

## **LI-FI BASED SMART SHOPPING**

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*Abstract— Shopping is a basic need that is important for day-to-day activities to lead the life peaceful. Shopping in a department store or in a mall becomes tedious when the more number of the customer assembles near the billing counter of the same intent, which in turn makes that place as a large crowded area. In order to avoid such a scenario and to do the shopping in a pleasant way, our proposed one aims to make LIFI system. The proposed system that uses LI-FI technology is used to transfer the data quickly. LI-FI transmitter is connected with all the racks in the supermarket. LI-FI receiver which has connected with the trolley is able to receive the product ID from LI-FI transmitter through light waves. And it is send to the cloud storage. One android application is installed in the mobile, to do the shopping. It shows the nearby product details which are extracted from the cloud storage. The purchased product list is updated using BUY and DELETE option. After finishing the purchase, authentication will be carried out to pay the amount. Further verification will be done at the gate section.*

**Keywords— LI-FI technology, Product details, Payment, Android application, Cloud storage.**

### **I. INTRODUCTION**

The LIFI is a new emerging technology which has the high-speed data transmission. The LIFI uses two sections; one is a transmitter, and another one is a receiver. The LIFI technology can transmit the data about the 224 GBPS rate. It found in laboratory researches. In real-time, it is capable of sending the data about the 1 GBPS. The LIFI technology is proposed by University of Edinburgh professor Harald Haas. The LIFI is similar as WIFI in which WIFI uses electromagnetic waves to transmit the information where the LIFI uses light waves to transmit the information. Since the LIFI uses light waves, it is 33 times faster than WIFI. Here a LED is used as a transmitter and a photo diode is used as a receiver. Through embedded kit, a LED is programmed and controlled. When a LED is on, photo diode will receive the digit as '1' and when a LED is OFF, photo diode will receive the digit as '0'. Since the light waves cannot penetrate through the walls or objects, it has the high-level of security and the information is sent through encryption manner. And it requires Line of Sight (LOS). Hence, it can be used for only short-range applications. At receiver side, the information is received only as stream-able content. It will decode the information in order to obtain the original information. Through the LIFI technology, we can send the information as data, audio, video or the internet. It has many applications like indoor navigation, underwater communication and vehicle to vehicle communication. Here, we are using this LIFI technology in the supermarket in order to reduce the human effort and also to reduce the billing time. In which we connected a LED lamp in every rack which can send the information of products which are available in that corresponding rack. We can receive the information in the mobile by using the photo diode and through android application the payment will be carried out to reduce the billing time.

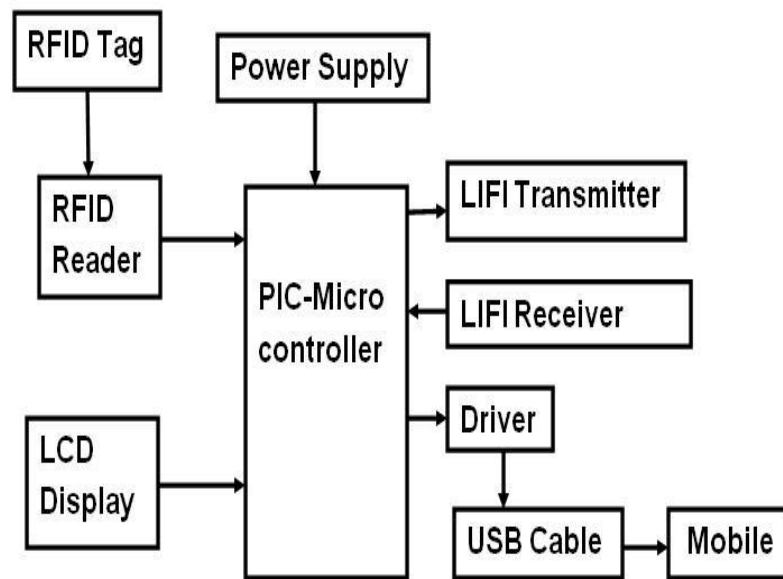
### **II. LITERATURE SURVEY**

The major problem in every super mall is that customer has to wait for the billing process. To avoid this problem, many techniques have been implemented. "RFID based smart shopping and billing [1]" system used RFID tag instead of bar-code. RFID is used to read the product information, which is attached to every trolley. Here, every trolley has to connect by using wires to transmit the purchased products detail to the server in order to carry out the payment process. "Electronic shopping cart for effective shopping base on RFID" [2] proposed a system in which each product is attached with RFID tag.

Here also RFID is used to scan and read the product details which are inside the trolley, and transmits the information to the server via wireless transmission by using the RF transmitter. “Smart shopping cart for automatic billing in supermarket [3]” In this system, RFID is used to scan and read the product information. Here, zigbee module is used to transmit the purchased product details from the customer to the server. “Smart shopping trolley using RFID [4]” proposed a system in which each trolley is attached with Product Identification Device. Through zigbee communication, the information is sent to the server. By using the trolley identification number, payment will be carrying out. “Smart shopping cart with automatic billing system through RFID and Bluetooth [5]” system uses RFID to read the product information. Here Bluetooth is used to send the information from the customer to the server. “Smart basket design using Arduino and RFID [6]” proposed a system which uses RFID to scan and read the product details. Here arduino is used to transmit the information via the WIFI module which has been attached to arduino. “A new technology for smart shopping cart [7]” proposed a system in which every product is attached with MIFARE tag. By attaching MIFARE reader in every trolley, the product information can be received. “Automatic product detection and smart billing for shopping using LIFI [8]” proposed a system which uses RFID to get the information which is inside the trolley. By using LIFI technology, the purchased product information is sent to the server. It has some disadvantages such that the billing process is carried out using LIFI module which requires LOS. To overcome this drawback, we proposed a system in which cloud storage is used. To overcome this drawback, we proposed a new system through this paper. And, another disadvantage is that using RFID which has high cost, less security, scanning problems, radio waves and extra. To overcome this problem, we used LIFI module in the proposed system.

### III. EXISTING METHOD

This system has four modules. There are: product, trolley, billing system and server module. In the product module, each and every product is attached with unique RFID tag which contains the product details such as code, name and price. The trolley module consists of a RFID reader which is used to read and add the product details into the list. It has a Micro controller and LIFI transceiver in which, the billing details send to the server. The payment is carried out using the android application which has been installed in the mobile.



*Fig 1 shows the block diagram of existing method*

#### IV. PROPOSED SYSTEM

##### A. PRODUCT MODULE

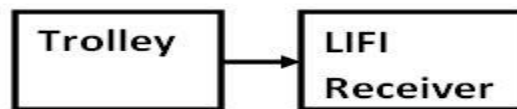
In every rack, Arduino and LIFI transmitter are attached. Arduino is used to store the product ID. And this arduino controller is programmed to send this stored ID to LIFI transmitter. LIFI transmitter is used to transmit the product ID through light waves. This information can be received only by LIFI receiver that means photo diode. This product module is shown in Fig 2.



*Fig 2 shows the block diagram of product module*

##### B. TROLLEY MODULE

Trolley section has a LIFI receiver which is able to receive the product id number from the LIFI transmitter through the light waves.



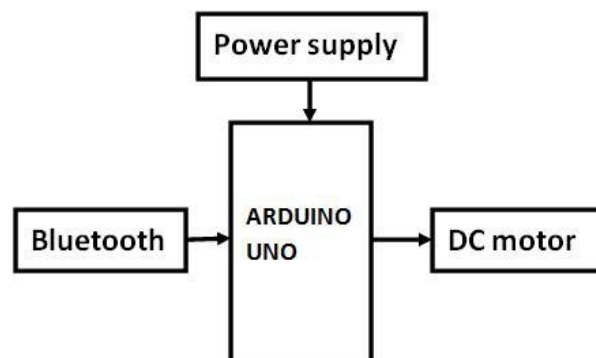
*Fig 3 shows the block diagram of trolley module*

##### C. MOBILE MODULE

One android application is installed in the mobile. It has VIEW NEAR PRODUCT, BUY, and FINISH, PURCHASED LIST, DELETE buttons. If a customer wants to buy a product, they need to click the BUY button. Then, that product will add to the card. The purchased list contains the purchased product details. If the customer wishes to remove a product, they need to click the DELETE button for that product which is in the purchased list. After finishing the purchase, they need to click the FIINISH button. Then, the authentication will be carryout. If the payment has finished, paid message will sent to the gate section through the Bluetooth in-order-to open the gate by using DC motor

##### D. GATE MODULE

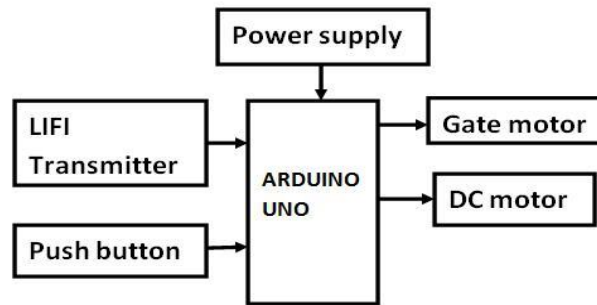
After the payment process, the mobile will send the PAID message with the respective trolley identification number. The gate will be open for that particular trolley by using the DC motor.



*Fig 4 shows the block diagram of module*

### **E.SYSTEM OVERFLOW**

Here the LIFI transmitter is connected with every rack and the LIFI receiver is connected with every trolley. The LIFI transmitter (LED bulb) always transmits the product id no. When the customer trolley is in the range of light transmission, the LIFI receiver (solar panel) is able to receive the product id and send to the mobile through the cloud storage. One android application is installed in the mobile in which the nearby product details are shown. These product details are extracted from the cloud storage. If the customer wishes to buy a product, they need to click the BUY option in the application for the respective product. The purchased list button is there to show the purchased products and the total billing details. The customer can remove the product by clicking the DELETE button for that product which in the purchased list. After finishing the purchase, the customer needs to click the finish button and then it will authenticate to credit the amount. If the payment is done, then the paid message will send to the gate section in order to open the gate by using DC motor.



*Fig 5 shows the block diagram of proposed system*

### **VI.CONCLUSION**

The main objective of this system is to avoid standing in queues while billing and reduce the time taken for shopping. With the use of LIFI technology, the billing and payment process takes place in the mobile itself. Once the PAID message is arrived to mobile, then only gate will be opened with the help of DC motor. There are many future scopes. We can use debit or credit card instead of mobile banking. To ensure the high level of security during the swiping process, we may include LIFI module.

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