SMART SHOPPING TROLLEY WITH AUTOMATED BILLING SYSTEM

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ABSTRACT

Using QR code technology, the Smart Shopping Trolley with Automated Billing initiative completely reimagines the shopping experience. With its sensors, the cart updates the system instantly when products are added by scanning the QR codes on them. Customers view scanned products and pricing by interacting with an intuitive touchscreen interface. During the checkout process, automated billing computes the total amount by scanning QR codes, offering effective payment alternatives. For merchants, this innovation optimizes inventory management, reduces wait times, and expedites checkout procedures. The concept promises a smooth shopping experience driven by QR code integration, marking a significant advancement in retail technology.

Keywords: QR Code Pictures, ESP32Cam Module, And Central Billing System, Local Website, Interface Graphics, Tracking Purchases And Processing Payments, Calculation Of The Total Amount.

I.　　INTRODUCTION

The Smart Shopping Trolley with Automated Billing project represents a pioneering endeavor in the realm of retail, leveraging QR code technology to revolutionize the traditional shopping experience. In an era characterized by rapid technological advancement and shifting consumer expectations, this project responds to the need for streamlined processes and enhanced convenience in the retail sector. By assigning unique QR codes to each product, customers can seamlessly scan items using their smartphones or integrated trolley scanners, updating their digital carts in real-time. A user-friendly touchscreen interface complements this technology, providing shoppers with instant access to product details and pricing, thereby enriching their shopping journey. At checkout, the automated billing system compiles scanned items, facilitating swift and hassle-free transactions. The Smart Shopping Trolley with Automated Billing project is an innovative example of how technology and convenience can come together to redefine the shopping experience. However, the benefits of integrating QR code technology for retailers go beyond those enjoyed by customers; it also holds the potential to revolutionize inventory management and operational efficiency.

II.　　LITERATURE SURVEY

Some literature research was done for this article in order to obtain accurate information on the approaches that are now in use; they are described below.

[1] "Smart Shopping Trolley using QR Code and ESP32Cam" model is implemented by R.Ranjith and Soumyalatha Naveen from REVA University, School of Computer Science and Engineering, Bengaluru, India in June 2022. They proposed system is to save the time consumption very reliable, low cost 365 and easily manageable that are implemented with latest technologies. This model can be mounted on all shopping trolley.

[2] In April 2019, Ponnalagu and Sudipta Ranjan Subudhi developed a "intelligent shopping cart with automatic product detection and secure payment system" (paper [2]). This system integrates many components such as an Arduino UNO, RFID reader, fingerprint sensor, keypad, LCD screen, and GSM/GPRS module. It makes it easier to scan products using RFID and keypad input, then verify payments using UID and fingerprints. However, because of the fingerprint sensor's hygienic issues, its intricate process can put off some customers, particularly during a pandemic. Moreover, the need for a SIM card for every GSM module raises maintenance and cost. Its usability and accessibility could be improved by simplifying the user interface, looking at touchless payment methods, and taking into account alternate communication technologies.

[3] In 2023, Meghana Galipelli, Madhu Bala Myneni, Mehul Nallamothu, and Navyatha Jangam created a project called "Smart Shopping Trolley with Automated Billing using Arduino." This idea uses an LCD-equipped shopping cart to show the total amount of things purchased, introducing an automated customer billing system

to malls. RFID cards are used to offer clients access to the items, speeding up the checkout procedure and giving them more time. The LCD panel also shows particular product information, including the name and price.

[4] Sapana, Swapnali, Mohammad, A. D. Sonawane 2021 from Department of Electronics and Telecommunication Engineering, JSPM'S Rajarshi Shahu College of Engineering, Pune are doing Shopping Trolley with "Automated Billing Using Arduino". This project is cost effective and friendly for the customers to avoid the billing by standing in the long queues for a longer time. It can made customers can themselves scan the products without any help of manual billing. The total price of the products is displayed accordingly. It has consisted of RFID, Arduino Nano, Node MCU esp8266, GSM module and LCD screen.

In the manuscript [5] Shishir R. Patil, M.C. Ellemmi, Shridhar N. Mathad, S. S. Gandhad The article on the Smart Trolley project, titled "Automatic Billing System using Arduino," was published in 2022. They have effectively put into practice a workable RFID-based technology to greatly assist customers and save valuable time, particularly in paying, which is a very time-consuming activity that requires waiting for our turn. RFID can scan a large number of objects at simultaneously, but each item needs to be tagged. With built-in tags and readers that don't take up much room, the trolley becomes smart and very appealing to customers.

[6] RFID technology is used in the implementation of the "IoT-based smart shopping cart system" described in this paper. The system will automatically recognize and track the things placed in the cart by using a variety of sensors and devices, including barcode scanners, RFID readers, and weight sensors. Any item that a consumer scans will have its code instantly recognized, and the item's weight, price, and name will be shown on the LCD screen. In 2023, Anusha K, Gayana G P, Rekha B Honnali, Sahana G B, and Shridevi H made the proposal.

[7] The study on the development of an improved "automated shopping trolley payment system" using a barcode scanner and weight sensor was implemented in December 2021 at Abdusalami Abubakar College of Engineering, Igbinedion University, Okada, Edo State, Nigeria, according to paper [7] by James Agajo, Ajao A. Lukmam, Sadiq Thomas, Najashi Gafai, and Ishaya R. Namah. This research developed a system placed on the shopping trolley, which is to complete the billing process in the trolley rather than waiting in long queues. To achieve this with a barcode scanner, weight sensor and LCD screen.

Paper [8] Subhransu Sekhar Panda, Jharana Behera 2022 Journal of Engineering Science (JES) Gandhi Institute for Technology, Bhubaneswar, India. This creative project idea can be used in shopping centers, supermarkets, and malls to buy products. RFID cards are used to securely access every product in shopping places. RFID tags or cards are used to access the products. Therefore, this project will help to improve security and also reduce shopping times. It also offers customers a pleasurable & user-friendly shopping experience.

In the manuscript [9] The "smart shopping cart" project was completed by Paripally Pallavi, Bodla Raviteja, Anna Varun, and R. Narender 2022. It was developed using an Arduino Uno and an ESP32 camera. An Arduino Uno is linked to a 128x64 graphic LCD panel with green, red, and blue leds. Bill details are displayed via an application, and payments are made using the application.

III. EXISTING SYSTEM

The customer would not know the entire amount purchased under the current approach until he walked to the counter to pay his bill. Once one gets to the counter, he can remove some products and choose which ones should be put back. Personnel were crucial to the operation of these devices because they required manual labor. In order to prevent these kinds of issues, we developed a smart trolley that allows users to view the entire bill for the goods they have purchased and sends the bill amount wirelessly to the billing area.

IV. METHODOLOGY

When it comes to system design, The difficulties that customers encountered during periods of high shopping traffic were the basis for the initial identification of the needs for the smart shopping trolley system. These specifications included automatic invoicing, user-friendly interface, cheap installation costs, and real-time product identification. The system's parts were thoughtfully chosen to satisfy the specified needs. Selecting appropriate sensors, communication modules, display units, and microcontrollers was part of this. During the selection process, variables like compatibility, cost-effectiveness, and availability were taken into account. The physical system is made up of integrated hardware, such as displays, sensors, and microcontrollers. Software development also included programming the microcontrollers to handle data processing, regulate sensor

inputs, and communicate with users via the display unit. Product identification was accomplished by using QR code technology. A distinct QR code with pertinent details including the product name, price, and barcode was given to each item. The trolley was equipped with QR code scanners to make the scanning process easier. The image processing and wireless transmission capabilities of the ESP32Cam module were used. It was incorporated into the system to interface with the central billing system, extract product information, and take and process QR code images.
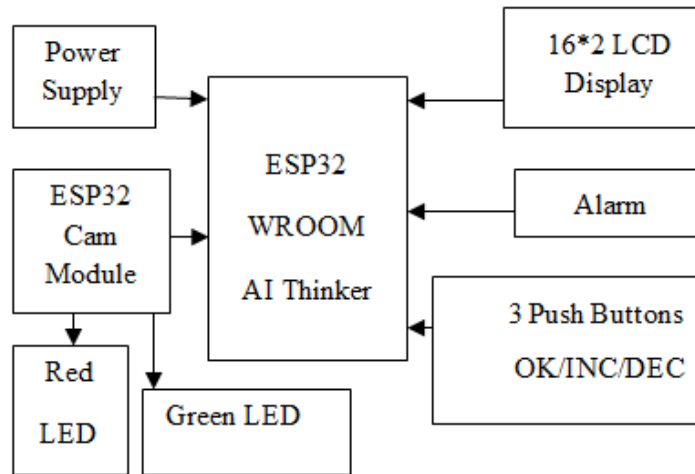

Figure.1 – Block Diagram of the Proposed System

To give customers a graphical interface for tracking their purchases and completing payments, a local webpage was created. The webpage's functions include calculating the total amount, displaying scanned products, and enabling safe online payments. System testing and evaluation involved extensive testing to make sure every part worked as it should have. This involved verifying the hardware's ability to communicate with one another, the capability of scanning QR codes, and the precision of billing computations. To assess the smart shopping trolley system's usability and efficacy, a user study was carried out. The prototype system was used by participants to simulate shopping scenarios, and their input was gathered to determine areas that needed improvement.
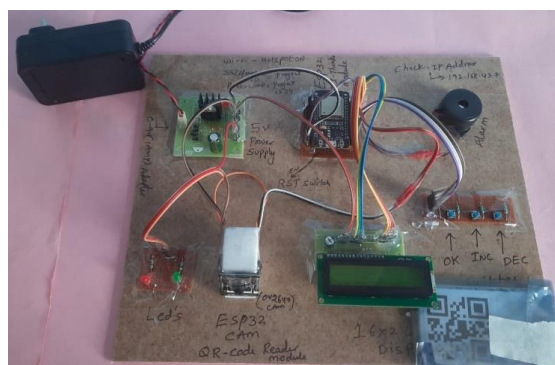

Figure.2 – Hardware Module

Three main criteria were used to thoroughly evaluate the prototype system: speed, accuracy, and dependability. The focus was on billing accuracy, scanning speed, and system responsiveness. User and operator feedback was gathered while it was installed in actual locations, such as supermarkets, to improve its operation and design. Through comparison with pre-established benchmarks, the assessment verified the system's efficacy in real-world situations. This all-encompassing method addressed usability issues as well as technical performance, encouraging ongoing improvement for peak performance and user happiness.

V.   RESULTS

Smart Shopping Cart using IoT

ITEMS	QUANTITY	COST
Biscuit--25/-	2	50
Lux Soap--30/-	0	0
MANGO(1KG)--45/-	1	45
Milk Bread--15/-	2	30
Grand Total	**5**	**125**

Pay Now

Customers participate in this initiative by registering for an account on the mobile app and entering personal data including name, contact information, and preferred method of payment. Customers scan the QR codes on certain products with the IP address mobile app to add them to their virtual shopping basket. When a new item is added, the intelligent shopping cart recognizes it and instantly updates the display screen with the item's details and running total. On the trolley's display screen, customers may see their current bill amount at any point while they are shopping. After shoppers have finished their purchases, they head to the register. The customer's shopping cart contents and final bill amount are represented by a unique QR code that is generated by the mobile app.

VI.   CONCLUSION

An important development in retail automation and customer service is the use of QR code technology to construct a smart shopping cart with automatic billing. This creative approach increases operational efficiency for shops while providing a seamless and easy shopping experience by utilizing IoT and mobile technologies. These kinds of solutions have the potential to play a major role in the retail environment of the future as technology advances. Thus, it guarantees correct transaction records and lowers the possibility of billing errors. simplifies the purchasing process, resulting in shorter lines and higher client satisfaction.

VII.   FUTURE SCOPE

To make shopping easier, the automated invoicing system and smart shopping cart combine QR code technology. It has functions such as an integrated scanner for deciphering product QR codes, an LCD for displaying item specifications and costs, and a safe payment gateway for smooth transactions. It also has an easy-to-use interface that makes shopping list personalization and navigation simple. The technology ensures billing accuracy and transparency by giving real-time information on products purchased and overall expenses. Additionally, it might include functions like inventory control, tailored suggestions based on past purchases, and loyalty program integration for improved client interaction. All things considered, this approach transforms purchasing for both customers and businesses by fusing efficiency, convenience, and cutting-edge technology.

VIII.   REFERENCES

[1]   The "Smart Shopping Trolley using QR Code and ESP32 Cam" was implemented in June 2022 by Ranjith R and Soumyalatha Naveen from REVA University's School of Computer Science and Engineering in Bengaluru, India.

[2]   Using RFID technology and a secure payment mechanism, Ponnalagu and Sudipta Ranjan Subudhi built the "Intelligent Shopping Cart with Automatic Product Detection and Secure Payment System" in April 2019.

[3]   In 2023, Mehul Nallamothu, Meghana Galipelli, Navyatha Jangam, and Madhu Bala Myneni used RFID technology to construct the "Smart Shopping Trolley with Automated Billing using Arduino".

[4] "Shopping Trolley with Automated Billing Using Arduino" was implemented by Sapana, Swapnali, Mohammad, Department of Electronics and Telecommunication Engineering, JSPM'S Rajarshi Shahu College of Engineering, Pune, 2021.

[5] Utilizing RFID technology, Shishir R. Patil, Shridhar N. Mathad, S. S. Gandhad, and M. C. Ellemmi built a "Smart Trolley with Automatic Billing System using Arduino" in 2022.

[6] Anusha K, Gayana G P, Rekha B Honnali, Sahana G B, and Shridevi H built a "IoT-Based Smart Shopping Cart System" using IOT technology in 2023.

[7] The group led by James Agajo, Ajao A. Lukmam, Sadiq Thomas, Najashi Gafai, and Ishaya R. Namah from the College of Engineering at Igbinedion University in Okada, Edo State, Nigeria, executed "Development of an Improved Automated Shopping Trolley Payment System Using a Barcode Scanner and Weight Sensor" in December 2021.

[8] The "RFID-Based Secure Access System for Shopping Complexes, Super markets, and Malls" was implemented by Subhransu Sekhar Panda and Jharana Behera at the Gandhi Institute for Technology in Bhubaneswar, India in 2022.

[9] Paripally Pallavi, Bodla Raviteja, Anna Varun, and R. Narender from Electronics and 42 Communication Engineering, ACE Engineering College, Hyderabad, Telangana, India, created a "smart shopping cart" system using an Arduino Uno and ESP32-CAM in June 2022.