Smart Shopping trolley

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Abstract:
Shopping in supermarkets often becomes tiring when customers have to push heavy trolleys, keep track of items, and wait in long billing queues. To overcome these challenges, we propose a Smart Shopping Trolley system that makes shopping faster, easier, and more convenient. The trolley is equipped with automatic following technology, allowing it to move along with the user without manual effort. Customers can scan each product using an RFID reader on the trolley, and details such as product name, price, and quantity are automatically recorded. As items are added, the system maintains a real-time updated bill that customers can view instantly. At the end of shopping, the system generates the final total bill, enabling quick and hassle-free checkout while reducing waiting time at billing counters.This smart solution integrates IoT, sensors, and wireless communication to provide a modern, user-friendly, and time-saving shopping experience, while also reducing manpower requirements in supermarkets

Key Words: Smart Shopping Trolley Internet of Things (IoT) Automatic Following System RFID Product Scanning Real-time Billing Wireless Communication Customer Convenience.

INTRODUCTION

Shopping at supermarkets and large stores has become a regular part of people's lives, but it often comes with challenges. Customers usually need to push heavy trolleys, search for products, and later stand in long billing queues. This process not only consumes time but also reduces the overall shopping experience, especially for elderly people and those carrying many items.

To solve these issues, technology can play an important role. The IoT-based Smart Shopping Trolley is designed to reduce the effort of pushing trolleys, keep track of selected products, and simplify the billing process. By using smart features like automatic following and product scanning, customers can shop more comfortably and efficiently.

The trolley comes with automatic following technology, which allows it to move along with the customer without requiring manual pushing. Additionally, it is equipped with an RFID reader that helps customers scan each product before placing it in the trolley. As soon as an item is scanned, its details like product name, price, and quantity are displayed and stored in the system.

Another important feature is the real-time billing system. The trolley continuously updates the total bill as new products are added or removed, which helps customers keep track of their spending. Once shopping is complete, the system generates the final bill, allowing quick and easy checkout without standing in long queues.

This project makes use of IoT, sensors, and wireless communication technologies to create a modern solution for smart shopping. It not only improves customer convenience but also reduces the need for additional manpower in supermarkets, making the shopping process faster, smarter, and more enjoyable.

LITERATURE SURVEY

1. K. Sathesh; P Kowsalya, Integrated Smart Trolley System: Arduino Nano-Based RFID Billing and Weight Sensor Augmentation, In this paper we study a shopping mart, imagine ten people waiting in line. If the first five people have many items in their carts, the last person with only one or two items may wait a long time to pay. To address this issue, we introduce an innovative Smart Trolley Billing System using Arduino

Nano and EM-18 RFID technology. This system automates checkout and tracks inventory in real-time, enhancing the shopping experience. By seamlessly integrating Arduino with RFID tags, product identification becomes instant, eliminating manual scanning. With features like an LCD screen for transparent item lists and weight sensors for added security, our solution aims to optimize shopping, improve customer satisfaction, and streamline inventory management in retail environments.

2. Manikandan S; Harish Murugan, RFID based Smart Trolley Billing System using IoT, In this paper we study that system consists of RFID detection alongside 8051 microcontroller processing and load cells monitoring and uses IoT communications and relay controls to power an intelligent automated shopping cart. Real-time data tracking functions alongside cloud service readiness to deliver advanced monitoring and management capabilities as the system's standout feature. A Smart Trolley consumes RFID technology to recognize products that go inside the cart through unique product tags linked with RFID. Product details that the 8051 microcontroller retrieves are displayed through an LCD screen interface. The system delivers automated operations together with precise product tracking along with weight measurement functionality and billing support. Data transmission to the cloud enables distant storage functions along with distant system monitoring that produces meaningful information about trolley utilization while bolstering inventory handling capabilities.

3. Atshaya C; Parvathavarthini S, RFID based Human Following Smart Trolley with Real-Time Pricing, This research includes IoT components such as IR(Infrared) sensors, ultrasonic sensors, RFID readers, and GSM module can be implemented for seamless functioning. The hardware consists of an Arduino UNO board and employs DC motors for movement, Servo motors for interaction with objects, and an LCD screen to display real-time prices. Further research focuses on applying techniques of image processing to identify products more effectively and monitor users for their comfort and enhancement of the smart trolley.

4. M. Jayaprakash; A. Hency Juliet, Transforming Shopping with IoT: Exploring the Intelligent Way to Design the Smart Trolley using IoT Principles,In this paper we study that The interconnection of commonplace items is revolutionizing people's daily lives, thanks to the Internet of Things (IoT). A smart shopping system, consisting of interconnected products, might one day be a reality in supermarkets. In this Internet of Things system, products may be individually identified using low-cost RFID tags, which, when added to an RFID-enabled smart shopping cart, can be read automatically. This means shoppers won't have to endure the checkout line at all—billing can be handled right in the cart. The integration of RFID-equipped smart shelving into this system allows for the monitoring of inventory and, perhaps, the update of a central server. The suggested shopping system, which is dubbed IoT Assisted Smart Trolley (IoTAST), is cross-validated with the standard Smart Trolley (ST) model to clearly evaluate its performance. Since an RFID reader can automatically read all objects instead of a labourer physically scanning them, inventory management becomes considerably easier with this sort of technology

METHODOLOGY

The first step is trolley movement automation. The smart trolley is designed with sensors and a motor system that allows it to automatically follow the user. This removes the need to push the trolley manually and makes shopping easier, especially when carrying many items.

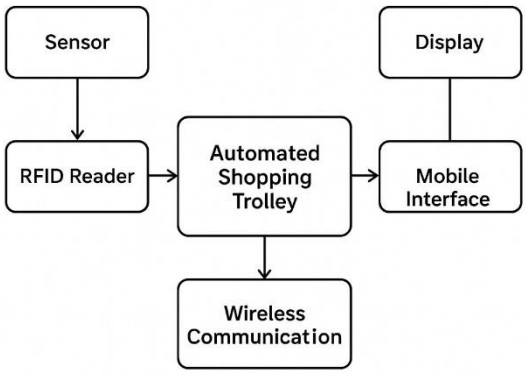
The second step is product identification. Each product in the supermarket is equipped with an RFID tag. The trolley has an RFID reader that scans the product when the customer places it in the trolley. This ensures that the system can correctly identify the product’s name, price, and quantity.

The third step is real-time data processing. Once the RFID tag is scanned, the trolley’s system updates the database instantly. The product details are stored, and the total bill is recalculated on the spot. Customers can view this updated bill on a display screen or a connected mobile application.

The fourth step is billing and checkout. After the customer finishes shopping, the system generates the final bill automatically. This bill can be directly used for payment at a quick checkout counter, reducing the time wasted in long billing queues.

The final step is IoT and wireless integration. The trolley is connected using IoT and wireless communication, allowing it to share data with the central supermarket system. This helps the store keep track of product sales and stock, while customers enjoy a smooth and modern shopping experience.

BLOCK DIAGRAM



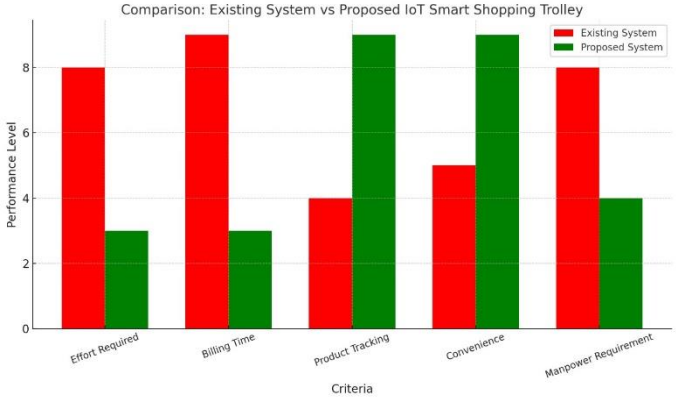
OBJECTIVE

1. To design a smart trolley that automatically follows the user without manual pushing.
2. To implement an RFID-based product scanning system for quick and accurate item identification.
3. To develop a real-time billing system that updates automatically as products are added or removed.
4. To create a seamless checkout process that reduces waiting time and improves customer convenience.

PROBLEM DEFINATIONS

Shopping in supermarkets can be tiring and time-consuming for customers. People often have to push heavy trolleys, search for products, and wait in long billing queues. This process not only wastes time but also creates inconvenience, especially for elderly people, physically challenged individuals, or those in a hurry. Additionally, traditional shopping trolleys do not keep track of items or prices in real time, forcing customers to wait until checkout to know their total bill. This can lead to confusion, billing errors, and longer waiting times at counters. Supermarkets also face challenges in managing manpower efficiently for billing and customer assistance. Therefore, there is a need for a modern shopping solution that can reduce physical effort, track products automatically, provide real-time billing, and make checkout faster. The IoT Smart Shopping Trolley addresses these problems by combining automatic movement, RFID scanning, and IoT-based billing to make shopping more convenient and efficient for both customers and store management.

COMPARISION OF EXSITING SYSTEM AND PROPOSED SYSTEM



FUCTIONAL REQUIREMENTS

1. Automatic Following:

The trolley should automatically follow the customer using sensors or RFID tracking without the need for manual pushing.

2. Product Scanning:

The trolley should have an RFID reader to scan products automatically as they are placed inside, detecting product name, price, and quantity.

3. Real-Time Billing:
The trolley should update the total bill in real time and display it to the user via a display or mobile interface.
4. Final Checkout Automation:
The system should automatically generate the final bill at the end of shopping, allowing instant checkout without waiting in billing queues.

NON FUCTIONAL REQUIREMENTS
1. Reliability:
The system should operate continuously with minimal downtime, ensuring smooth shopping experience without interruptions.

2. Scalability:
The system should be able to handle a large number of trolleys and customers simultaneously in a supermarket environment.
3. Performance:
The trolley should respond in real-time to customer movement and product scanning, with minimal lag.
4. Security:
The system should ensure customer billing data and product details are secure, preventing unauthorized access.

CONCLUSION
In conclusion, the smart trolley system makes shopping easier, faster, and more convenient for customers. It removes the need to push heavy trolleys, keeps track of items automatically, and shows the bill in real time. This saves time and reduces long waits at billing counters. By using IoT, sensors, and wireless communication, the system not only improves the shopping experience but also helps supermarkets work more efficiently with less manpower. Overall, it is a modern solution that benefits both customers and store owners.

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