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AUTOMATIC PRODUCT DETECTION AND SMART BILLING FOR SHOPPING USING LI-FI

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Abstract - **The Internet of Things (IoT) has revolutionized the way we interact with technology, allowing for greater connectivity and automation in our daily lives. One area of IOT that has seen significant growth in recent years is the use of Light Fidelity (LI-FI) technology. LI-FI uses light waves to transmit data, providing a fast, secure, and reliable means of communication. In this context, the need for an IOT-based LI-FI trolley arises. Such a trolley can be equipped with LI-FI transmitters based on Arduino, an LCD, a load cell, an RFID sensor, and LI-FI receiver-based Node MCU. Additionally, the trolley can have a solar panel, a battery, and IoT connectivity to enable remote monitoring and control. This IOT-based LI-FI trolley can be used in a variety of applications, including inventory management, logistics, and asset tracking. With the ability to transmit and receive data through LI-FI technology, the trolley can provide real-time information about the items it is carrying, their location, and their condition. This can lead to greater efficiency and accuracy in inventory management and logistics operations, ultimately resulting in cost savings and increased productivity. Moreover, the use of IOT connectivity allows for remote monitoring and control of the trolley, enabling managers to track its location, monitor its performance, and receive alerts in case of any issues. The inclusion of a solar panel and a battery ensures that the trolley remains operational even in areas with limited access to electricity. In conclusion, the development of an IOT-based LI-FI trolley can provide significant benefits in terms of efficiency, accuracy, and cost savings in inventory management, logistics, and asset tracking. Such a trolley can be easily deployed in various settings and can be customized to meet the specific needs of different applications.**

Keywords— Internet of Things (IoT), Light fidelity (LI-FI), RFID, LCD

I. INTRODUCTION

The Internet of Things (IoT) is a rapidly evolving field that is transforming the way we interact with technology. It has provided a new way of connecting devices, allowing for the collection, processing, and sharing of data in real time. One of the latest advancements in IOT is the use of Light Fidelity (LI-FI) technology, which uses light waves to transmit data wirelessly, providing a fast, secure, and reliable means of communication. In this context, an IOT-based LI-FI trolley can be developed using LI-FI transmitter-based Arduino, an LCD, a load cell, an RFID sensor, and LI-FI receiver-based Node MCU. The trolley can also be equipped with a solar panel, a battery, and IoT connectivity to enable remote monitoring and control. The IOT-based LI-FI trolley can be utilized in various applications, including inventory management, logistics, and asset tracking. The trolley can provide real-time information about the items it is carrying, their location, and its condition, enabling greater efficiency and accuracy in inventory management and logistics operations. Additionally, the trolley can be remotely monitored and controlled using IOT connectivity, The inclusion of a solar panel and a battery ensures that the trolley remains operational even in areas with limited access to electricity. This makes it suitable for use in a wide range of settings, including outdoor environments. In conclusion, the development of an IOT-based LI-FI trolley using LI-FI transmitter-based Arduino, an LCD, a load cell, an RFID sensor, and LI-FI receiver-based Node MCU, along with a solar panel, a battery, and IOT connectivity, has the potential to revolutionize inventory management, logistics, and asset tracking. This technology can provide greater efficiency, accuracy, and cost savings while enabling real-time monitoring and control from remote locations. Smart cart using Arduino and RFID is a new advancement in the field of Supply Chain Optimization. This system shall not only eradicate the long queues in supermarkets and malls but also save a lot of time for customers. The system also helps the customer with money management. The system uses RFID tags in place of Barcode tags which are much more efficient and powerful when it comes to scanning products. The device developed using Arduino and RFID shall be installed on the shopping cart or

shopping basket and the customer shall scan their products themselves and the total generation shall happen on the cart itself. This shall also give an idea to the customers on how much their particular shopping session shall cost them. Hence, time management and money management, both shall be taken care of.

II. LITERATURE SURVEY

1) V.PADMAPRIYA, R. SANGEETHA, R. SUGANTHI, THAMARAISELVI: LIFI-BASED AUTOMATED SMART TROLLEY USING RFID [2016]

In this paper, an innovative product with societal acceptance aids comfort, convenience, and efficiency in everyday life. Shopping at the mall is becoming daily activity in various cities. We can see a huge rush at malls on holidays and weekends. The rush is even more when there are special offers and discounts. People purchase different items in the malls and put them on the trolley. They have to find the product on the list, and queue to pay, at the billing counter. It is a time-consuming process. To avoid this, we are developing a system which we called a 'LIFI Based Automated Smart Trolley Using RFID'. In this system, we are using RFID tags instead of barcodes. Every product has an 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, a LIFI receiver will be placed, which will receive the data from the transmitter.

2) ARUN CHAKRAVARTHY, KALEESWARI M, MANDA ARUN: LI-FI BASED SMART SHOPPING [2019]

It proposes a system that uses LI-FI technology is used to transfer the data quickly. LI-FI transmitter is connected to all the racks in the supermarket. LI-FI receiver which has connected to the trolley can receive the product ID from the LI-FI transmitter through light waves. And it is sent to the cloud storage. One android application is installed on 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 options. After finishing the purchase, authentication will be carried out to pay the amount. Further verification will be done at the gate section.

3)MR.PINAGADI.VENKATESWARA RAO, VISHNUMENON, SURESH, VIGN ESH, STRIDHARAN.G: LI-FI BASED INTERACTIVE INTELLIGENT SHOPPING SYSTEM WITH AUTO PAYMENT USING ANDROID [2018]

In this paper, an implementation of Android Application is deployed on the Consumer Phone which is attached to Li-Fi Hardware via OTG. Every Product is attached with Li-Fi. The user will have to show the product in front of the Mobile so that the corresponding Product info is automatically updated. This includes Product ID & Cost. Li-Fi Module is also connected to Trolley. Android users can pay the bill via mobile phone and the details are updated on the shop server. The shop server communicates to the Gate hardware, where another Li-Fi is connected. Trolley communicates with the Gate section so that the products are packed safely without standing in the queue. Normal mobile users can place the order via cash is paid on COD mode.

4)SONARIKARVAISHNAVI, SATISH, BHAVANAKALIA, UDITBHATTACH ARJESRIKAN NARAYAN: SMART BILLING TROLLEY USING RFID AND LI-FI [2020]

A system is proposed which we have named the 'LI-FI Based Automated Smart Trolley'. In this system, we have used RFID tags in place of traditional barcodes. Every product has an RFID tag. Whenever the customer places a particular product inside the trolley, it is scanned through the RFID Reader. The weight and cost of the product could be displayed on a private computer. To implement this, we are using Visible Light Communication (VLC) technology to send the corresponding statistics to the central computer. At the billing counter, a Li-Fi receiver is placed, which can obtain the information from the Li-Fi transmitter linked to the RF reader.

III. SYSTEM ARCHITECTURE

The Internet of Things (IoT) is a rapidly evolving field that is transforming the way we interact with technology. It has provided a new way of connecting devices, allowing for the collection, processing, and sharing of data in real time. One of the latest advancements in IOT is the use of Light Fidelity (LI-FI) technology, which uses light waves to transmit data wirelessly, providing a fast, secure, and reliable means of communication.
In this context, an IOT-based LI-FI trolley can be developed using LI-FI transmitter-based Arduino, an LCD, a load cell, an RFID sensor, and LI-FI receiver-based Node MCU. The trolley can also be equipped with a solar panel, a battery, and IoT connectivity to enable remote monitoring and control. The

IOT-based LI-FI trolley can be utilized in various applications, including inventory management, logistics, and asset tracking. The trolley can provide real-time information about the items it is carrying, their location, and its condition, enabling greater efficiency and accuracy in inventory management and logistics operations. Additionally, the trolley can be remotely monitored and controlled using IOT connectivity. The inclusion of a solar panel and a battery ensures that the trolley remains operational even in areas with limited access to electricity. This makes it suitable for use in a wide range of settings, including outdoor environments. In conclusion, the development of an IOT-based LI-FI trolley using LI-FI transmitter-based Arduino, an LCD, a load cell, an RFID sensor, and LI-FI receiver-based Node MCU, along with a solar panel, a battery, and IOT connectivity, has the potential to revolutionize inventory management, logistics, and asset tracking. This technology can provide greater efficiency, accuracy, and cost savings while enabling real-time monitoring and control from remote locations.

Smart cart using Arduino and RFID is a new advancement in the field of Supply Chain Optimization. This system shall not only eradicate the long queues in supermarkets and malls but also save a lot of time for customers. The system also helps the customer with money management. The system uses RFID tags in place of Barcode tags which are much more efficient and powerful when it comes to scanning products. The device developed using Arduino and RFID

shall be installed on the shopping cart or shopping basket and the customer shall scan their products themselves and the total generation shall happen on the cart itself. This shall also give an idea to the customers deleted. If the customers wish to see the total, they can press the total button and the total shall be displayed. While making the payment of the bill, the customers just have to press the bill button after connecting the USB to the billing section and their bill shall be automatically generated in the admin's system.

The following block diagrams give a brief idea about the transmitter and the receiver at the trolley side as well as the billing side.

BLOCK DIAGRAMS:

TRANSMITTER

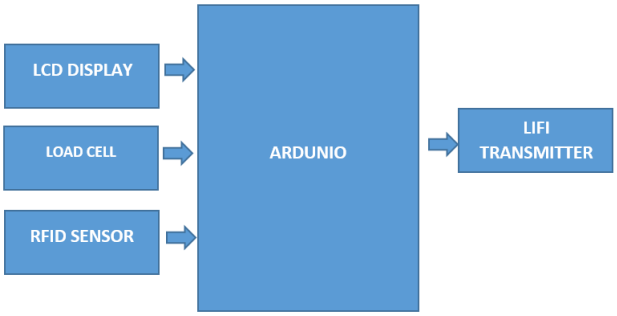

FIG: BLOCK DIAGRAM OF TRANSMITTER

RECEIVER

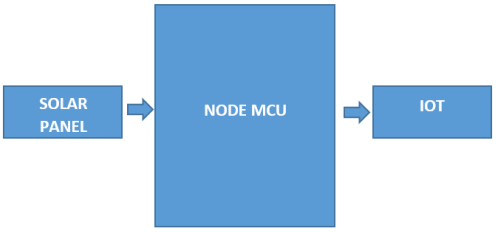

FIG: BLOCK DIAGRAM OF RECEIVER

IV. IMPLEMENTATION OF THE SYSTEM

OBJECT RECOGNITION:

Here we shall discuss, step by step, how we implemented our system

4.1 Designing the Circuit

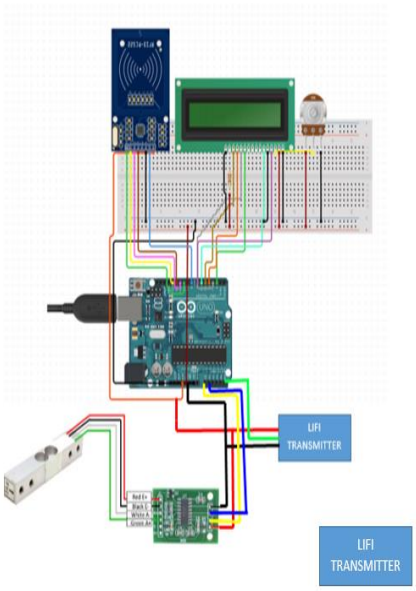

FIG: TRANSMITTER

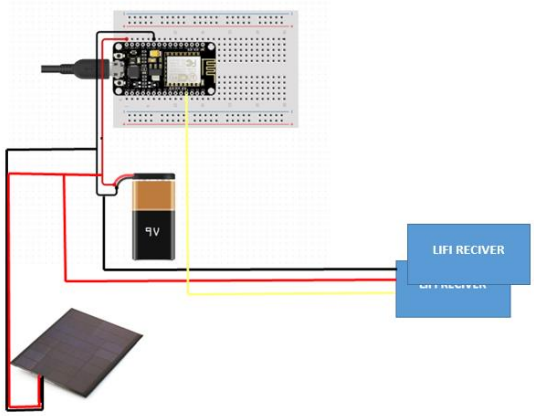

FIG: RECEIVER

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4.2 Building the Trolley Section

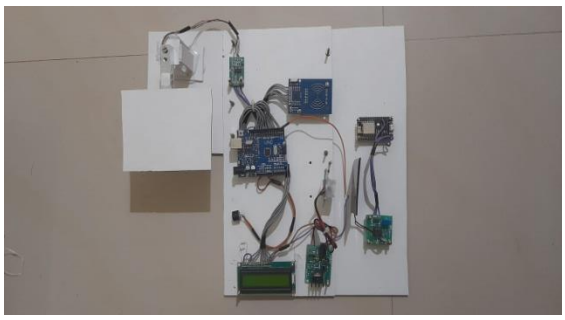

FIG: IMPLEMENTATION OF THE CIRCUIT

4.3 BILLING SECTION

The billing section shall be operated by the admin.

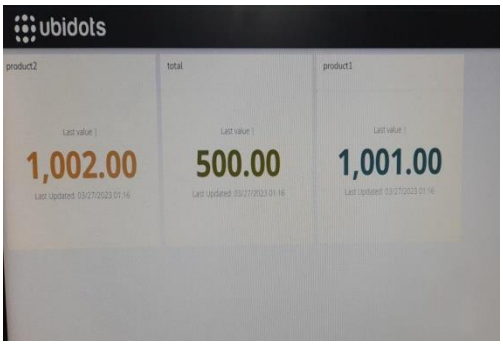

FIG: BILLING SCREEN AT THE ADMIN'S SECTION

V. RESULTS

The results of the project" is as follows:

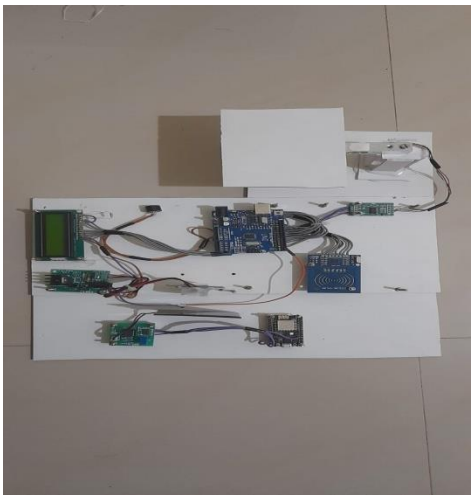

FIG: RESULT

5.1 DELETING A PRODUCT :

A product can be deleted by simply scanning the item you wish to delete

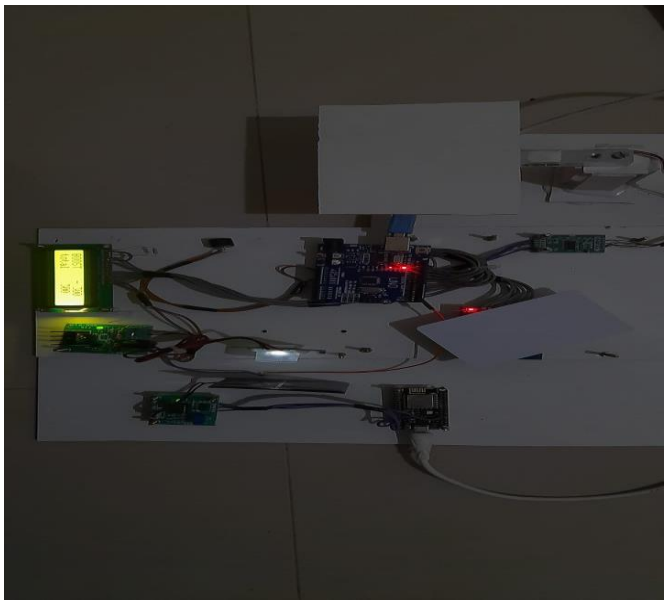

FIG: BEFORE THE ITEM IS CANCELLED

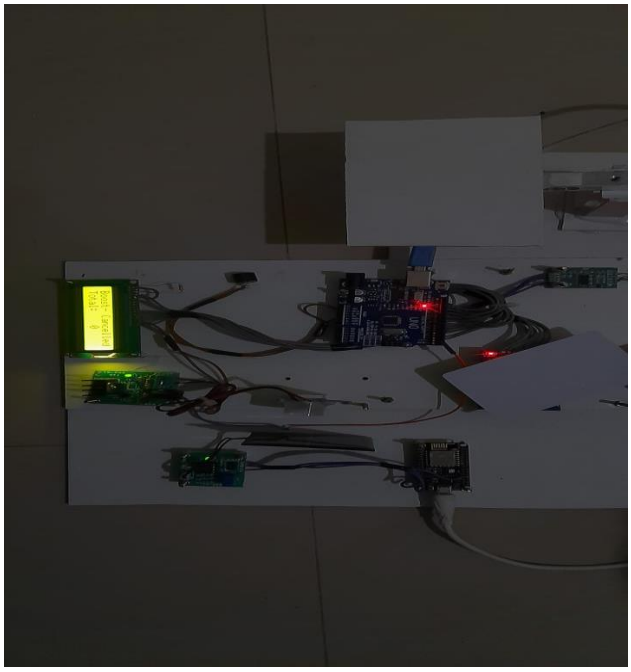

FIG: AFTER THE ITEM IS CANCELLED

Here, the minus sign (-) indicates that the scanned product (BOOST worth Rs. 300) has been canceled

5.2 SENDING THE BILL:

The bill can be sent to the admin's system for payment procedures by pressing the bill button.

5.3 CONCLUSION:

"Smart Cart using Arduino and RFID" has been successfully implemented. This system is not only effective in eradicating long queues but also manages the budget of the customer. This system is automated and far better than the existing Barcode system. With new technologies rapidly making every walk of life smart, shopping should be made smarter too. The system also has a very quick and easy billing option.

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