Smart-Shop Cart

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ABSTRACT: - In the present scenario, it is essential to have an automatic billing system for shopping malls, supermarket and other wholesale & retail stores. Numerous billing systems like barcode scanning mechanism based systems or tag-based systems are available in the market. It is important to replace such exciting system with better and robust system so hereby we proposed" Smart Shop-Cart" for shopping malls. In this system, the basic fundamental is barcode scanning for products, but we replace the conventional barcode scanner for faster and better results. In our prototype, the shopping cart will already have a barcode scanner system installed on for simple, better and portable barcode scanner. This scanner is connected wirelessly to MCU via Bluetooth or ZigBee module. MCU is also connected to PC/Laptop for creating the database of all customers, their products, and bills. This database also tracks the total sale and number of goods sold per day. In addition, RFID technology is implemented in this system as a barcode scanner and for the payment through card-based system. Simulation and hardware-based (block diagrams) results are proposed in this paper.

Keywords- Smart Shopping Cart, RFID, ZigBee, Bluetooth, MCU, GPS, LCD.

I. INTRODUCTION:

The lifestyle of today's generation is evolving on a daily basis, necessitating the expansion of shopping malls, supermarkets, and retail outlets. On holidays and weekends, malls see a lot of foot traffic. If there are exclusive deals and discounts, the situation becomes even worse. In order for consumers to avoid long lines at the billing counter, save time, and shop comfortably, efficient billing management systems are required in shopping establishments. To achieve this aim, a "Smart Shop-cart" for Shopping Malls is proposed. This paper explains in depth the simulation study as well as the hardware experimental setup. The barcode scanning phenomenon is used in our proposed process, but unlike typical billing systems, a barcode scanner device is connected to the shopping trolley, which scans the code and shows the numbers and types of items as well as the total sum of the purchased products on the LCD. RFID technology is used as a barcode scanner that is connected to the Arduino via ZigBee or Bluetooth. The data will be sent from the transmitter to the receiver, which is connected to the cashiers' PC/Laptop. The entire database is kept up to date on the laptop using pc flash magic software, as the microcontroller updates the data through the serial port on a regular basis. While detailed information about the current customer, product, and price is displayed and saved in MS Excel, it will also begin to be displayed on LCD. It also has a GPS system, which allows the cashier to monitor the customer. In the event of a blackout or power outage, Li-fi technology is often used to use solar power as a backup battery source, ensuring that the link between the transmitter and receiver is maintained.

II. LITERATURE SURVEY:

The Number of methods is proposed by researchers in this domain.

B. Ananthaba Rathi proposed High Speed Billing System in which RF detector is placed inside the shopping cart which is linked to the server for billing.

R. Rajesh Kumar, R. Mohan Raj, M. Varatharaj proposed Smart Trolley in which they have used RFID cards for each product and RFID reader with MCU on each trolley for calculating the bills while shopping.

Automation of shopping cart using RFID module & ZIGBEE module, in this system, RFID tags are used instead of barcodes. These RFID tags will be on the product. When the customer takes a product and places it in the trolley, the trolley will contain an RFID reader which will sense the RFID tag which is present on the product. Thus, displays the product price on the LCD display. Like this, the process continues. Along with it, comes a ZIGBEE transmitter in the trolley, which transfers data to the main computer. The ZIGBEE receiver is placed near the main computer which receives the data from transmitter.

P. Chandrasekar, T. Sangeetha have proposed Smart Shopping Cart with Zigbee and RFID in which they utilize RFID cards for each product along with Product Identification Device (PID) for the trolley which is used for calculation of products and bill. This approach used Zigbee for transmitting the billing details to central billing system. Few more researchers have proposed system for billing management but most of the methods are similar in nature and used MCU plus communication module-based system for each trolley.

Existing Work:

At present, we are using the process in malls with help of barcode scanner. There is a manual billing mechanism that has been used in any transaction market place, where the barcode of a product is used for billing, which is done by a barcode reader. These systems require manual operation, which necessitates the use of human personnel. While each product sold can be less costly, the overall cost of sale for a business is higher, and obtaining exact product specifics is challenging and time consuming. Furthermore, this is a slow operation, and customers must wait in long lines. As a result, this is one of the reasons why most people choose to leave the mall rather than stand in a long line to buy a few products. To avoid that, many new types of technologies are introduced. Customer has to put a product into smart shopping trolley. Each and every product has product id. The RFID reader can read the product id. Which can have been useful for customers. The block diagram of the existing module is shown [8]. All such solutions can be useful for

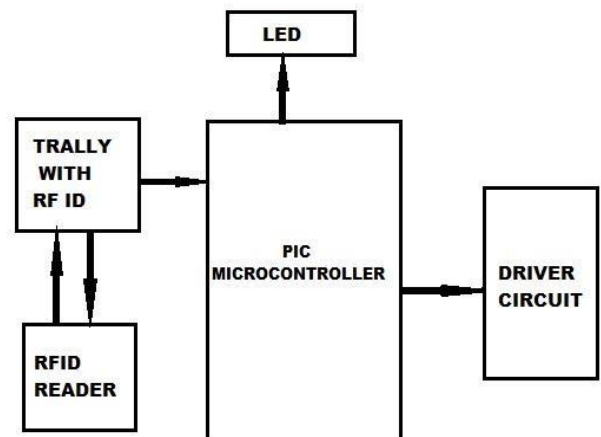customer. Such solutions save the customer time and money.

Fig.1 Existing System [8]

III. COMPONENT USED:

The transmitter part consists of a RFID module, RFID tags card, push button, LCD display, Lifi technology, GPS, Data logging, GSM (optional) RF sensor, Zigbee Module all connected to MCU.

The receiver part consists of a Zigbee module (receiver), USB to UART module and Pc Flash Magic.

A. Micro-controller:

ATMEGA32 is used in any processor with an eight-bit AVR architecture. It runs on a DC voltage of 4.5 to 5.5 volts. It's a 40-pin PDIP with xxxii I/O lines that can be programmed. It has a non-volatile 32kB in-system and self-programmable flash, a 1024B EEPROM version, and a 2kB internal SRAM variant. It has timers, A/D converters, PWM, and a serial port, among other features. The processing speed varies from 0 to 16 MHz. As a result, it saves the instructions and process. The aim of a microcontroller is to regulate the entire process in a repeatable manner.

B. RFID reader:

The EM-18 is used, which runs on 5 volts DC and draws less than 50 milliamps. It operates at a frequency of 125 kHz. It will cover a 10cm gap. It continuously emits RF signals across its range, and if an RFID tag comes into contact with it, it retrieves the information stored on the tag. The aim of an RFID reader is to retrieve product information from RFID tags.

C. RFID tags:

These tags are made up of a semiconductor device for storing its unique range and an

antenna coil for diverging its hold on information. It may or may not have an electric battery, depending on whether it is active or passive. If a tag does not have an electric battery, it is considered a passive tag. As long as the tag is within the RFID reader's range of coverage, the reader emits radio signals that provide power to passive tags and then re-emits the radio-based signal with data to the reader. The aim of RFID tags is to clearly identify merchandise.

D. LCD:

It's a liquid display of some kind. It is divided into two rows and sixteen columns. Any part of the show has a row or a column, which is made up of eight rows and five columns and is referred to as a constituent. It has sixteen pins, but only eight pins are used to feed details. The supply voltage should be 5 volts. The registers, specifically the information and order registers, confirm that everything is working properly. The ASCII (American Standard Code for Information Interchange) values for characters to be displayed are stored in the information register. The command register stores values that can be used to make adjustments such as backlight differentiation, pointer location, and so on. The aim of an LCD is to show information to clients, such as a welcome note, product catalogue, product details, invoice etc.

E. Infra-Red device:

It's a sensor that detects objects. It operates in the 300GHz to 400THz frequency range, with wavelengths ranging from 700nm to 1400nm. It's a semiconductor diode and a photodiode. The semiconductor diode emits infrared light that varies in length depending on the manufacturing parameters, and the photodiode detects a mirrored image of the emitted light caused by an obstacle. The aim of the IR system is to count the items entering the Shop-cart in order to deter theft, as well as to detect light in the event of a power outage or blackout.

F. Zigbee:

It's an IEEE-802.15.4-based specification for a series of high-level communication protocols for building personal area networks with lightweight, low-power digital radios, such as for home automation, medical device data collection, and other low-power, low-bandwidth uses, designed for small-scale projects that need wireless networking. As a result, Zigbee is a wireless ad hoc network with low capacity, low data rate, and close proximity (i.e., personal area). ZigBee is used to communicate between shopping carts and servers. For equipment that needs batter, ZigBee offers low-cost, low-power connectivity. As a result, the equipment's battery life is extended. ZigBee transmits data at a rate of 250kbps at 2.4GHz, 40kbps at 915MHz and 20kbps at 868MH.

G. Li-Fi:

Li-fi is a form of wireless optical networking. It is a type of visible light communications (VLC) system in which data is transmitted using light-emitting diodes (LED). In the shopping cart, solar panels with Li-fi technology will be used as a backup energy source in the event of a blackout, ensuring that the connection between the transmitter and receiver remains intact.

H. Push button:

An electric switch resembles a switch that can produce high output when ironed and low output when unironed. The aim of an electric switch is to attach and disconnect devices.

I. LED:

It's a Light Emitting Diode, which produces light at a voltage of about 5 volts on average. It's a touch diode of some kind. It recombines holes and electrons everywhere it emits light. Because the product count between RF and IR varies, the aim of a semiconductor diode is to be careful.

J. Power Adapter:

The adapter's capacity is used to provide dc power to the setup. It functions as a rectifier, taking 240 volts AC and thirty amps as input and producing 12 volts DC and one amp as output, which is suitable for our setup. A power adapter's aim is to provide a gentle DC supply from an AC power supply.

K. GPS module:

"Global Positioning System" is the abbreviation for "Global Positioning System." The Global Positioning System (GPS) is a satellite navigation system that specifies an object's ground location. The shop-cart will also be fitted with a GPS module, allowing the cashier to keep track of the customers.

L. GSM module (Optional):

An multinational mobile contact system. The GSM sim900A type module is used, which has a supply voltage ranging from 3.4 to 4.4 volts. It will have four frequency bands (850/900/1800/1900 MHz). The frequencies used by GSM are 850 and 900 megacycles per second. It's the ability to send data in the form of voice (calls), text (Short Message

Service), or data (GPRS – General Packet Radio Service). The aim of GSM is to send a warning for unauthorised use and an invoice to the corresponding user in the form of text as an SMS.

used to search and retrieve information from the QR code. The user information is embedded in the QR code using a QR generator. In our project, the QR code is used to provide a facility for scanning and

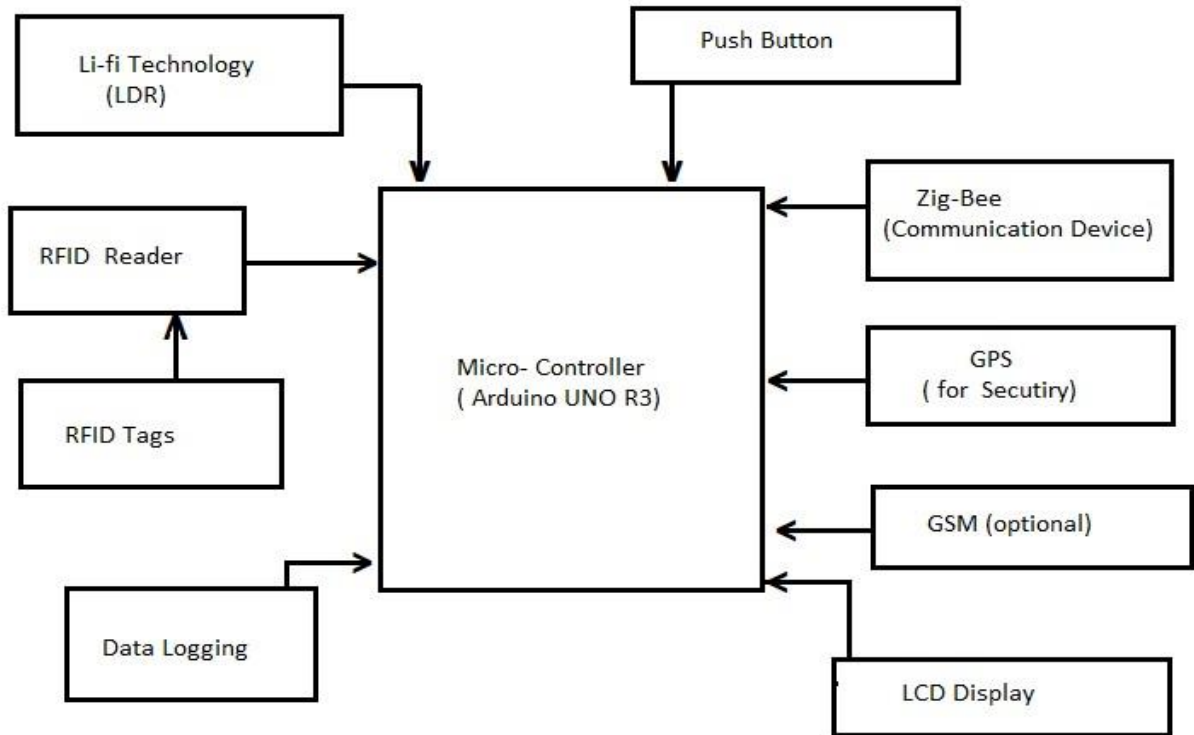## IV. BLOCK DIAGRAM OF TRANSMITTER AND RECEIVER:
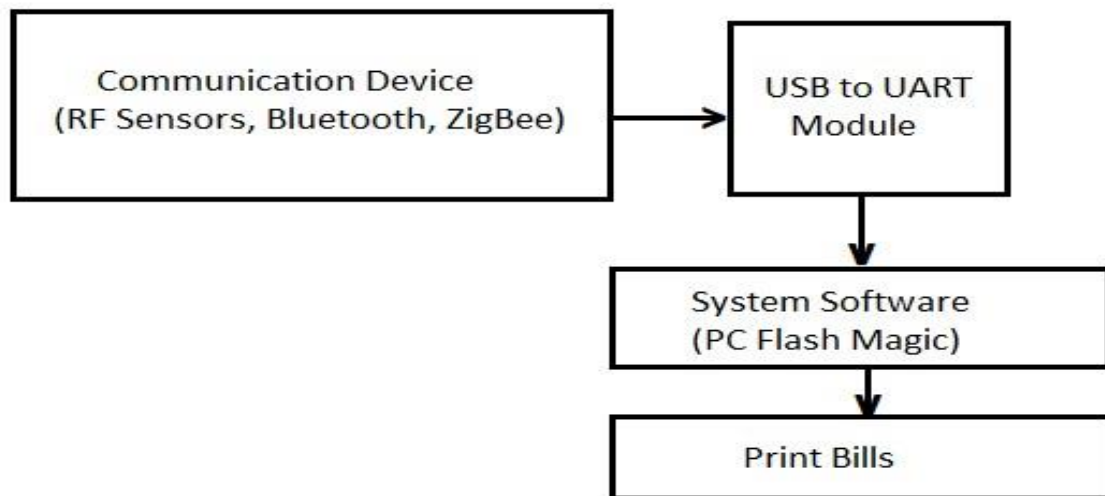

Fig-2 Block Diagram of Transmitter

Fig-3 Block Diagram of Receiver

M. QR Code:

The Quick-Response Code, or QR code, is a two-dimensional matrix representation of a barcode that is

retrieving user information, as well as redirecting to the bank for payment processing via the payment gateway specified by the shopping mall or code provider (For example: Paytm, Google Pay, Phone pay etc.). generation during payment processing.

V. WORKING METHODLOGY:

PROPOSED METHOD:

The basic issue with current research proposals is that they use a separate system for each trolley and then use a wireless communication module to link it to the billing system. Such plans would make the system more complicated, inefficient, and costly. Another aspect that makes such a device inefficient is electromagnetic interference, which is caused by the large number of wireless communication modules used in each trolley. Furthermore, a customer could only need a few things for which he or she does not need a trolley, so we can use a small basket to solve this problem. We introduced a robust and superior technique in this paper that can outperform current methods. The "Smart Shop-cart" uses an RFID module (which scans the item's barcode) connected to an MCU that is wirelessly connected to the main device for the purpose of updating inventory, bill, payment, and sales information.

WORKING:

• The barcode of the products to be purchased is checked by the EM-18 RFID module. We've used signal for RFID so that each user can read the item effectively. Assuming that everything has been tested, the bell will ring. Without a doubt, the client is aware that the item has been examined. We've also used an infrared sensor to verify the cause. If a donor places an object in a trolley and then moves it around, the IR beams can be blocked, resulting in interference in the inclusion of objects in the trolley. The total number of items added to the cart will be displayed on the LCD.

• Counting is done solely for the purpose of surveillance. If a man discards the RFID tag when meandering through the shopping centre and places the item in a trolley, then checking the number of items enables to get measurements of the articles collected. Following that, tallying is done, but there is no extension of the expense of a specific item in the receipt. This suggests a surge in a large range of stock without an increase in cost.

• If an unwanted item is expelled from trolley then it diminishes the scope of items notwithstanding bill. It is utilized to subtract the aggregate cost to the expelled specific thing cost. Suppose if you don't want an item that is added in your cart then one can scan the barcode of product again. It will delete the item from the list. (first scan work for entering the product and second time scanning will remove the product). • After purchasing all the items, push button is pressed. Now LCD will display the subtotal of the products purchased and the list of items. On pressing the switch, the ZigBee transmitter will transit this information to the ZigBee receiver which is connected to PC Flash Magic software via USB to UART module. The PC software will display the name and total number of items purchased along with their price and calculate the total amount.

• Data logging system will provide a secure data regarding the purchase list of the customer. The database will count the specific data reg. The items purchased by the costumer thus keeping the data secure.
• A Li-fi technology is also added. The purpose of adding Li-fi is to use solar power as an energy power supply. Suppose the light source break down due to some reason then this backup power can be used to maintain the connection between the transmitter and receiver. For the detection of light IR sensors will be used. If sensor sense the blackness or dark due to the power-cut then they will send the signals and the backup power source will powered on automatically.

• A GPS tracking system is also provided for security purpose so that the person on the counter can keep the track of the costumers in the shopping mart.

• The cart comes with a GSM (optional) module. The aim of GSM is to send an SMS to the corresponding user as a warning for unauthorised use and an invoice.

• The counter will have a QR-Code, which will be used to provide a facility for scanning and retrieving user information, as well as redirecting to the bank for payment processing via the payment gateway specified by the shopping centre or code provider (For example: Paytm, Google Pay, Phone pay etc.). Customers can pay their bills using apps like Paytm, Gpay, and others by scanning the QR-Code given on the counter, which is more convenient and time-saving than the manual method.
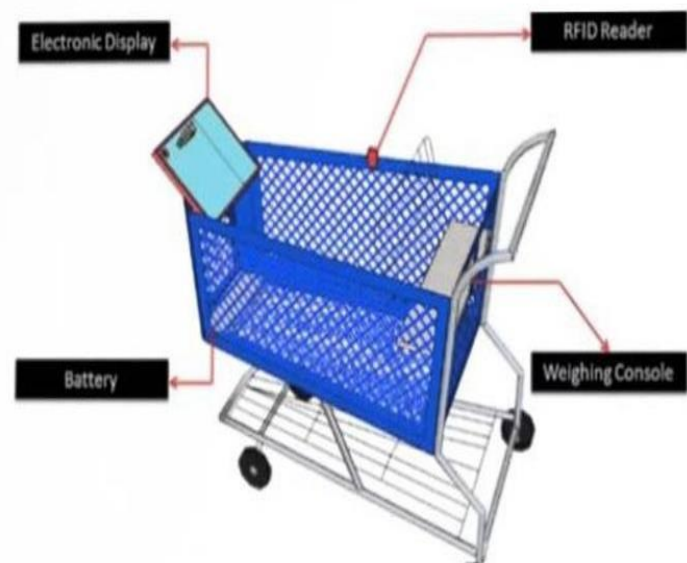

FIG.4 RFID based Smart Shop-cart

Advantages:

• It saves time for consumers and decreases the payoff offered to employees.

• RFID tags can be rewritten if required.

• There is no provision for line of sight.

ALGORITHM:

This is the detailed process which shows how our system will work. The following algorithm will be followed as shown [11].

• Start the procedure.

• Get the machine up and running.

• Scan a product for RFID tags.

• Examine the RFID tags.

• Whether the tag is registered or scanned, the data associated with it can be read from memory by an RFID reader.

• Using an LCD, display the data and cost.

• The cost of the item is automatically applied, and the overall cost is measured.

• If any component is omitted, the overall cost is subtracted from the cost of the removed item, and the process is repeated.

• In the billing system, submit the total number.

• Finish the process by printing the bill.

FLOW CHART:
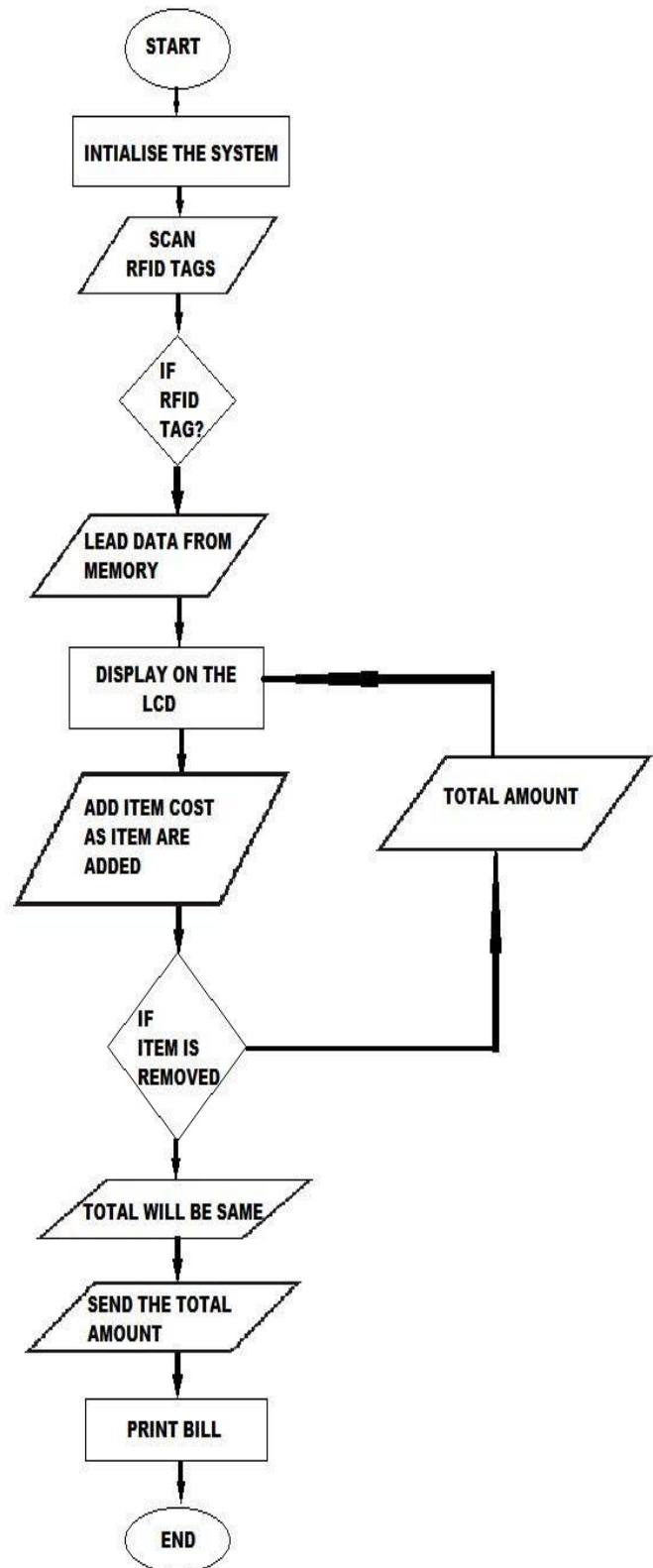
This is the flow process of the algorithm for the working of the system.

Fig.8 Flow Diagram [11]

VI. CONCLUSION:

In this project, we demonstrated a method for billing goods that is reliable, simple, and fast. The current scheme, which uses hardware barcode scanners on billing counters, creates a long line. An RFID tag will be added to any product in the store or mall. Each cart will be equipped with an RFID reader and a ZigBee Transceiver. Billing will be done via an online payment system. If a product is withdrawn, it must also be removed from the bill. For anti-theft purposes, an RFID reader must be installed at the exit door. Purchasing Habits of Consumers Offers/discounts should be shown on the phone. Product details, expiration date, and a better alternative are all displayed. As a result, by utilising this, the supermarket shopping system can become more convenient. It would also provide a store with an anti-theft scheme. It will allow for online billing transactions and will also make recommendations to the consumer for purchasing goods, displaying special deals, and so on. RFID tags and ZigBee should both function properly. Both the customer and the cashier would profit from this Smart Shop-cart. It will also save a lot of time and making shopping convenient.

VI. APPLICATION:

• It can be utilized in dress showrooms.
• Grocery store
• All wholesale shopping malls

VII. ACKNOWLEDGMENT:

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