expenditure. This information will be displayed on a LCD screen which will also be placed on the trolley for the customer to verify the item bought and to keep a track on the amount spent on each item. At the billing side, the employee can get an itemized bill from each and every trolley just by giving the trolley number as the input to a software which would then print the itemized bill. Data can be erased from the micro controller memory after the bill is printed so as to make that trolley reusable.
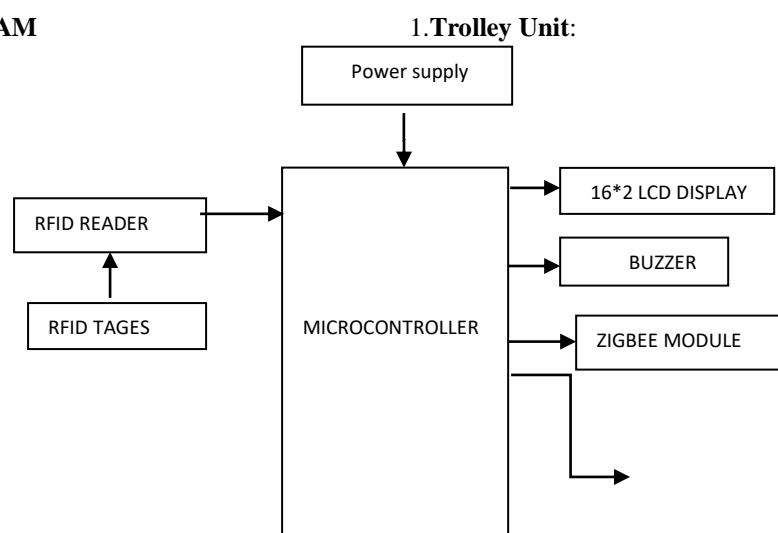
Index Terms : Radio Frequency Identification (RFID), Wireless ZigBee Module, Infra-Red (IR) transmitter and receiver, RFID tags, Microcontroller, Server database, GSM Module.
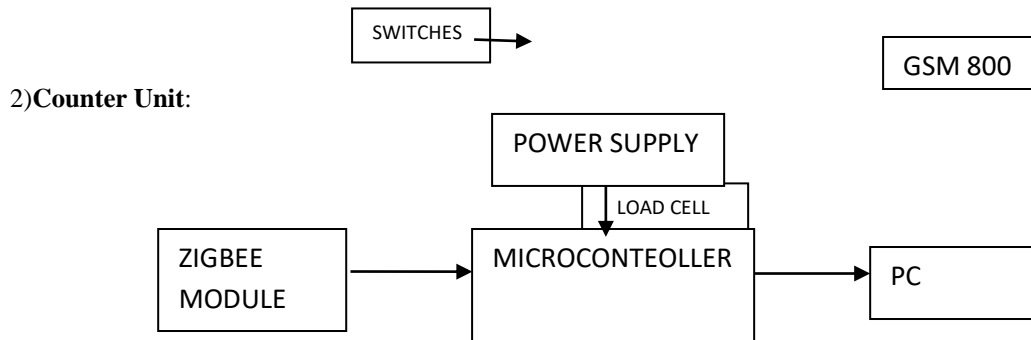
I. INTRODUCTION

The recent evolutions in technology and people's understanding towards the technical advancements have made it possible to develop comfort in the grocery industry. Also consumer perceptions of privacy, security and trust in present commerce mentioned that the proliferation of electronic commerce technologies has utterly transformed the way business is conducted. Products are lined up in stores; customers check their price and may be their nutrition value too. Put all the stuff in a cart and push it around to fill until its bloating. Standing in a queue for billing wastes an ample amount of time and customers realize they have stuff in their cart more than they can afford to buy. The recent couple of years have witnessed explosive interest in RFID and supporting technologies due to rapid expanding use to track products. Similar technology can be used for unique identification of each product in the supermarket. The RFID readers are non-contact sensors that can read over a considerable distance. The items are added just by hovering the item over the reader once only. Deleting the item from the cart is just as simple, which can be done by hovering the item over the reader a second time. Supermarket is the place where customers come to purchase their daily using products and pay for that. So there is need to calculate how many products are sold and to generate the bill for the customer. Cashier's desks are placed in a position to promote circulation. At present, many supermarket chains are attempting to further reduce labour costs by shifting to self-service check-out machines, where a single employee can oversee a group of four.

II. BLOCK DIAGRAM

1. **Trolley Unit**:

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2)**Counter Unit**:

III. HARDWARE USED

Trolly Unit
In this unit the ARM processor is attached to a RFID reader and barcode reader. As the user puts the items in the trolley the reader on the trolley reads the tag and sends a signal to the ARM processor. The ARM processor then
stores it in the memory and compares it with the lookup table. If it matches then it shows the name of item on LCD & also the total amount of items purchased.

Billing Unit
As soon as the shopping is over the user comes near the billing section .The total bill will display on the billing
computer.

Power Supply
The AC supply is applied to 12V step down transformer. The transformer output is the 12V AC which is rectified using a diode bridge. The output of Diode Bridge of 12V DC is filtered by capacitors.

RFID Tags
The RFID tags are used to tag the barcode of the items. Which gives the information of the items. The RFID constist of two types of tags that are active tag and passive tag. We are using the active tag which have battery life.The RFID has either fixed or programmable logic data which sense the sensor.

RFID Reader
RFID reader is used to read the barcode information which is tag by RFID tag. When the
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IV. SOFTWARE DESCRIPTION

object is take close to the sensor the light from the LED reflects from the object and bounced into the
LCD Display
A 16*2 LCD display is a very basic module and is very commonly used in various devices and circuits . a 16*2 LCD means it can display 16 characters per line and there are 2 such lines. LCD is used to display the cost and names of the items in the project.

Zigbee
 The RFID tag number is compared with database if it is present in the database then Product details like Cost, manufacturing Year and Name of the Product is displayed and at the end Total Bill information is displayed that is Number of Products purchased and Total cost etc. The web portal is maintained at the server and being accessed from the cart. Customer can pay the bill amount and there after leave the counter without waiting in big queue for scanning each product during payment like what it was happening in the existing techniques.

GSM Module
GSM is an architecture used for mobile communication in most of the country. We are using GSM to send message of entire bill of the purchase on customer mobile phone.

Load cell
We are using a 50kg load cell for the measurement of the weight of the items in case there is no rfid tag present to that items. By using this we can measure   the   actual   weight   of   items

1. Embedded c that is used by the hardware that is RFID receiver (fitted in trolley) and transmitter

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(RFID tags) that look ups up the specified table of item and maps the product with price.

V. DETAIL DESCRIPTION OF SYSTEM

2. VB is used on the front end to display the final Billed amount to the customer on both the display Each trolley is associated with a RFID reader and tags. The functioning of the system is explaining below:

• When the customer purchase a product, she/he first scans the RF tag of the product using the RFID reader and then places it into the trolley .While the customers scanning the RF tag of the product, a price of the product is taken and stored in the system's memory.

• Information stored in system's memory is compared with the lookup table. If matches are found then cost, name of respective product gets displayed on the LCD.

• Here we have used IR sensor for counting purpose. This works as the IR sensor continuously emits Array's. If we put a product in a trolley at that time there is obstacle of IR rays, then it would result in interruption in counting of products in trolley. This recorded data is stored in microcontroller

• Counting is mainly done for security purpose. If in case while wandering round the mall someone removes the RFID tag and puts the product in trolley then counting the no of items helps to get information of items purchased. Thus counting is done but there is no addition of cost respective product in bill. This shows the increase in number of products but not Increase in bill. If an unwanted product is removed from trolley then it decreases the number of products as well as bill.

A) How System Works

A customer enters into the shopping mall on entering, she/he first picks up a trolley.
On the trolley and display exist where the final Payment is done .
In the trolley we are also using load cell to measure the weight of the product if RFID tag is not present to the product.
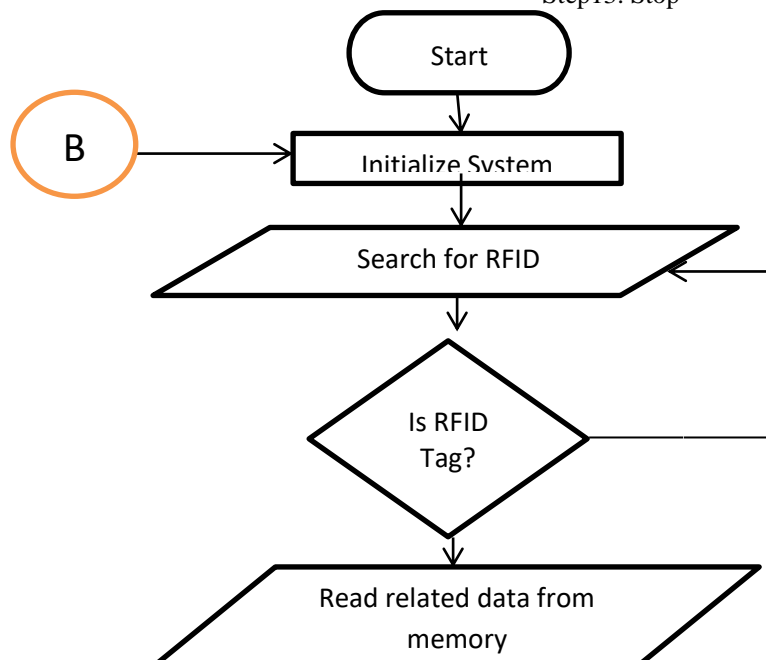
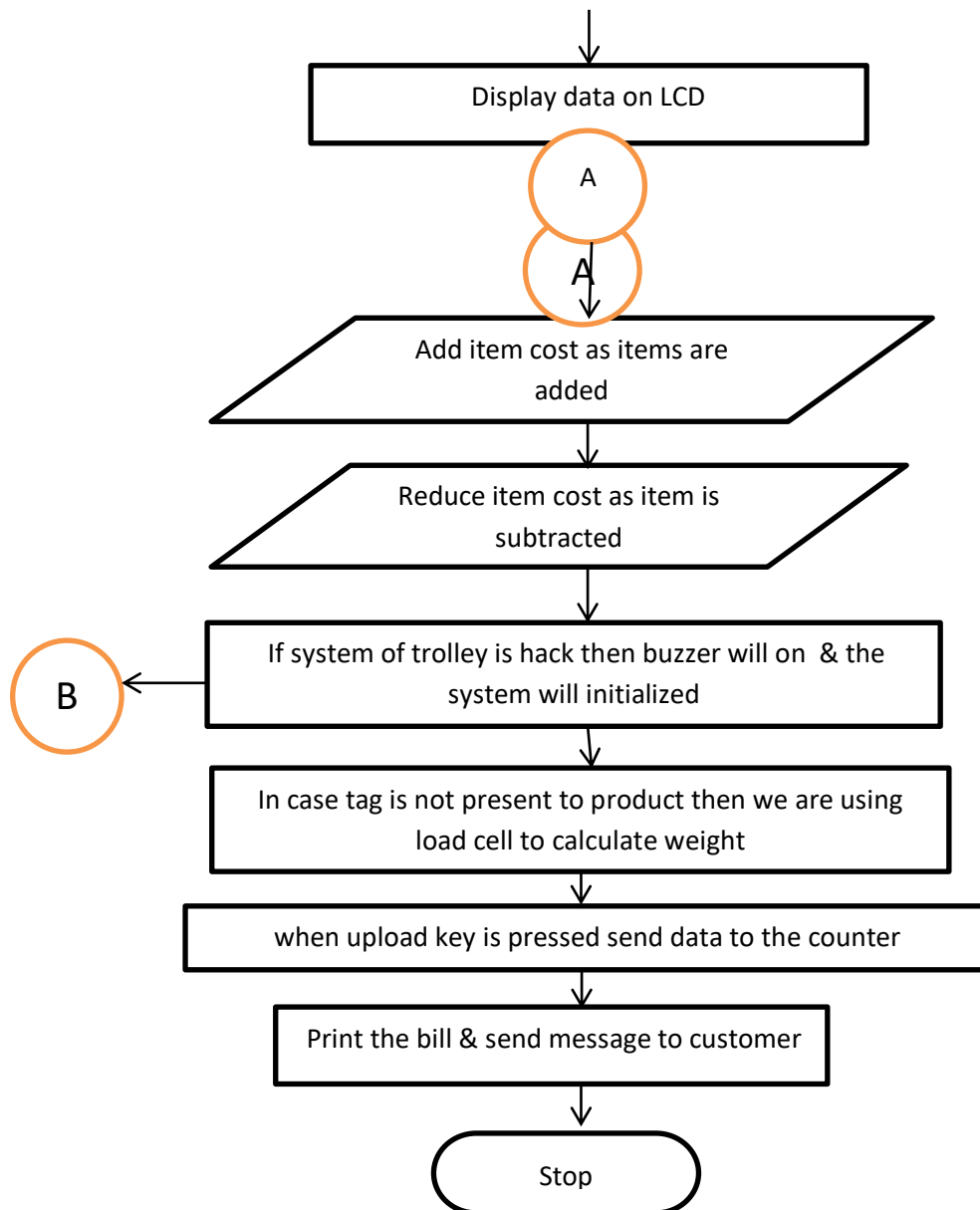• Double entry of product deletes the product name with respective to cost of product.

• After completion of shopping, a key is pressed indicating final billing of all the products. Thus the final information of all products is transmitted to a computer with the help of serial communication & the final billing is done by VB software on computer.

After shopping the entire bill can be send on customer cell phone through GSM Module.

VI. ALGORITHM

Step1: Start
Step2: Initialize System
Step3: Search for RFID
Step4: Check RFID tag
Step5: Read related data from memory
Step6: Display data on LCD
Step7: Add item cost as items are added
Step8: Reduce item cost as item is subtracted
Step9: If system of trolley is hack then buzzer will on & the system will initialized
Step10: In case tag is not present to product then we are using load cell to calculate weight
Step11: when upload key is pressed send data to the counter
Step12: Print the bill & send message to customer
Step13: Stop

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                           A

                           A

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                  load cell to calculate weight

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              Print the bill & send message to customer

                          Stop
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VII. CONCLUSION

We will creates an automated central bill system for supermarkets and mall. Using RFID and Zigbee by which customers do no need to wait near cash counters for their bill payment. Since their purchased product information is transferred to central billing system. The system proposed is highly dependable, authentic, trustworthy and time-effective. There will be reduction in salary amount given to employees, reduction in theft.

Also the system is time efficient. In future we can used a card swiping system in the trolley for payment purpose.

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