Automatic Billing Computation in Shopping Mall Using LIFI Integrated with LED

P. Anand[1], R. Karthika[2], T. Murugeshwari[3], S. Nandhini[4], R. Vaishali[5]
[1, 2, 3, 4, 5] Department of Information Technology
[1, 2, 3, 4, 5] Saranathan College of Engineering, Trichy-620012, Tamil Nadu, India

Abstract- *Barcode and RFID readers are widely used in real time for shopping. But, this technology is not giving the proper solution for long queue while purchasing. In our project, we introduced the li-fi (light-fidelity) technology. Li-Fi is a bidirectional, high speed and fully networked wireless communication technology which is similar to Wi-Fi. It is wireless and uses visible light communication or infra-red waves which carries the information and has been proposed as a solution to the RF-bandwidth limitations.*

Keywords:- Lifi technology, LED, OTG, Microcontroller

I. INTRODUCTION

Shopping mall is a place where most people from all walks of life will get their daily necessities ranging from food product, apparels, toiletries; gardening tools electrical appliances, and others. Thus, the level of advancement of shopping mall system and infrastructure also varies. Compared to some foreign countries shopping mall system, there are still plenty of spaces for improvement in terms of providing quality shopping experience to the consumers. Consumers often face problems and inconvenience when shopping. These problems include worrying that the amount of money brought is not enough for paying all the items wanted, insufficient information of the items that are for sale and also wasting unnecessary time at the cashier. There are some existing methods to solve the problems that are stated above but the effectiveness still consider improvable. Examples of existing problem solving techniques are substituting the conventional way of keying item per item by hand to the cash register with the technology of barcode scanning where the price are stored in the barcode, and also set up a customer information counter to help the consumer if there are any enquiries about the items at shopping mall. The problems stated above might eventually be solved or else improved by the implementation of LIFI technology in shopping mall. This can be done by simply attach an LIFI transceiver to all the items in shopping mall and attach a LIFI receiver with a LCD display on the shopping trolley can solve all the problems above.

II. OBJECTIVE

The main objective of this project is to reduce and eliminate the time taken for billing and tension free shopping and also allow the users to self-checkout of the products in super markets by designing a lifi technology integrated with led communication.

III. PROJECT METHODOLOGY

In our project, all these inconvenience are overcome by using a wireless sensor network. The entire system consists of four sections: Trolley section, Product section, cart section and mobile section.

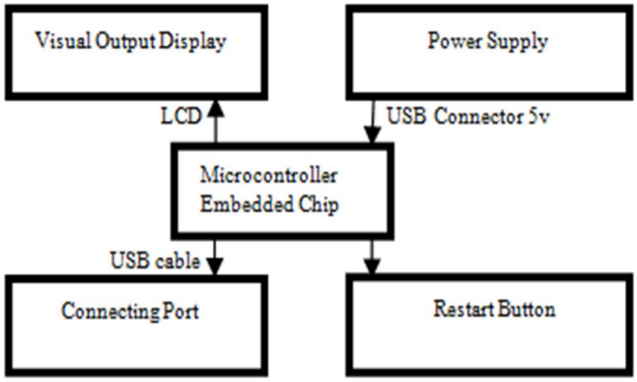
- In product section, each and every product is attached with LIFI module, which contain the product id, product price, date of manufacturing, expiry date etc.
- In trolley section, which is also containing LIFI module, is integrated with the LIFI transmitter for communicating the product details. The purchased product details are to be stored into microcontroller.
- In customer mobile section, also connected with purchase, including product id, cost of the product are entered. After completing the purchase, the payment is processed in mobile itself via mobile banking system.
- Use mobile phone for billing; it has android application for the payment. After completing the purchase it automatically added the product which is included. It is calculate the quantity and cost of the product.
- In cart section is fully monitored the purchasing product either is that same or not. After payment mobile LIFI will send the all the details to the gate module. If the payment is correct, the door will be open automatically, if not alarm will on.

IV. WORKING METHODOLOGY

- The LIFI technology controls the entire process.
- An Apk software installed in an Android mobile, which supports the OTG.

- A mini 4 inch LCD visual display monitor is integrated with the LIFI, which is attached to the microcontroller embedded board.
- Using Java Eclipse, a GUI based android application is coded.
- Using the LIFI technology, the preloaded values of the products in central database are valued and the coded Application accesses these values using a wireless network.
- A 5V battery kit powers the LIFI sand the LCD monitor.

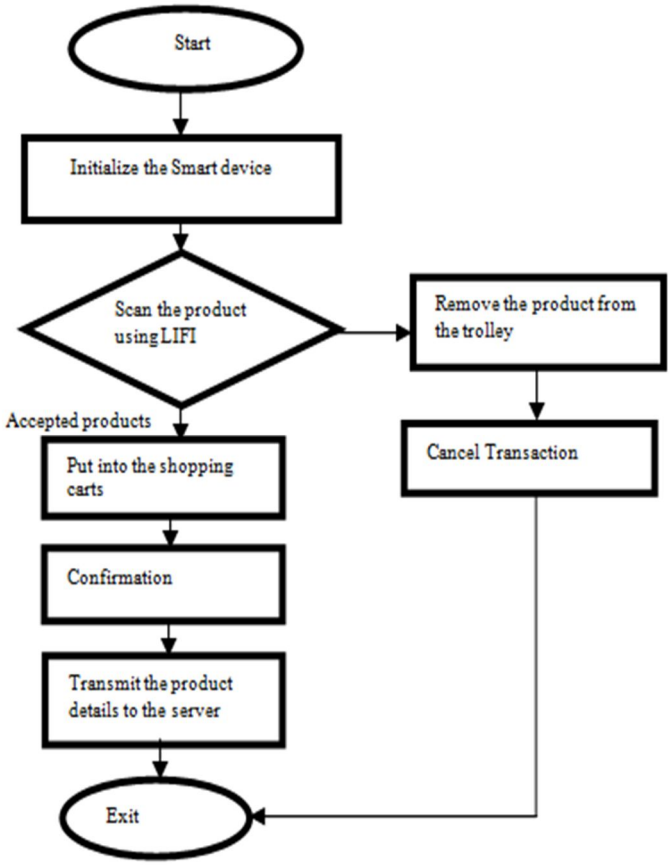
V. BLOCK DIAGRAM OF MICROCONTROLLER



DESCRIPTION

In our project, we used the microcontroller chip integrated with the LIFI transmitter. The embedded board has the restart button, which is used for the initialization of the device and also integrated with USB connecting port for the transferring of data from the mobile phone i.e. which are the products have been purchased. We used a 5V power supply for the embedded board. The embedded board has the LCD visual display which displays the quantity and cost of the product.

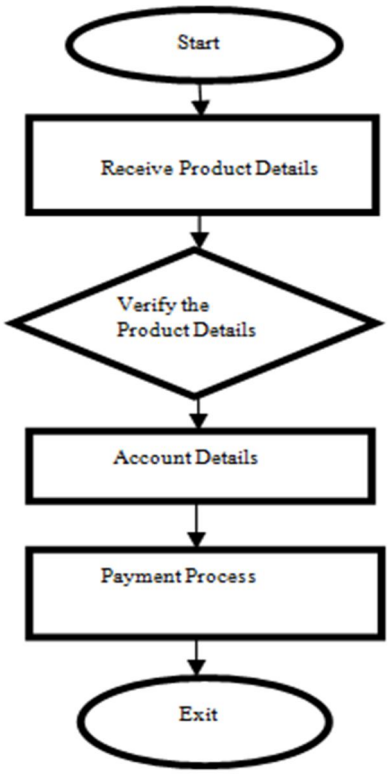
VI. TROLLEY SECTION



DESCRIPTION

In our project, we fix a microcontroller and LIFI transmitter in the trolley i.e. shopping cart. Before the purchase, we have to initialize the device. First, we have to scan the product which we are used to buy. Once we purchase a product, we have to scan the product before putting it into the trolley. With the help of LED light communication, the purchased product details are transfer to the server. If we need to remove the purchased product from the trolley, for that we need to scan the purchased product again. If our purchasing is finished, we have to confirm the details to the server. The server gets the purchased products of the customer through the LIFI and LED communication. The customer paid the money for the purchased product with the use of Online Transaction through the mobile phone.

VII. BILLING SYSTEM



DESCRIPTION

For the billing section, first we need to install the shop application on the mobile phone. Once we finished our purchasing, the details are sent to the shop server through the mobile phone. The server verifies the taken products with the billed products. The server sends a bill i.e. cumulative cost of the taken products by the customer. The customer needs to pay the bill from the Online Money Transaction from his bank account. Once the payment is completed, the server acknowledges the customer. At the gate section, the LIFI technology verifies the details of the products which the customer has purchased, which is already send by the server. If the products are mismatched, the alarm gets on else the customer will move on.

VIII. ARCHITECTURE DIAGRAM

DESCRIPTION

In our project, we will create an application to product name, product price which is connected with LIFI to the shop server. Mobile Client is an Android application which created and installed in the User's Android Mobile Phone. For creating an Application, we will be using Advanced Java Concepts like JSP and Servlets. While creating the application, we will assign the design fields like Username, Password, Phone and other information. Once the created the user is allowed to enter the data and also the server will store the data and allow the purchase to enter into the application. Server is used to verify the product information and allow the User to purchase. Product information will be stored in shop server and also the Server will analyze the contents user. The server will extract the identification of the customer. The Server will be retrieving the user information like Access time and location which is used to find the User's location and we can provide the any necessary help to them. The Server Module will maintain the entire User's access information and respond to the Clients request. Since the communication between the User and the Server is frequent, we have to establish the communication between them. For this purpose we can provide Network connectivity between them. The Server will extract the User information based on the query they've entered in the search bar. Li-Fi is a bidirectional, high speed and fully networked wireless communication technology similar to Wi-Fi is a subset of optical wireless communications (OWC) and can be a complement to RF communication (Wi-Fi or Cellular network), or a replacement in contexts of data broadcasting. It is wireless and uses visible light communication or infra-red and near ultraviolet (instead of radio frequency waves) spectrum, parts of Optical wireless communications technology, which carries much more information and has been proposed as a solution to the RF-bandwidth limitations. Whatever the products purchased by the customer is added into the cart, and then automatically the android phone detects the product id and price it's shown to customer. Once Customer purchase the product, that product id matched to the lifi. Cart also connected with LIFI connection. The final amount is shown to customer in android product purchase application. The customer ready to pay the bill using mobile banking or net banking by using android mobile application. After purchasing the products, user can pay the bill in android mobile itself. Once user purchased all items, finally debit the amount from customer account. This information will automatically send to shop server. The Server will verify the products provided by the customer and verify them with the shop server and then allowed to the customer will leave. While customer leaving from the shop, automatic product detection established.

IX. HARDWARE REQUIREMENTS

- Processor : Corei3/i5/i7
- RAM : 2-4 GB(min)
- Android Mobile phone
- LIFI technology

X. SOFTWARE REQUIREMENTS

- Platform : Windows Xp/7/8
- Front End : Java-JDK1.7, Android-sdk and Eclipse
- Back End : MYSQL

XI. DISADVANTAGES OF EXISTING SYSTEM

- Manual billing.
- Use barcode for billing.
- Human staff is needed for billing.
- Low product cost but overall expenses are much high.
- Difficult to track the product.
- Getting product information is difficult & time consuming.
- It does not disclose any automatic way of indicating to the shopper how the total bill is affected as objects are added or removed from the cart.
- In billing section, one by one product is checked and entered, this will take few minutes in the case of large number of product purchase.

XII. ADVANTAGES

- Automatic billing
- Does not use barcode billing
- Human staff is not needed for billing
- Easy to track the unpurchased product
- Time saving

XIII. CONCLUSION

In this paper, we presented the design and implementation of without queue purchase billing used LIFI. Most recently LIFI is new emerging technology in the trend. 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 LIFI receiver via OTG communication in the shopping cart. We present a coded modulation scheme based on LiFi for indoor visible light communications. Since the bandwidth of a single LiFi light is limited, we use parallel LiFi wicks with different product current to transmit data simultaneously.

We conclude that, the time required for billing in the shopping malls is reduced by self-scanning process also we deduct the product from the trolley.

XIV. APPENDIX

REFERENCES

[1] T. Komine and M. Nakagawa, “Fundamental analysis for visible light communication system using LED lights,” IEEE Trans. Consum. Electron., vol. 50, no. 1, pp. 100–107, Feb. 2004.

[2] S. Rajagopal, R. D. Roberts, and S.-K. Lim, “IEEE 802.15. 7 visible light communication: Modulation schemes and dimming support,” IEEE Commun. Mag., vol. 50, no. 3, pp. 72–82, Mar. 2012.

[3] R. Mesleh, H. Elgala, and H. Haas, “On the performance of different OFDM based optical wireless communication systems,” IEEE/OSA J. Opt. Commun. Netw., vol. 3, no. 8, pp. 620–628, Aug. 2011.

[4] S. Kim and S.-Y. Jung, “Novel FEC coding scheme for dimmable visible light communication based on the modified Reed-Muller codes,” IEEE Photon. Technol. Lett., vol. 23, no. 20, pp. 1514–1516, Oct. 2011.

[5] Y. Wang et al., “Trellis-coded pulse amplitude modulation for indoor visible light communication,” in Proc. Int. Conf. OIT, 2013, 90 430I.

[6] X. Ma and L. Ping, “Coded modulation using superimposed binary codes,” IEEE Trans. Inf. Theory, vol. 50, no. 12, pp. 3331–3343, Dec. 2004.

[7] X. Ma, C. Liang, K. Huang, and Q. Zhuang, "Obtaining extra coding gain for short codes by block Markov superposition transmission," in Proc. IEEE ISIT, Istanbul, Turkey, Jul. 2013, pp. 2054–2058.

[8] C. Liang, K. Huang, X. Ma, and B. Bai, "Block Markov superposition transmission with bit-interleaved coded modulation," IEEE Commun. Lett., vol. 18, no. 3, pp. 397–400, Mar. 2014.

[9] J. Li et al., "Superposed pulse amplitude modulation for visible light communication," Opt. Exp., vol. 21, no. 25, pp. 31 006–31 011, Dec. 2013.

[10] J. Vuˇci´c, C. Kottke, S. Nerreter, K.-D. Langer, and J. W. Walewski, "513 mbit/s visible light communications link based on DMT-modulation of a white LED," J. Lightw. Technol., vol. 28, no. 24, pp. 3512–3518, Dec. 2010.

[11] X. Ma and L. Ping, "Power allocations for multilevel coding with sigma mapping," Electron. Lett., vol. 40, no. 10, pp. 609–611, May 2004.

[12] X. Li, A. Chindapol, and J. A. Ritcey, "Bit-interleaved coded modulation with iterative decoding and 8PSK signaling," IEEE Trans. Commun., vol. 50, no. 8, pp. 1250–1257, Aug. 2002