ASSISTIVE SHOPPING CART FOR VISUALLY IMPAIRED USING RFID AND VISIBLE LIGHT COMMUNICATION

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Abstract- This paper aims at developing an independent shopping aid for visually challenged people which helps them to walk through the shop, select items and complete billing without anyone's help. The existing communication systems use Bluetooth, WIFI, ZigBee etc., In recent years, there is a rapid development in the solid-state light-emitting diode materials which gave way for the next generation data communication known as visible light communication. Visible Light Communication has a promising future and it acts as a complement to the present RF communication by achieving larger bandwidth and high data rate. At present, the day to day activities uses a lot of LED-based lights for illumination, which can also be used for communication because of the advantages like fast switching, high power efficiency and safety to human vision. Hence, this project presents about eco-friendly data communication through the visible light so that we can easily guide people in shopping places and help them with the product they select.

Index Terms **- LED, LiFi, VLC, Visually impaired, Shopping.**

I.INTRODUCTION

An LED light is a semiconductor light source. Not only LEDs consume 90% less energy than incandescent bulbs, have improved physical robustness but also they have a longer lifespan, they have a low risk of combustion or burnt finger while handling in close proximity since they produce much less heat than ordinary lights. One of the important advantages is fast switching is possible in LED, therefore the constant current supplied to the LED light bulb can be dipped and dimmed, by switching up and down at extremely high speeds, that the flickering of light is invisible to the human eye. Therefore, LED is the most preferred light source in visible light communication. Light Fidelity(Li-Fi) is a fragment of Visible Light Communication (VLC) system. Visible light communication uses visible light in wavelength between the range 380 and 780 nm [6]. Visible Light Communication is a subset of optical wireless communications technologies.

The word blindness is used for complete or near complete loss of vision. The terminology "visually impaired" is used to represent people suffering from an extensive range of conditions which affect the clarity of vision and visual field. Common visual impairments encompass cataract, glaucoma, nearsightedness, farsightedness, corneal clouding, childhood-blindness, blind from birth (genetic defect), partial blindness and astigmatism. For this reason, it is safe to assimilate that visual impairment does not only mean blindness and it is also very common occurrence than speculated.

II.EXISTING SYSTEM

In retail shops, the products are usually on the shelves behind the counter and are fetched by an employee while the customers waited. This consumes a lot of time and manpower; the employees will not be able to give their undivided attention to individual customers. Supermarkets offer a wide variety of products and are predominantly self-service shops. In such stores, the customers can weigh all their choices and buy the product that best suits their need. The downside of this method is that billing is done by scanning barcodes of the product by the employees while the customers wait in the long queue.

Visually impaired people may encounter many hardships with day to day routine activities such as reading signs and navigating. Therefore, it is almost impossible for a visually impaired person to go on about their life independently. Even though some of these people might be able to do regular activities, they may struggle to read small letter and sentences, for example - elderly people. This includes shopping for basic needs in the supermarket and other shops. So visually impaired people may often require an assistant to read out information about the product. This is time consuming, inefficient and requires a lot of manpower.

III. SYSTEM DESCRIPTION

In our proposed system we develop an easy way of purchasing product for visually impaired people. The concept of our project is to reduce the time and manpower in shopping places and help visually impaired people. The trolley has the capability to display product information and the total prices of all the products. This makes it easy for the customer to know how much they have to pay while shopping rather than at the billing counter, after a long wait in the queue. Also, the scanning of the product is done simultaneously while shopping rather than spending a considerable amount of time waiting for the employee to scan after a long wait in the queue. This way the customer can receive faster and quality service. It also has a speaker to give that information through audio, for visually impaired customers, without the help of an assistant. The same transmitter in the trolley can be used to obtain navigation information from RFIDs placed at the side of the racks for the benefit of the visually impaired. Therefore, the speaker can give directions to those people.

The benefit for the shopkeeper is that they tend to get more customers due to the improved quality of service, the efficiency, user-friendliness and simplicity of the method of shopping. Thus, getting financial benefit due to this and due to the fact that there will be a large cut in their overall budget since they would need fewer cashiers and assistants.

IV.BLOCK DIAGRAM

A. ***Trolley section:*** The transmitter is fixed in trolleys (fig. 1). The RFID reader is attached to an Arduino microcontroller. The read data is stored in the controller memory and compared with the already stored data. It fetches the corresponding product information and price and displayed through LCD screen and heard through the speaker.

B. ***RFIDs and RFID reader:*** The transmitter section has RFID reader that reads the product information through RFIDs. RFID has a factory-assigned serial number that is used as a key for search in a memory, the serial number is read by the reader through RF signals.

C. ***LCD display:*** The product information such as the product name and price are displayed on an LCD screen, which will help the visually impaired people. This information is fetched from the controller memory.

D. ***Voice board and speaker:*** The product information is processed through a voice board and the corresponding recording is played through a speaker, this will help people those who are unable to read from the LCD screen (completely blind).

E. ***Keypad:*** The trolley has 1x5 keypad for choosing various modes. For example, supermarket, textiles, medical shop, foot wear shops etc. The modes allow reuse of same RFID keys for different product from different type of shops. The keypad also has total and remove buttons. The total button is used to view the total amount of the purchase.

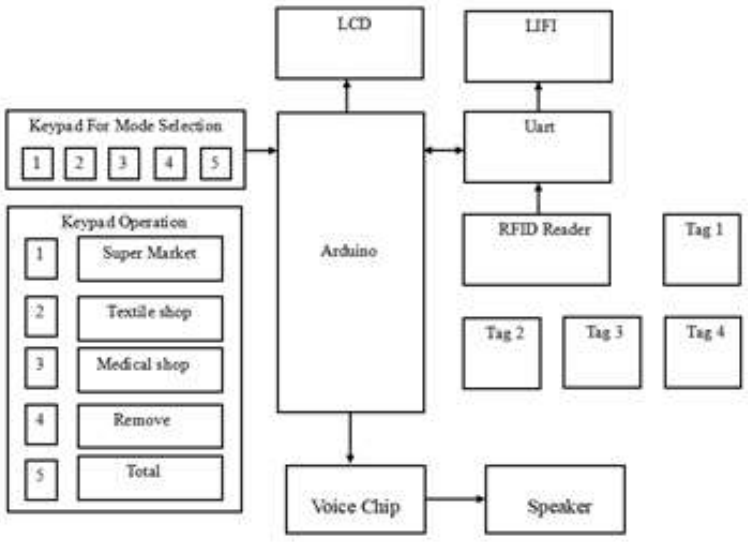

Fig.1 Block diagram of Transmitter

F. ***LIFI module:*** The total is transmitted to the receiver section through LiFi transmitter and receiver. The communication is fully based on visible light communication which is eco-friendly. The modulation used here is OFDM. Data is converted to binary digits (0s and 1s) is fed into an LED light bulb, therefore the data is sent embedded in light beam at rapid speed. The photodetector in the receiver detects the rapid changes in the light beam received and converts it into an electrical signal carrying the required data.

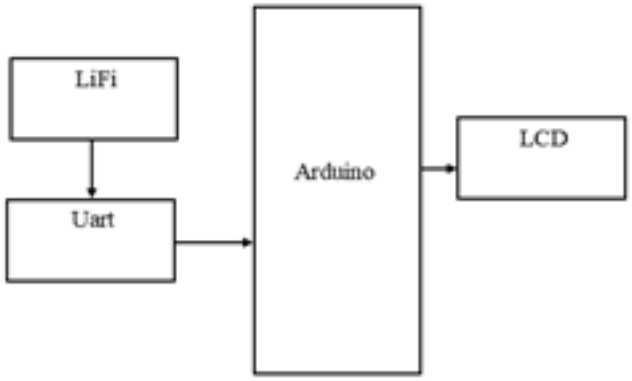

Fig.2 Block diagram of Receiver

G. ***Billing counter:*** The receiver is at the billing counter (fig.2). The total amount is displayed through LCD connected to the Arduino microcontroller. The cashier can collect the money as per the displayed value.

V. RESULT AND IMPLEMENTATION

The circuit design of the transmitter i.e., the module to be incorporated into trolley is shown in fig 3. The RFID data received through the scanner is processed and product information is displayed on an LCD as well as heard in the speaker. The total is transmitted through the LED light source after the shopping is done. Total and remove functions can be done by keypad buttons.

Fig.3 Transmitter

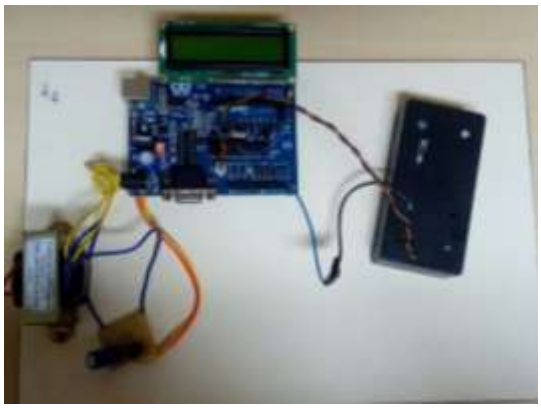

Fig.4 Receiver

The circuit design of the receiver i.e., module at the billing counter is shown in fig 4. The data is received through the photodetector, and the information is displayed on the LCD screen. These are the complete prototype of the proposed system. Displayed total and product information are shown in fig 5. The total is displayed in first column and the last product scanned is displayed in the second column.

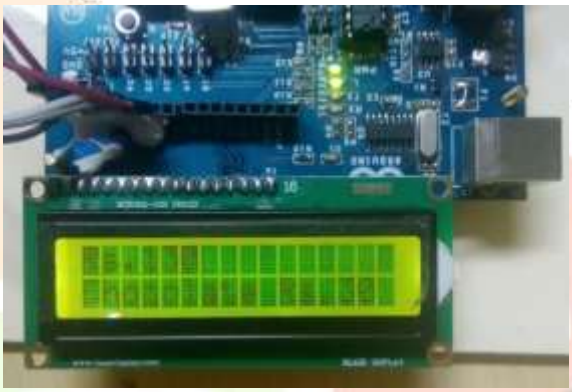

Fig 5. Displayed total and product information

VI.CONCLUSION

The model developed showcases a simple and easy way to shop for visually impaired since the price along with the product information is displayed on an LCD and as well as heard through a speaker. The developed model is just the prototype of the application, bigger displays can be implemented and text-to-speech module can be added instead of voice board.

In future works, when phones have inbuilt photodetector, the model can be employed to transmit total to the phone and make cashless payments online.

VII.REFERENCE

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