Reducing Queue Times: An Automated Billing Approach Through a Smart Shopping Cart

Jash Dipenbhai Gandhi

Abstract:

Long queues at billing counters have become a regular nuisance for the customers in supermarkets, departmental stores, and large malls during peak hours, festive season, times during discount and offers. Such delays arise due to the inefficiencies in manual billing processes and bulk purchases. This paper presents a Smart Shopping Cart system designed to address such challenges through an automated billing process. With advanced hardware and software combined, the system reduces average checkout time to a mere 2–5 minutes, enhancing both service quality and customer satisfaction levels.

Introduction:

Shopping can be a fun activity, but the experience is usually ruined by long queues and slow billing processes. Customers spend an average of 10–20 minutes in billing queues at supermarkets and 15–30 minutes during peak hours in large malls. These delays are caused by high footfall, bulk purchases, manual errors in billing, and payment delays due to network issues. It involves a Smart Shopping Cart that offers automated billing functionality, thus no longer requiring any checkout counters at all.

Proposed Solution: The proposed Smart Shopping Cart has an automated billing system that eliminates the need for long queues. The system uses advanced technologies such as RFID, barcode scanning, and load cells to identify products in real time, price them, and bill them. The e-bill is sent to the customer's email, and the customer can view the details of his purchase on the retailer's website.

System Architecture:

The hardware components of the Smart Shopping Cart include:

Arduino Mega: It serves as the main processor for the system.

Load Cell with HX711 Module: It is the weighing device. This is done to ensure the right billing for items.

LCD Display: Real-time information regarding items added and prices GM65 QR and Barcode Scanner Module: Product barcodes and QR codes will be scanned for identification of the items.

Advantages of the System:

Reduced Queue Times: Automated billing reduces checkout time to 2–5 minutes, even during rush hours.

Enhanced Customer Experience: Eliminates the need for standing in long queues, making shopping more enjoyable.

Error-Free Billing: Minimizes manual errors in scanning and billing.

Real-Time Updates: Displays item details and total cost instantly on the LCD.

E-Bill Generation: Customers receive a digital bill, reducing paper waste and promoting sustainability.

Cost Analysis:

The total estimated production cost of the Smart Shopping Cart is approximately $130. The breakdown of costs is as follows:

Arduino Mega: $30–45

Load Cell: $5–15

HX711 Module: $3–10

LCD Display: $5–1

GM65 Barcode Scanner Module: $60 (approx. ₹4770)

Implementation:

The hardware components of the cart are integrated with a database manager and a website. The RFID and barcode systems are used to ensure accurate item detection, and the Wi-Fi module is used to update the centralized database in real time. Customers can add products to their cart, view the total cost on the LCD, and receive an e-bill upon completing their purchase.

Conclusion:

A long queue at a billing counter had always been considered theperennial scourge of retails. Distributed across individual cart checkouts to break and eradicate the long-billed queues smart shopping carts revolutionize retail, promising faster checkout and error-proof shopping.

Future advancements may lead to more   intricate navigation   systems combined with voice-activated assistance while making purchases further heighten customers' experience of this system.

BLOCK DIAGRAM OF OUR CURRENT WORKING MODEL
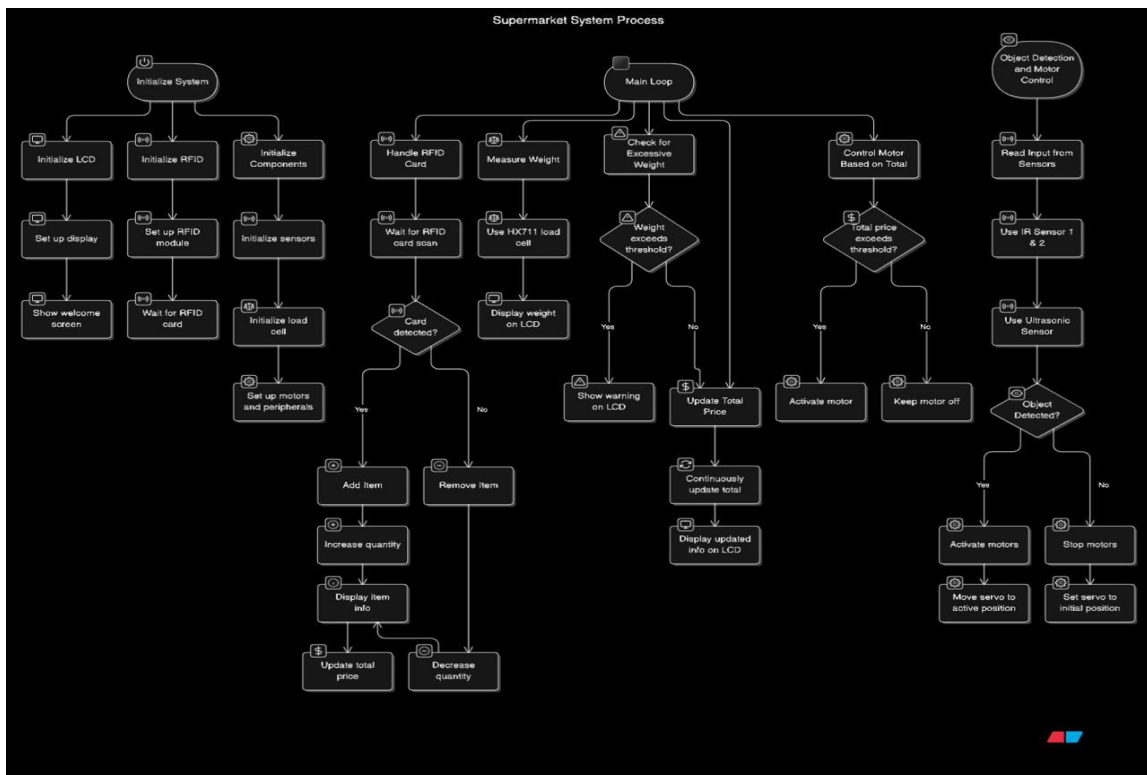
References

1. in making of this research paper we were guided by our teachers Shivrajsinh Rayjada, Bhargav Sejpal, parth sata

2. Suraj.S, Vishal Guruprasad, Udayagiri R Pranava, Preetham S Nag, "RFID Based Wireless Intelligent Cart Using ARM7," International Journal of Innovative Research in Science, Engineering and Technology, Vol. 5, Issue 8, 2016.

3. Suryaprasad J, Praveen Kumar B O, Roopa D & Arjun A K, " A Novel Low-Cost Intelligent Shopping Cart," IEEE, 2014.

4. Komal Ambekar, Vinayak Dhole, Supriya Sharma,"Smart Shopping Trolley Using RFID," International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), Volume 4 Issue 10, 2015.

5. K.Gogila Devi, T.A.Kaarthik, N.Kalai Selvi, K.Nandhini, S.Priya, "Smart Shopping Trolley Using RFID Based on IoT," International Journal of Innovative Research in Computer and Communication Engineering. Vol. 5, Issue 3, 2017.

6. Amine Karmouche, Yassine Salih-Alj, "Aislelevel Scanning for Pervasive RFID based Shopping Applications ," IEEE. [6]. Satish Kamble, Sachin Meshram, Rahul Thokal & Roshan Gakre, "Developing a Multitasking