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SMART SHOPPING TROLLY USING ANDROID APP

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1. Abstract

Our project has two major things, IR Sensor which is controlled by Arduino which detects items to place in trolly . An App which is designed to get the items with respective prices which are placed in trolley. As the payment modes are also included in this app which makes the payment process easier and faster. This project will allow users to pay for goods and services using their smartphones. It will reduce the time spent by the customer in making a purchase. Key features of the smart shopping trolley include automated product detection through Android app scan QR code ,make a digital payment and checkout. The system enhances customer convenience, reduces waiting time at checkout, and provides a more engaging and tailored shopping experience. It also benefits retailers by improving inventory management, optimizing and increasing customer satisfaction. The integration of mobile technologies is at the core of the project

2. INTRODUCTION

Every day, people need to fulfil their needs to survive. Such needs can be fulfilled by doing some economic activities, one of which is shopping. Anyone can shop in all kinds of stores, mall e.g., in a mall etc. People shopping in those places usually purchase many items. Because of that, the owner of such places will commonly provide some tools to carry the items, such as a trolley/shopping trolley. This is to remove the burden of the customer having to carry the items they purchase. Once a customer finishes shopping, he/she will have to go to the cashier/checkout counter to pay for all the items he/she buys. There, the customer must take all the items out from the trolley, and then hand them over to the cashier for him/her to scan. That whole activity takes a lot of time. QR code scanning also takes some time to do, particularly when the item does not have any QR code stuck to it or when the QR code is difficult to scan. All in all, the efficiency of the mall's operations is reduced, time is wasted, and there is a financial loss both for the customers and the mall's owner alike. The project propose a new payment system for the smart trolley. In the system, the customer can scan the QR code on items by themselves, and then confirm their purchase once they finish shopping. While the customer is scanning, he/she can see how much money they will have to spend on the items he/she buys, so he/she can carefully decide what items to buy and how many of each he/she buys. After that, the customer can verify the items and exit from the shop. Since there are neither checkout counters nor cashiers in the payment system, the mall's operational costs are cut down significantly. The customers will not need to queue in the checkout area in the mall, and the mall owner will not need to hire cashiers

3. OBJECTIVES

The scope of smart shopping trolleys encompasses both the technical and practical aspects of improving the overall shopping experience for customers while increasing efficiency for retailers. The implementation of these trolleys covers multiple areas, including: Technological Integration: Incorporation of technologies like AI, mobile technology to

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transform traditional shopping trolleys into smart, interactive systems. Customer Convenience: Facilitating a seamless shopping experience through features like manual billing, real-time product information. Retail Efficiency: Enhancing operational efficiency for retailers with better inventory management, reduced labor costs through automation. Data Utilization: Leveraging data collection to provide retailers with insights into customer behavior, product preferences, and mall traffic, enabling more informed decision making. Sustainability: Promoting sustainable practices by reducing checkout time, food waste, and energy consumption through automated processes and smart recommendations.

4. LITERATURE SURVEY

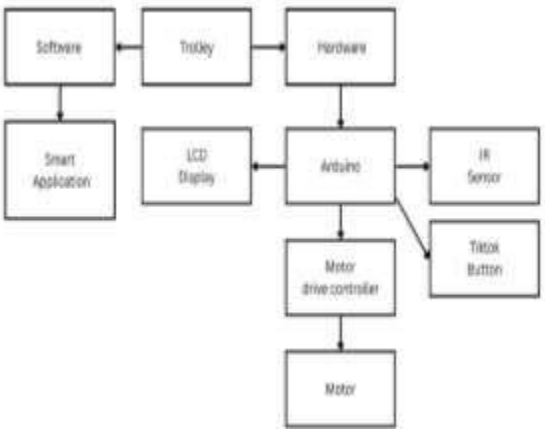
1. Paper Name: A Cloud-Based Platform for Big Data Driven CPS Modeling of Robots

Author: NAIHENG ZHANG

2. Paper Name: Analysis of 5 G Technology in Airports: Requirements, Chal lengeand Use Cases Evaluation Author: Sergio Fortes

3. Paper Name: Automated Shopping Cart Using RFID with a Collaborative Clutering Driven Recommendation Author:1Ruchi Gupte, 2 Shambhavi Rege

5. METHODOLOGY



Hardware

1. Arduino

In the Smart Shopping Trolley system, the **Arduino** acts as the central control unit that connects and manages all the hardware components. It receives input signals from the **IR sensor**, which detects the presence or movement of items in the trolley, and from the **Tiktok button**, which can be used by the user to manually trigger specific actions like resetting and delete the product. Based on these inputs, the Arduino processes the data and sends appropriate output signals to other connected components. It controls the **LCD display** to show important information such as the item total count. Additionally, the Arduino sends control signals to the **motor drive controller**, which then powers the to move the trolley door perform locking functions. Through this role, the Arduino ensures that all components work in synchronization, enabling a smooth and automated smart shopping experience.

2. IR Sensor

The IR (Infrared) Sensor in the Smart Shopping Trolley system is used for product detection. It works by emitting infrared light and detecting the reflection from nearby objects. When a customer places an item in the trolley or brings it close to the

sensor, the IR sensor detects its presence and sends a signal to the Arduino. The Arduino then processes this signal and updates the system accordingly such as adding the item to the shopping list, activating the LCD display to show item details. The IR sensor helps in automating the product detection process, making the trolley more intelligent and reducing the need for manual input.

3. LCD

The **LCD (Liquid Crystal Display)** in the Smart Shopping Trolley system is used to visually display important information to the user. It is connected to the **Arduino,** which sends it commands and data based on the system's operations. When a product is detected by the IR sensor, the Arduino processes the data and sends the product count to the LCD screen. This allows the user to see real-time updates of their shopping product count. The LCD enhances user interaction by making the system more transparent, informative, and easy to use, reducing the need for assistance or separate billing counters.

4. Motor Drive Controller

The Motor Drive Controller in the Smart Shopping Trolley system is responsible for controlling the operation of the motor based on signals received from the Arduino. Since the Arduino cannot directly supply enough current to drive a motor, the motor drive controller acts as an interface that amplifies the control signals. When the Arduino sends a signal such as to move the trolley door forward, backward, the motor drive controller receives this signal and powers the motor accordingly. This component ensures safe and efficient operation of the motor by managing the direction, speed, and power supply. It plays a key role in enabling features like automatic movement, obstacle avoidance.

5. Motor

The motor in the Smart Shopping Trolley system is used to enable movement or control specific mechanical actions, such as open or close the door. It operates under the control of the motor drive controller, which receives commands from the Arduino. When the user performs an action like detect the movement. The Arduino processes the input and sends a signal to the motor drive controller, which then activates the motor. The motor may be used to assist in moving the trolley door, stop it when needed, or close it if an item is not scanned. This automation makes the trolley more secure and user friendly, reducing human errors and improving the overall shopping experience.

6. Tiktok Button

The Tiktok Button in the Smart Shopping Trolley system serves as a manual input switch for the user. It is connected to the Arduino and allows the user to perform specific actions like reduce the product count the system, confirming an product, resetting the count. The Tiktok Button adds a layer of user control to the automated system, making it more interactive and flexible for different shopping needs.

6. Software

1.Smart Application

The working of the smart shopping trolly system the admin work as a small data base. first the admin login in admin section and admin can generate the product QR code. To make QR code it required product name and price. In show user, it shows all users whom logged in.

The working of the Smart Shopping Trolley system starts when the user initiates the system. First, the user logs into the Android application by registering or using existing customer. Once logged in, the system is the shopping process begins. The customer uses their mobile camera to scan the QR code of each product.

Upon scanning, the product details such as name and price are fetched and processed by the app. Simultaneously, the LCD display on the trolley shows the count of scanned items, allowing the user to visually monitor their shopping activity.

The app displays the quantity of each scanned item in real-time. Users can manage their cart by adding or deleting items if they change their mind. Once done, they proceed to scan the next product, repeating the cycle until all items are scanned. After completing the product selection, the system manually generates the total bill. The user is then prompted to choose a digital payment method to pay the final amount.

Before finalizing the transaction, the system performs a cross-check of the product count to ensure accuracy and prevent item mismatch or fraud. Once verification and payment are successfully completed, the user logs out of the application. This marks the end of the shopping process, which is now faster, more accurate, and user-friendly due to the integration of smart technology.

Project Working

The working process of the Smart Shopping Trolley begins when the user initiates the system. The user logs into the Android application by either registering or using existing login credentials. Once the system is activated, the user starts shopping by scanning products using their mobile camera. As each product is scanned, its details such as name, quantity, and price are fetched from the database. The LCD display mounted on the trolley shows the real-time count of scanned products, while the mobile app simultaneously displays the quantity and price of each item.

The user has the flexibility to add or delete products from their virtual cart if they change their mind. After updating the cart, they continue to scan the next product, repeating this cycle until all desired items are added. Once scanning is complete, the system automatically generates the total bill. The user then proceeds to the payment section, where they can select a digital payment method such as UPI, credit/debit card, or wallet.

Before the final payment, the system performs a cross-verification of the product count to ensure all scanned items match the items in the trolley. This helps prevent errors and unauthorized items. After successful payment and verification, the user logs out of the app, marking the end of the shopping session. This smart, automated process reduces billing time, enhances user convenience, and ensures a smooth, technology-driven shopping

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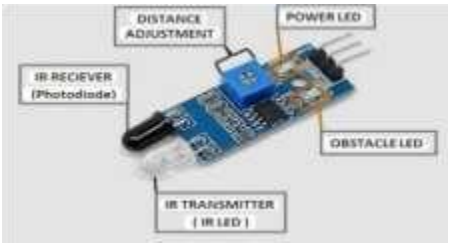
5 Requirement Specifiations

5.1 ARDUINO

ARDUINO

In a Smart Shopping Trolley project, Arduino serves as the central microcontroller that controls and coordinates all the components, including sensors, motors, and displays. Arduino processes data from IR sensors to detect items, controls the LCD display to show real-time information, and manages the servo motor for automated tasks like opening compartments. It acts as the brain of the system, receiving inputs from various sensors, executing the necessary actions, and providing feedback to the user. With its flexibility and ease of use, Arduino is an ideal choice for integrating and managing the diverse components in the smart trolley system.

5.2 IR SENSOR



In a Smart Shopping Trolley project, an IR (Infrared) Sensor is essential for detecting items as they enter or exit the trolley. Positioned at the trolley's entrance, the IR sensor tracks each item that crosses its path, enabling the system to count and identify items in real time. This information is then used to update the cart's total cost, reducing the need for manual scanning at checkout. Additionally, the IR sensor can contribute to security by alerting the system to unauthorized item removals, enhancing both efficiency and accuracy in the shopping experience.

5.3 LIQUID CRYSTAL DISPLAY

In a Smart Shopping Trolley project, an LCD Display serves as a crucial interface for interacting with shoppers. It provides real-time updates on the total cost of items in the trolley, helping customers manage their budgets effectively as they shop. Positioned prominently on the trolley, the LCD can also display additional information, such as item details, promotional offers, and personalized recommendations. By offering clear, immediate feedback, the LCD enhances the shopping experience, making it more transparent and engaging for customers while reducing the likelihood of surprises at checkout.

5.4 DC MOTOR

In a Smart Shopping Trolley project, a Servo Motor can be used for automated functions such as controlling the movement of a compartment or a retractable handle. For example, it can be used to open and close a storage compartment in the trolley, allowing customers to easily store or retrieve items. Additionally, servo motors can assist in automating the steering or direction of the trolley, providing a more effortless shopping experience by guiding the trolley in response to user commands or sensors. This enhances the overall convenienautomation of the trolley, making it smarter and more user-friendly.

6. FUTURE SCOPE

The scope of smart shopping trolleys encompasses both the technical and practical aspects of improving the overall shopping experience for customers while increasing efficiency for retailers. The implementation of these trolleys covers multiple areas, including: Technological Integration: Incorporation of technologies like AI, machine learning, IoT, and AR to transform traditional shopping carts into smart, interactive systems. Customer Convenience: Facilitating a seamless shopping experience through features like automatic billing, real time product information, personalized recommendations, and in-store navigation. Retail Efficiency: Enhancing operational efficiency for retailers with better inventory management, automated restocking alerts, and reduced labor costs through automation. Data Utilization: Leveraging data collection to provide retailers with insights into customer behavior, product preferences, and store traffic, enabling more informed decision making. Sustain ability: Promoting sustainable practices by reducing checkout time, food waste, and energy consumption through automated processes and smart recommendations. Security and Privacy: Ensuring secure transactions through biometric authentication, blockchain for payment processing, and adherence to privacy

7. FLOWCHART DIAGRAM

Working Principle of the Smart Shopping Trolley (Based on Flowchart)

The flowchart describes the working of a Smart Shopping Trolley system that uses a mobile app, camera, and LCD for a seamless shopping experience. Here's the working principle explained step-by-step:

Products are scanned using the mobile camera, and their details are fetched

1. Start:
   The process begins when the user initiates the system.

2 .Login & Register:
The user logs into the Android app and activates the smart

3. Scan Product using Mobile Camera

4. LCD Display:
   The scanned product's count is shown on the trolley's LCD screen.

5. Show Quantity and Price on App:
   It displays the number of items and the price of the scanned product.

6. Add or Delete Product:
   The user can either add or delete the items if not needed.

7. Next Product Scan:
   The user continues scanning other products. This step loops back to product scanning.

8. Generate Total Bill:
   Once all items are added, the system calculates the total bill.

9. Payment Method:
   The user selects a preferred payment method to pay the bill digitally.

10. Cross-check Product Count:
    Before finalizing, the system verifies the number of items to avoid mismatches.

11. Logout App:
    After successful verification and payment, the user logs out of the app.

12. End:
    The shopping process is complete

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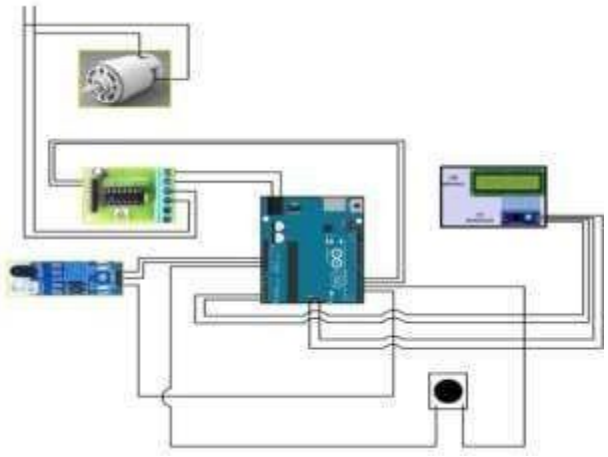
8. CIRCUIT DIAGRAM



CIRCUIT DIAGRAM WORKING

This circuit diagram represents an automation system using an Arduino Uno. It consists of several electronic components including an IR sensor, an L298N motor driver, a DC motor, an LCD display with I2C interface, and a push button. The Arduino Uno serves as the central control unit. It receives inputs from the IR sensor and the push button, and based on the logic programmed into it, controls the motor via the motor driver and displays messages on the LCD.

The DC motor is connected through the L298N motor driver, which allows the Arduino to control the motor's direction and speed using digital output pins. The motor driver takes signals from the Arduino and accordingly drives the motor. The IR sensor is used to detect the presence of the Product. It outputs a digital signal which the Arduino reads. When the sensor detects an item (usually indicated by a LOW or HIGH signal depending on the sensor type), the Arduino can trigger the motor to turn on, and simultaneously update the LCD with a message and shows the count of the product".

The LCD display is connected via an I2C module, which reduces the number of pins needed for communication. The I2C interface uses the SDA and SCL lines, typically connected to the A4 and A5 pins of the Arduino. It is used to show the status of the system, such as whether an object has been detected or the motor is operating. A push button is included in the circuit, which provides manual control. When the button is pressed, it may trigger the motor manually or reset the system, depending on how the code is written.

In operation, the system starts with the Arduino initializing all connected components. The LCD may display a "Smart Shopping Trolley'' message. When a Product is placed in front of the IR sensor, the sensor sends a signal to the Arduino. The Arduino processes this signal and responds by activating the motor through the L298N driver and updating the LCD display. The Push Button is used to manually reduce the count of the product on LCD Display and if push button hold for 5sec the trolley system resets and LCD also gets reset.

9. RESULT

The experimental results of a smart shopping trolley can vary depending on the goals of the experiment, the specific hardware and software components used, and the user feedback collected during the experiment. Here are some potential results that could be observed: Improved customer experience: A smart shopping trolley could improve the shopping experience by providing real-time information to the user, such as total cost and suggested products. This could result in increased customer satisfaction and loyalty. Increased sales: By suggesting related products or promotions based on the user's shopping history or preferences, a smart shopping trolley could potentially increase sales for the retailer. Technical limitations: Some potential technical limitations of a smart shopping trolley could include sensor errors or inaccuracies, connectivity issues, or issues with the software platform. User acceptance: The success of a smart shopping trolley will depend on user acceptance. If users find the system easy to use and helpful, it could become a valuable addition to the shopping experience. However, if users find the system confusing or intrusive, it may not be useful. Overall, the experimental results of a smart shopping trolley will depend on a variety of factors, including the hardware and software components used, the experiment design, and user feedback.

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10. CONCLUSION

In conclusion, smart shopping trolleys have the potential to revolutionize the shopping experience by providing real-time information and personalized recommendations to customers while also providing valuable data to retailers. The technology is still relatively new, and while there are some technical limitations and challenges to adoption, the benefits to both customers and retailers are significant. The future scope of smart shopping trolleys is vast, as there are many potential directions for innovation and improvement. Some potential areas for future development include: Enhanced personalization: Smart shopping trolleys could be further developed to provide even more personalized recommendations and promotions based on individual shopping history, preferences, and even biometric data. Integration with online shopping: Smart shopping trolleys could be integrated with online shopping platforms to provide a seamless shopping experience across both online and instore channels. Advanced analytics: As more data is collected by smart shopping trolleys, retailers will be able to use advanced analytics tools to gain deeper insights into customer behavior and preferences. Improved hardware and connectivity: As hardware technology advances, smart shopping trolleys could become more accurate, reliable, and affordable. Improved connectivity could also help to overcome some of the current technical limitations of the technology. Integration with other technologies: Smart shopping trolleys could be integrated with other technologies, such as augmented reality, to provide even more engaging and interactive shopping experiences

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