Elegant Trolley For Shopping Malls Using RFID And Li-Fi

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Abstract- An innovative product with societal acceptance is the one that aids the comfort, convenience and efficiency in everyday life. Shopping at mall is becoming daily activity in various cities. We can see huge rush at malls on holidays and weekends. The rush is even more when there are special offers and discount. People purchase different items in the malls and put them in the trolley. They have to find for the product on the list, queue to pay, at the billing counter. It is a time consuming process. To avoid this, we are developing a system which we called as RFID & LI-FI Based Automated Smart Trolley.

In this system we are using RFID tags instead of barcodes. Products has RFID tag. Whenever the customer puts a product into the trolley, it will get scanned by RFID Reader. The name , cost ,quantity & total bill of the product will be displayed on android application of mobile phone. We are using RFID transmitter to transfer the data to the main computer. At the billing counter, RFID receiver will be placed, which will receive the data from the RFID transmitter connected to the RF reader. RF reader connected to the trolley.As we put the products, the costs will get added to total bill. If the product is removed from the trolley its bill will be automatically deducted .Thus the billing will be done in the trolley itself.Also We are using Visible Light Communication (VLC) technology to scan the products.some products has LI-FI TX and scanning product details transmitted by using RFID TX.This system will make shopping easy and will reduce time loss.

Keywords- LI-FI Technology, Android Application ,RFID Tag, RFID Receiver

I. INTRODUCTION

Today every supermarket and shopping mall makes use of the shopping baskets and shopping trolleys to collect the items from the racks. The customers have to put every product which they want to purchase into the trolley and they have to wait in the long queue for the billing system. It is a complex process. To overcome that several technological solutions have been developed. But the effectiveness of the developed system should be improvised. So that, we are using visible light communication instead of wireless standards such as ZigBee, Bluetooth etc., and also we are using RFID reader and LI-FI transmitter in the smart trolley. At the billing section, the LI-FI receiver is used which is connected to the main computer.

II. PROBLEM STATEMENT

Shopping at mall is becoming daily activity in various cities. We can see huge rush at malls on holidays and weekends. The rush is even more when there are special offers and discount. People purchase different items in the malls and put them in the trolley. They have to find for the product on the list queue to pay at the billing counter. It is a time consuming process .To avoid this implement the Smart Billing Trolley system which reduces the billing time.

III. LITERATURE SURVEY

1. Smart Shopping Cart with Automatic Billing System through RFID and ZigBee:

This is based on the "ZigBee" technology which is very advanced technology. Every time the mart customers has to take the trolley and roam here there for collecting the items which takes a lot of time. After collecting all the shopping stuff the customer has to wait in the queue for payment at the accountant section. Due to large queue time is wasted, to overcome this they have developed an smart way of shopping. In this particular technology RFID tag is used by replacing the barcode form the product. The trolley will consist of a RFID reader, LCD screen and the ZigBee module. When a person put any product in the trolley it will scan the product and price and the brand of the product. The addition of price of the entire product will be added to generate the bill. This bill is stored in the microcontroller memory, which then transfers to main computer through ZigBee module.

2. Automatic Billing System using LI-FI Module:

In this project data transfer is processed between products and the mobile phone. Each and every product is

having LIFI transmitter and it store the encoded data similar to the product id, cost of product and quantity. Here the mobile is integrated with LI-FI receiver via OTG communication in the shopping cart. It can read the commodities' information when the LI-FI transmitter holding goods are chosen by the customers, each information of the goods can be entered by using the mobile LI-FI and when the product is kept into the trolley, which also contains the LI-FI module, double check the product identity. After completing the purchase, the payment is processed in mobile itself via mobile banking system. Finally the cart section will verify the payment and purchase of product which will again cross check the products by the trolley module when we come out of the exit section of the shopping center. If the product is mismatched at this stage it immediately alerts the owner. This technology is used in this project for finding out the information of the commodities.

3. LI-FI based automated smart trolley using RFID:

In this system we are using RFID tags instead of barcodes. Each and every product has RFID tag. Whenever the customer puts a product into the trolley, it will get scanned by RFID Reader. The name and cost of the product will be displayed on the LCD. We are using Visible Light Communication (VLC) technology to transfer the data to the main computer. At the billing counter, LI-FI receiver will be placed, which will receive the data from the transmitter.

4. Smart Shopping System by Using LI-FI Technology In Supermarkets:

In this system LI-FI technology is used. LI-FI is a new emerging technology in trend which uses light waves to transfer data. In this paper, we propose an automatic billing system which is not only time effective but also reduces human effort. This system uses LI-FI technology to transfer data quickly. The free accessible android application is deployed in mobile using which we get the product details and the payment is processed in the mobile itself. For security, the products are verified in the gate section by checking the products in the troslley. The main objective of this paper is to avoid queues in supermarkets and malls.

5.Futuristic Trolley for Intelligent Billing with Amalgamation of RFID and ZIGBEE:

In this system we are using RFID tags instead of barcodes. This RFID tags will be on the product. Whenever the customer puts a product into trolley it will get scanned by bvgfc RFID reader and product price and cost will be display on LCD display. Like this the process goes on. We are using ZIGBEE transmitter which will be at trolley which is used to

transfer data to main computer. At the main computer ZIGBEE receiver will be placed which will receive data from transmitter. .To store the products price and total billing memory used will be Atmel AT24C04. LCD used will be 16X2 alphanumeric display. It will be used to display products names, products cost etc.

IV. PROPOSED SYSTEM

This system consists of Arduino uno atmega328 microcontroller, RFID Reader and tag, LI-FI transmitter and receiver, android application, server PC. RFID reader and LI-FI Rx are interfaced with trolley unit. Each and Every product containing RFID tag and LI-FI Tx. It have unique id number so, it is used to identify the product. The RFID reader and LI-FI Rx get the information about the product from the product using RFID tag and LI-FI Tx. We can switch the scanning of product weather is from LI-FI Rx or RFID reader by pressing button. When the customer put the product into the trolley the details about the products transmitted to server PC through RF Tx and Rx. At that time customer can able to see the product details such as name,price of the product on android application. When the customer want to return the product from the trolley simply the customer can press the remove button using application and takes off the product from the trolley. So that the quantity and cost of the product will be reduced from thetotal amount. Also product details from trolley can be transmitted to the main computer in the billing section through RF transmitter. Finally the computer can receive the data using RF Rx serial communication.
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V. SYSTEM COMPONENT

RFID Tag: An RFID tag consists of an integrated circuit and an antenna. The tag is also composed of a protective material that holds the pieces together and shields them from various environmental conditions. The protective material depends on the application. For example, employee ID badges containing RFID tags are typically made from durable plastic, and the tag is embedded between the layers of plastic. RFID tags come in a variety of shapes and sizes and are either passive or active. Passive tags are the most widely used, as they are smaller and less expensive to implement. Passive tags must be powered up by the RFID reader before they can transmit data. Unlike passive tags, active RFID tags have an on-board power supply (e.g., a battery), thereby enabling them to transmit data at all times. For a more detailed discussion, refer to this article Passive RFID Tags vs. Active RFID Tags.

LI-FI Technology: A movement is afoot to vastly broaden available bandwidth by transmitting from LEDs (light-emitting diodes) using a technology known as LI-FI, or Light

Fidelity .Rather than tapping WI-FI's radio frequencies, LI-FI embeds data in the light waves emitted by LEDs. It leverages the digital nature of LEDs which after all are semiconductors by deploying a signal processor within a light fixture to rapidly modulate frequencies, loading full-on Internet data onto them. The modulations are so fast that they are imperceptible and flicker-free to the human eye but a photoreceptor in a smart phone or laptop sees the signals and gathers them for conversion from photonic to electronic.LI-FI is a new way to establish wireless communication links using the Led lighting networks. Is an alternative to WI-FI that transmits data using the spectrum of visible light has achieved a new breakthrough with UK scientists reporting transmission speeds of 10Gbit more than 250 times faster than 'superfast' broadband. The term LI-FI was coined by Edinburgh University's Prof Harald Haas during a TED talk in 2011 though the technology is also known as visible light communications (VLC). Many experts claim that LI-FI represents the future of mobile internet thanks to its reduced costs and greater efficiency compared to traditional WI-FI.

Database: Database is the collection of the related data types. For storing the similar type of the data record database is used. In the smart billing trolley data are stored in the database and when user need then data is retrieve from the database. Database can be updated by performing the actions. Database contain the shopping mall related data such as product details. Database has to select particular data which user want to access and show to user.
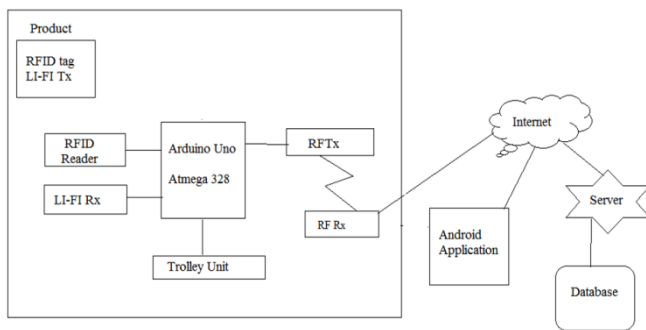
VI. SYSTEM ARCHITECTURE

Fig. System Architecture

- *Mathematical model*

Set Theory
-S= {s , e , I , O, U, DD , NDD }
Where,
let S be the set of System
s = Initial set of System
e = Final set of System

I = Input of the System
O = Output of the System
U = Processing of System
D = Deterministic data
NDD= Non deterministic data

Where,

-Initial state: Log in user, Get the data from RFID tag or Hardware (RFID Tag, LI-FITransmitter).
– Final state: Display the captured data by RFID tag on Webpage and Android Application ,Log out the user.
– Input: Input should be RFID tag data LI-FI transmiter data i.e. Product Details such as
product name ,product cost, product quantity.
– Output: Finally we display the captured data i.e. Bill of customer on the screen (monitor or mobile)
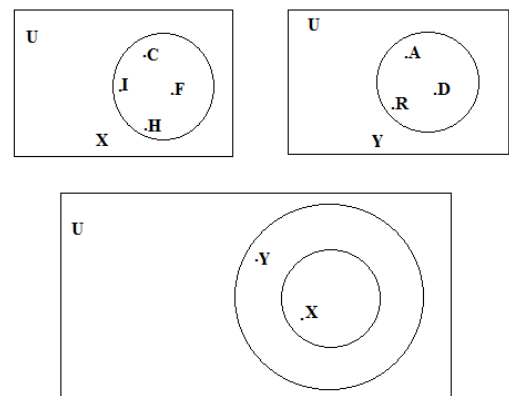
-U= {C, I, F, H, A, D, R}
Where,
Let U be the Set of System
Client=User
I=Input data (RFID tag data)
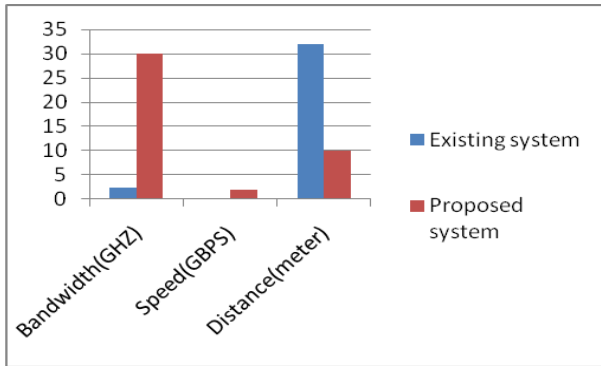F=LI-FI Tx
H=Hardware
A=Application (Web or Mobile)
D= Display captured data
R=Result or output
Success: User gets result very fast according to their needs
Failure: failure

VII. RESULT ANALYSIS

We are developed a Smart Billing Trolley for Shopping Malls. This smart billing trolley is easily accessible by anyone in shopping malls .In this system we use RFID instead of barcodes ,by using RFID overcome the drawback of line of sight. In proposed system we use RFID for transmittimg and reciving data.RFID has greater range for data transmission.In proposed system required minimum distance for scanning.

Following are the snapshots of the smart billing trolley.
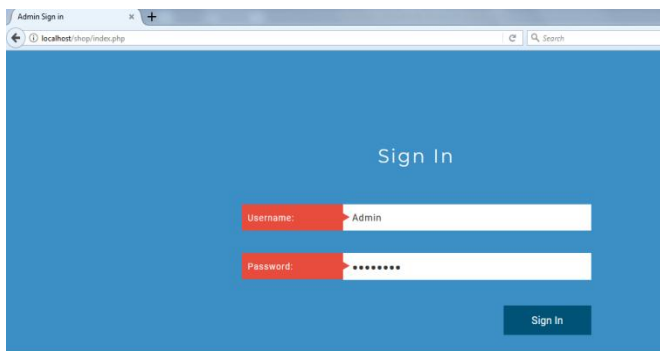

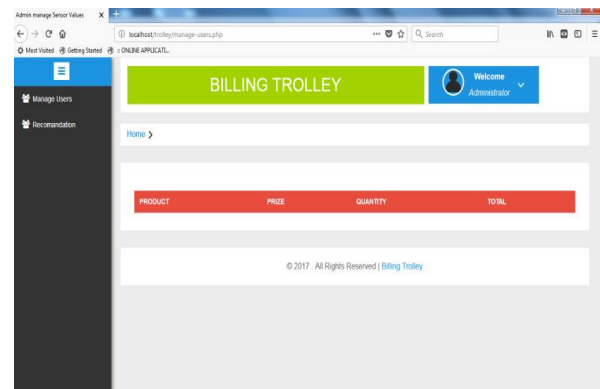Fig. Execution

Fig. Login Screen
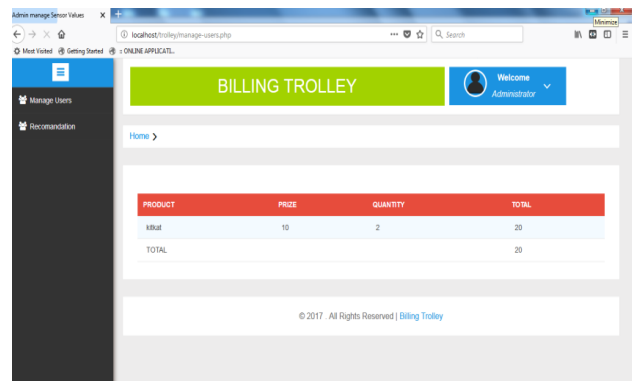

Fig. Product Details : Before scanning

Fig. Product Details : After scanning

VIII. CONCLUSION

The desired objectives were successfully achieved in the prototype model developed. The developed product easy to used. It has the effective usage of LI-FI technology and the smart trolley can minimize the queues in the mall. So that uses the android application for seeing the bill on mobile phone. The customer just needs to type the name of the product he wants to search on the Android device, and the cart will automatically guide him/her to the product/s locations.

IX. FUTURE WORK

The smart trolley could interact with customers during a shopping trip. The movement of the trolley can be made automatically with the help of various sensors. It is possible to use in hospitals and healthcare for billing the medicine cost without waiting more.

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