

LIFI BASED AUTOMATED SMART TROLLEY USING RFID

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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 'LIFI 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, LIFI receiver will be placed, which will receive the data from the transmitter.

Index Terms— Embedded, PIC Controller (PIC 16f877a), RFID tag, RFID Reader, LCD, LIFI transmitter and LIFI receiver.

1 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, LCD display and LIFI transmitter in the smart trolley. At the billing section, the LIFI receiver is used which is connected to the main computer.

2 EXISTING SYSTEM

Presently available billing system in the shopping malls are using barcode scanner. The cashier in the billing system scans the items using barcode scanner and gives us the total bill. For that method the customers have to wait in a long queue and this makes them to lose interest in shopping. To overcome such problems, several technological solutions have been developed to save customer time.

2.1 Barcode Vs RFID

RFID and barcodes are similar, they are both data collection technologies that means it automatically process the data. However, they differ significantly in many areas.

BARCODE	RFID
Requires line of site to read.	Can be read without line of Site.
Can only be read individually.	Several RFID tags can be read simultaneously.
Cannot be read if damaged or dirty.	Can cope with dirty environment.
Cannot be updated.	New information can be over written.
Requires manual tracking.	Can be automatically tracked.

2.2 WIFI Vs LIFI

3 PROPOSED SYSTEM

The proposed system illustrates to reduce waiting time of the customer in shopping mall. This system consists of PIC microcontroller, RFID Reader and tag, LIFI transmitter and receiver, LCD display, max232 logic converter. RFID is interfaced with PIC microcontroller. Each and Every product containing RFID tag. It have unique id number so, it is used to identify the product. The RFID reader get the information about the product from the tag, when the customer put the product into the trolley, the details about the products programmed in microcontroller compare the product details with its database to give the details to the LCD. At that time customer can able to see the product details such as name, price of the product in the LCD, when the customer want to return the product from the trolley, simply the customer can press the remove button and takes off the product from the trolley. So that the quantity and cost of the product will be reduced from the total amount. Also product details from PIC controller can be transmitted to the main computer in the billing section through LIFI transmitter. Finally, the computer can receive the data using MAX232 serial communication.

3.1 BLOCK DIAGRAM OF THE SYSTEM

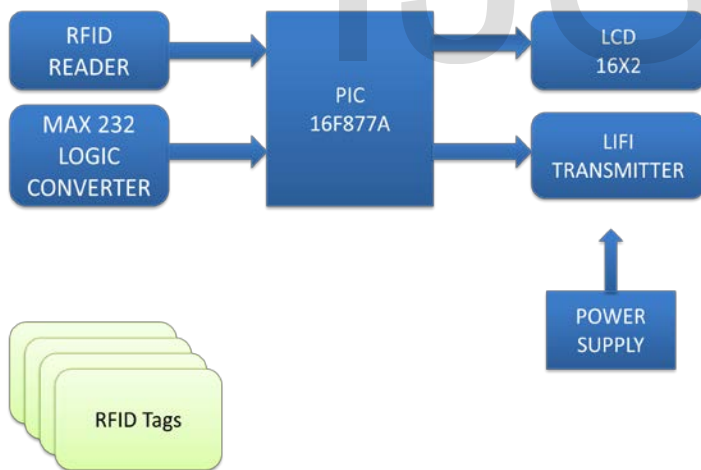


Fig.3.1 Block Diagram of trolley side

WIFI	LIFI
Data transfer speed is 150Mbps.	Data transfer speed is greater than 1Gbps.
Point to point topology.	Point to point topology.
It uses radio spectrum.	It uses light as a carrier.
Expensive than LIFI because it uses radio spectrum that requires license.	Cheaper than WIFI because it uses free band that does not requires license.
Operating frequency is 2.4GHz.	Operating frequency is hundreds of Tera Hz.
Radio frequency spectrum is lesser than visible light spectrum.	Visible light spectrum is 10,000 times larger spectrum than radio spectrum.

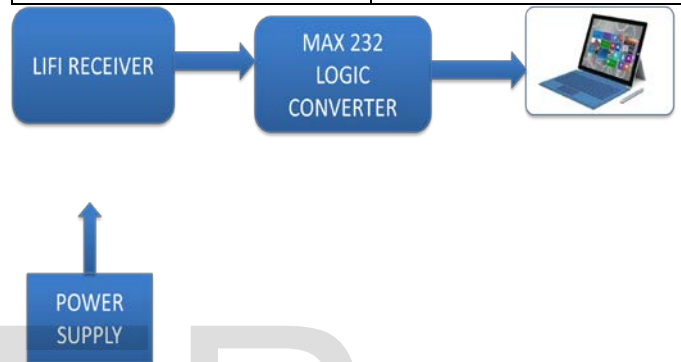


Fig.3.2 Block Diagram of server side

4 SYSTEM ARCHITECTURE

- A. PIC microcontroller 16f877A
- B. RFID Reader
- C. LCD display
- D. LIFI transmitter and receiver
- E. Max 232 converter

A.PIC microcontroller 16f877A

The PIC 16f877A is one of the most trending microcontrollers. This Controller mostly used for experimental and modern application because of its low price. It's compatible with 51 products. Since the introduction of PIC 16xx they have introduced an array of 8bit microcontroller to numerous lists here. They include the PIC family's 10xxx, 12xxx, 14xxx, 16xxx, 17xxx. They are 8bit processor; it means that the CPU can work only on 8bit of data at a time. A current model of pic microcontroller contains flash memory. In PIC, memory of program and data are separated. In the latest version, 32 bit data memory is available.

Key features:

1. Wide availability
2. Low cost
3. Ease of reprogramming with built in EEPROM
4. Operating frequency from 0 to 20MHZ
5. Operating voltage from 4 to 5.5V
6. Timer 0:8 bit

B.RFID READER

Radio Frequency Identification Reader is a device used to collect the information from the RFID tag. The advantage of RFID over barcode is, it can read each and every product from the bundle of products. But the barcode cannot do this. The barcode can read only one data at a time. In the present days the shopping malls are using barcode scanner since every products in the mall contains barcode. In our proposed system, each and every product has RFID tags instead of barcode. The RFID reader continuously waiting for the interrupt of RFID tag, once the tag was enabled, the RFID reader scans all details about the tag. The RFID reader can able to read the information from 300 feet but the barcode can read up to 15 feet only and also the barcode needs line of sight communication to scan the information. These disadvantages are overcome by using RFID.



Fig.4.1 RFID reader

C.LIFI TRANSCEIVER

It is a visible light communication that is light fidelity. It is bidirectional and high speed network oriented wireless communication devices like that Wi-Fi. It is a subset of optical wireless communication which carries more amount of information. The lifi uses common household LEDs for communication. It enables the data transfer at the speed of 224 Gbps.

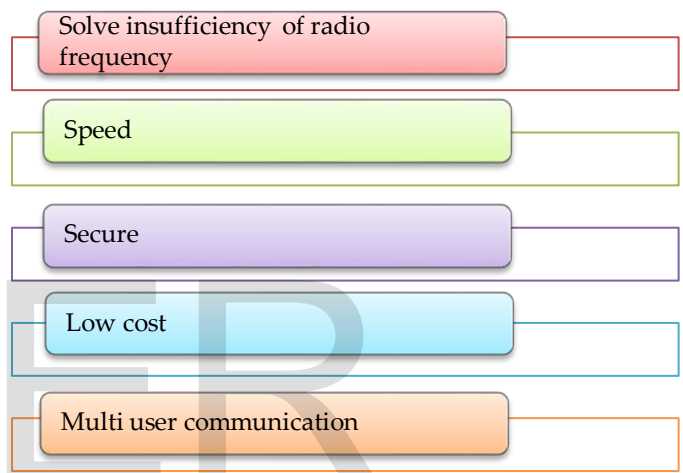
These devices are normally used for illumination only by applying constant current. The operational procedure is very easy to understand, If the LED can be switched ON, '1' is transmitted and if the LED is switched off, '0' is transmitted.. In the trolley section, LCD display is done successfully using microcontroller then the digital data is converted to analog, then it is fed to the LIFI transmitter. The basic IEEE standard for LIFI is 802.15.7 similar to have Bluetooth, zigbee

standards. The standard is able to deliver enough data rates to transmit audio, video and multimedia services via light transmission.



Fig.4.2 LIFI Technology

BENEFITS:



APPLICATIONS:

LIFI has found its applications in many fields. Some of them are given below,

- Vehicles and transportation
- Underwater communications
- Aviation
- Location based services(LBS)
- Hospitals and healthcare
- Hazardous environments
- RF spectrum relief
- Mobile connectivity
- Smart lighting

D.LCD DISPLAY

A liquid crystal display consists of an array of tiny segments called pixels that can be manipulated to present information. This basic idea is common to all displays, ranging from simple calculators to a full color LCD television. In this section, LCD display get the instruction from the microcontroller .it display 16 characters per line and there are two such line. This LCD contains two registers such as

command and data. The command register store the command instruction given to the LCD and the data register store the data to be displayed on the LCD. The characters are in the form of ASCII. In this prototype, input section get the details of each product from the controller and output section display the name, quantity and expiry date of the products.

E.MAX232 LOGIC CONVERTER

The MAX 232 logic converter is a Hardware protocol layer and dual driver and receiver. And it typically converts the RX, TX, CTS, RTS signal. The main function of the converter is used to convert the TTL logic level to RS232 logic level during serial communication of microcontroller with PC.

5 FLOW CHART

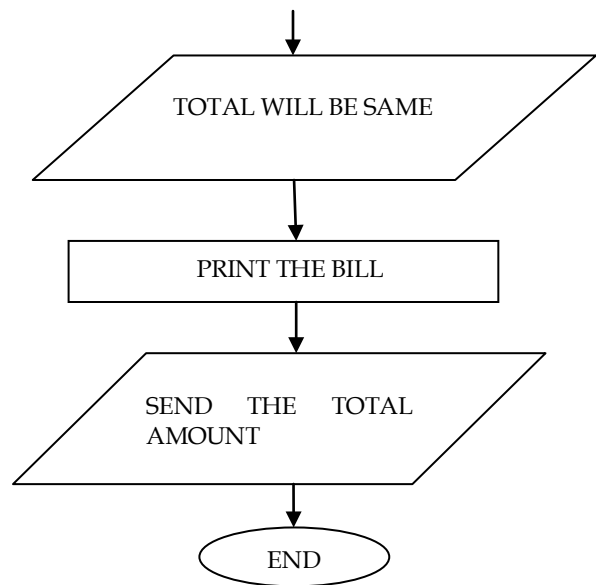
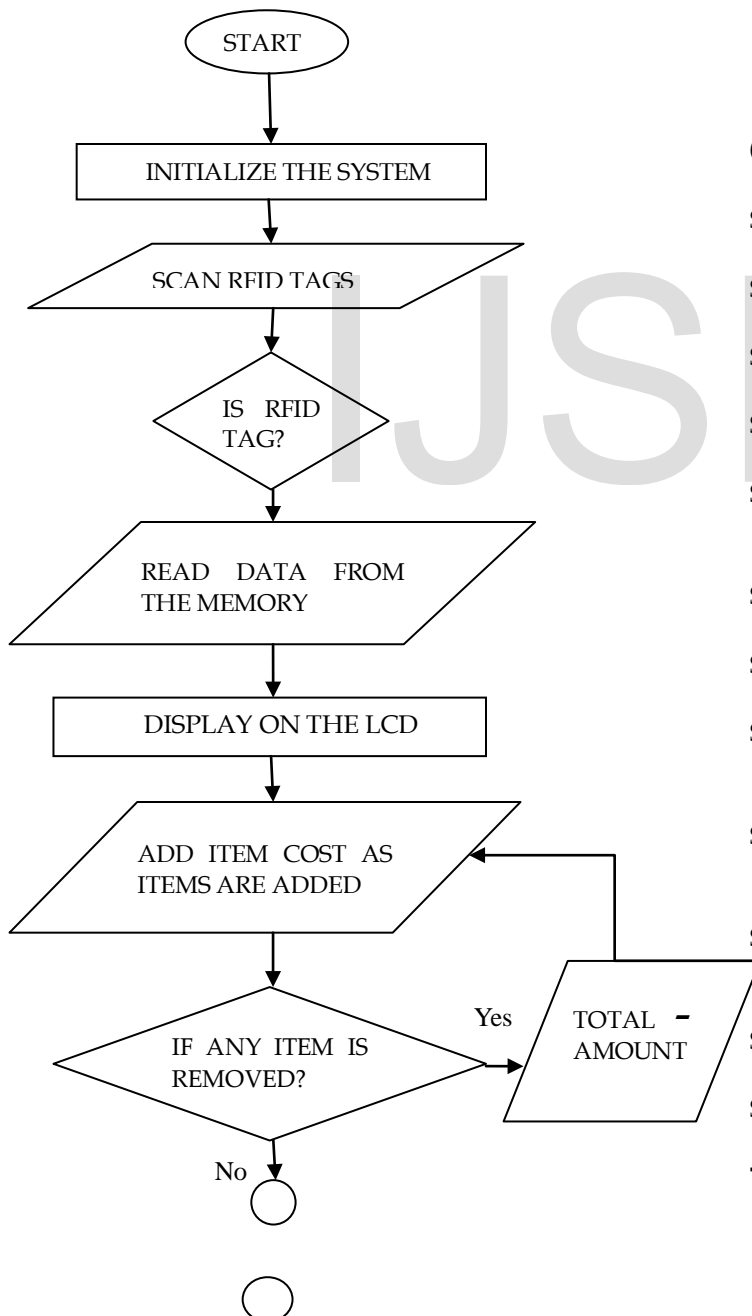


Fig.5 System Flow Diagram

6 ALGORITHM

Step 1: Start

Step 2: Initialize the System.

Step 3: Enable Interrupt for RFID.

Step 4: Check RFID tag

Step 5: If the tag is registered, read related data from the memory.

Step 6: Display the data on LCD.

Step 7: Add item cost as items are added.

Step 8: If an item is removed display a message 'ADD OR REMOVE'.

Step 9: Press REMOVE and continue the shopping as the total amount will be reduced, else ADD and hence there will be no change.

Step10: When upload key is pressed send data to the counter.

Step11: Print the Bill.

Step12: Stop

7 ADVANTAGES

- To implement the system for simplifying the billing process and to increase the security using LIFI

technique. This will take the overall shopping experience to a different level.

- Automatic billing of products by using RFID technique will be a more feasible option in the future.

8 APPLICATIONS

- The Automatic Trolley explores emerging mobile technologies and automatic identification technologies (such as RFID) as a way to improve the quality of services provided by retailers and to augment the consumer value thus for allowing to save time and money.
- Shopping trolleys fitted with low-cost sensors and LIFI Smart technology could reorganize the retail experience – pinpointing the location of trolleys within stores and also the users can be aware of the total bill amount during the time of purchase.



9 FUTURE ENHANCEMENT

- In future, the LIFI technology can be used in vehicle to vehicle communication.
- The LCD can be provided with a layout of the shopping market by which the customers can be able to get the exact information about the products present in different aisles. This increase user friendliness.
- The smart trolley could interact with customers during a shopping trip. For example, passing on discount vouchers based on where they are in the supermarket.
- The movement of the trolley can be made automatically with the help of various sensors. In this way, there is no need to pull the heavy trolley.

10 CONCLUSION

- The intended objective is successfully achieved in the developed prototype model.
- The developed product is easy to use and does not require any specific training. It has the effective usage of LIFI technology and the smart trolley can minimize the queues in the mall. So that customer's time can be saved.

11 REFERENCES

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ZIGBEE

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