Review on Automatic Scanning of RFID Tag of Product in Smart Trolley At Shopping Mall

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Abstract- *Today everything is done digitally instead of manually, with the help of IoT, wireless communication, and artificial intelligence. But the supermarket uses the same old, existing system. There have been advancements in shopping payment methods such as debit, credit, and UPI, which have made payments easier but do not help reduce the long queues at supermarket billing counters and make shopping time-consuming. Hence, we had discussed different methods to make old manual shopping into smart shopping and had proposed a new method. RFID systems will aid in the elimination of the current barcode scanning system, making shopping simple, easy, and time efficient. In this system, tags will attach to products and be read by a reader in the trolley, which will show all details about the products on an LCD display. It will also show product weight, and payment will also be done by RFID technique.*

Keywords- RFID Reader, RFID Tag, IoT, Smart Shopping, Node MCU

I. INTRODUCTION

Currently, everything is done digitally, which has replaced everything that was done manually. with the assistance of wireless communication, artificial intelligence, and the Internet of Things (IOT), which simplifies human life. Because of the high standard of living, purchasing products at the supermarket and boardwalk has become a daily ritual. People used to have a list of particulars written on a piece of paper when they went shopping for groceries; still, the advancement of technology has changed how people do shopping over the last decade [1]such as the use of debit and credit cards, as well as UPI payments. But still, supermarket shopping follows the same process in which the client has to take the handbasket or trolley from the store, fill the trolley or handbasket with the particulars he wishes to buy, and walk around the store. The handbasket or trolley is then taken to the billing counter for billing, where it is first empty for product surveying to determine product cost, then bagged in bags and reloaded in the trolley before leaving the supermarket or boardwalk.

There is a need for a customer to have a hassle-free shopping experience in a supermarket, from selecting products to buy and adding them to their carts to waiting in a long line at the checkout. Which becomes tedious for both the retailer and the customer. This review paper discusses smart shopping using a smart trolley, which will help for smart, simple, and easy shopping by eliminating the existing system.

II. EXISTING SYSTEM

The existing methods of identifying the products in the supermarkets are by reading the barcodes using barcode readers at the billing counters [2]. But multiple products cannot be scanned at once because the barcode of each product must be in line of sight of the scanner. Due to this, the shopkeeper has to scan each product one by one, which increases the queue at the billing counter. And for loose groceries like rice, wheat, or vegetables, we must weigh them according to our needs at the weigh scale, where the retailer weighs the item and attaches a barcode sticker. which eventually becomes a time-consuming process and increases the long lines and rush at the supermarket. To overcome this problem, we can use different methods to make shopping time efficient, simple, and easy. methods like RFID tags and weighing scales.

III. LITERATURE SURVEY

In [3]this paper the author discussed the current system of shopping in malls and hypermarkets and how time-consuming it is. They had proposed a method to solve the problem of shoplifting in supermarkets through smart payment and smart billing. After scanning the product with a QR code, measuring the weight with a weighing scale, and detecting theft with an image processing method, a bill will be generated on mobile, and the customer can self-check out

The author of [4]proposed the system in the paragraph that follows. when the customer will place the product in the bags, which are already in the cart. But only after the product is scanned by the RFID or barcode scanner installed in the 2SBC-Smart Cart retrofit unit. A weighing

scale will be placed at the cart's base, and its weight will be displayed on a screen. It is similar to the self-checkout system, which will be done by the cart itself. As the items are scanned, RFID/UPC product information is sent by Wi-Fi to a central database. The database will return the pricing information to the central computer on the cart via the Raspberry Pi. The total that is currently in the cart will be constantly presented to the customer. Following the tally of the items, the customer may proceed to the cashier and pay for the goods, then immediately exit the store.

Moving a shopping cart in a supermarket or mall becomes difficult because of the heavy weight of the items in the cart. So, to overcome this problem, the author of [5] designed a human-friendly smart trolley with an automated billing system. The trolley will follow the customer automatically. This will be accomplished by tracking the customer's movement using sensors on the trolley. If the customer stops or stays, the trolley will stay at the same distance. The billing will be placed in the trolley with an RFID reader. A Raspberry Pi unit with a software database will communicate with a central database interface, which will include an RFID scanner, an ultrasonic sensor, and a colour tag scanning camera. A camera installed at the trolley base is used to scan the customer's colour tag in their hands, through which the trolley will follow them.

The author discusses the smart trolley in this [6]paper, which will include an RFID reader, an RFID tag, a voice board, a QR scanner, an LCD display, and an added benefit: a childcare section. The trolley will consist of an RFID reader, which will scan the product, and the item will be shown on an LCD display. The price of the product will be spoken by the voice board. At the end, when the cart is loaded, the price will be updated on the RF module, and payment will be done by QR scanner. the RF module will perform its operation. An indication is given to the parents to safeguard the child. It is difficult to find due to the crowded nature of the supermarket.

In this [7]paper, the author has proposed a method to decrease the time at the billing counter. by the arrangement of an RFID reader, Raspberry Pi, Arduino, and LCD display in each shopping cart. To add the item to the cart, the add button should be clicked, and to remove the item from the cart, the subtract button should be clicked. It will also read the expiration date on the product. If the product is expired, the red LED will glow and the buzzer will be on. A green LED will illuminate once the shopping is completed. Item information in the cart will be sent to the central billing server, so it will show directly on the webpage, and it will be easy to pay the bill without any wasting of time.

IV. COMPARISON BETWEEN BARCODE,RFID, AND NFC.

Parameter	Barcode	RFID	NFC
Definition	Barcode is a method of storing data using a printed series of parallel bars or lines of varying width in a computer system.	Radio Frequency Identification (RFID) is an automatic identification method that uses the internet, in which data is digitally encoded in RFID tags.	Near Field Communication (NFC) is a type of short-range, high-frequency wireless communication technology.
Technology	Optical technology.	Radio Frequency.	It is a subset of RFID.
line-of-sight requirement	It requires line of sight.	does not require line of sight.	does not require line of sight.
communication	It is one-way communication.	It is one-way communication.	It is two-way communication.
Read and write	It read "only."	It can read and write.	It can both read and write.
Read rate	It read "one at a time."	It can read many 10s or 100s at a time.	It can read only one NFC at a time.
Tags	It does not have tags like RFID or NFC; its tags are printed with black and white pattern lines.	It has two types of tags: 1. Active tag 2. Passive tag.	NFC tags are passive in nature.
Range	The range is up to several inches or feet.	It is determined by frequency: 1. Low frequency:	It only works at a high frequency of 13.56 MHz .

		125–134 kHz 2. High Frequency: 13.56 MHz 3. Ultra-high frequency: 856 MHz to 960 MHz	
Storage capacity	It stores data in less than 100 bytes.	An active tag can store up to 2 kilobytes of data. In passive tags, it can store up to 4-8 kB of data.	It stores data up to 48 bytes (8 kilobytes).

V. PROPOSED METHIDOLOGY

To eliminate the difficulties of the existing system in supermarkets, we propose a new method. The main intention of the system is to minimise the time required for shopping and eliminate the long queue at the billing section. As previously stated, barcodes, RFID, and NFC are all compared. The RFID technique will be suitable and best for the system. The circuit will be mounted on the trolley, which will include an RFID reader, LCD, and weighing scale. The product will be attached with an RFID tag, which will be replaced by barcode stickers. While placing the product in the cart, it will be scanned, and after scanning, it will display all the product's details, such as the name and quantity, on the LCD display. The weighing scale will determine the weight of the product as well as the total weight of the cart. In this system, there is no need to go to the billing counter for payment. To make payment after shopping, the details will be displayed, and the customer can pay via RFID, which will make payment easy and simple. The customer can also remove or cancel the product from the cart, which can make changes to the display. To process all the data, we can use an Arduino, Raspberry Pi, or Node MCU. As per the requirement of the project, Node MCU will be the best, since it is a low-cost open-source IoT platform that connects objects and lets data transfer using Wi-Fi.

VI. CONCLUSION

Hence, discuss above the different methods to eliminate the existing system of supermarkets to solve various problems. And we had proposed the RFID technology in the trolley to make shopping for the customer simple and easy. which will reduce human error, increase efficiency, assist in the reduction of long lines, and save customers' time It will also make payment quick and simple.

REFERENCES

[1] T. Athauda, L. M. Juan Carlos , L. Jonathan and N. Karmakar, "Robust low-cost passive UHF RFID based smart shopping trolley," in IEEE Journal of Radio Frequency Identification, August,2018.

[2] R. S. Sudipta and R. N. Ponnalagu , "An Intelligent Shopping Cart with Automatic Product Detection and Secure Payment System," in IEEE 16th India Council International Conference(INDICON), December 2019.

[3] P. |. 1. S. Sakthy.S, . R. T and K. .. , "Smart Payment And Billing Management System," in International Conference On Power Energy Control And Transmission System (ICPECTS), December,2020.

[4] T. Arciuolo and A.-s. Abuzneid , "Simultaneously Shop, Bag, and Checkout (2SBC-Cart): A Smart Cart for Expedited Supermarket," in International Conference On Computational Science And Computational Intelligence (CSCI), December 2019.

[5] Hanooja, C. .. Raji, S. M. K. Jemsheer, M. A. V. and M. N. M. , "Human Friendly Smart Trolley with Automatic Billing System," in Fourth InternationalConference on Electronics, Communication and Aerospace Technology (ICECA), November,2020.

[6] R. Parameswaran and P. .. Bhuvaneswari, "RFID Aided Intelligent Shopping Trolley with Child Care Unit," in IEEE International Conference on RFID Technology and Applications (RFID-TA), October,2021.

[7] R. R. Vallabhuni, L. .. A. G. and V. Vallabhuni , "Smart Cart Shopping System with an RFID Interface for Human Assistance," in Third International Conference on Intelligent Sustainable Systems [ICISS], December,2020.

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