SSN COLLEGE OF ENGINEERING

KALAVAKKAM-603110

INTERNALLY FUNDED STUDENT PROJECT (IFSP-2023)

Human Following Smart Trolley with Barcode Scanner

Name, Year and Department of the Project Students

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Name, Designation and Department of the Project Guide

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PROBLEM STATEMENT:

In today's retail environment, customers face several challenges, including manually pushing shopping carts while navigating through aisles and managing the total cost of items as they shop. This often leads to inconvenience and budget uncertainty, as shoppers do not have real-time visibility of the total amount they are spending until checkout. Additionally, physically carrying or controlling a trolley throughout the store can be a burden, particularly for elderly or physically challenged individuals.

The "Human Following Smart Trolley with Barcode Scanner" project addresses these issues by developing an autonomous trolley that follows the user, eliminating the need for manual control. It also integrates a barcode scanning system to display real-time product prices and the total bill on an OLED screen, enabling customers to monitor their expenses on the go. This innovation aims to revolutionize the shopping experience by offering both mobility assistance and cost transparency.

OBJECTIVE:

1. Develop an Autonomous Trolley: Design and implement a smart trolley that can automatically follow the customer using UV and IR sensors. The trolley should accurately track the user's movement, eliminating the need for manual pushing and making the shopping experience hands-free.

2. Integrate a Barcode Scanning System: Incorporate a localized barcode scanner to automatically read product information and update the total bill. The system should identify each item as it is placed into the trolley and provide real-time pricing updates.

3. Display the Total Bill in Real-Time: Provide an easy-to-read OLED display that shows the individual product prices and the cumulative bill. This allows customers to track their expenses instantly and avoid any surprises at checkout, thus enhancing the overall convenience of shopping.

EXISTING SYSTEM:

In most retail environments today, customers are required to manually push trolleys as they move through the store. This can be physically exhausting and inconvenient, especially for elderly individuals, people with physical challenges, or those managing large shopping trips. Additionally, current trolleys lack any form of automation or assistance in tracking the shopper's movements, making the process entirely manual.

Another significant limitation of the existing system is the lack of real-time cost tracking during the shopping process. Customers are often unaware of their total expenditure until they reach the checkout counter, which can result in budgetary surprises or the need to return items if the total exceeds their planned budget. The absence of an integrated system for displaying real-time price information on the trolley itself makes it difficult for shoppers to manage their expenses efficiently as they add items to the cart.

Furthermore, there is no existing integration between a trolley that can follow the customer and a system that scans barcodes to track prices in real-time. This lack of a comprehensive solution leads to inefficiencies in the shopping experience, where both mobility assistance and cost transparency could be significantly improved.

PROPOSED SYSTEM:

The proposed system aims to transform the traditional shopping experience by introducing an autonomous, human-following trolley equipped with real-time cost tracking capabilities. The trolley follows the user based on inputs from UV and IR sensors, eliminating the need for manual control. This human-following mechanism is powered by a proximity sensing algorithm that detects the user's movements and adjusts the trolley's direction accordingly.

Additionally, the trolley integrates a barcode scanning system, allowing for instant product identification and cost calculation. Each product scanned by the barcode reader is processed through an Arduino-controlled system, which retrieves the product details and updates the total bill. An OLED display attached to the trolley

provides the user with real-time information about individual product prices and the cumulative total, enabling on-the-go monitoring of expenses.

This system not only improves the mobility aspect of shopping by removing the need for manual trolley control but also provides a seamless way to manage and track shopping costs in real time.

INNOVATION:

The innovation of this project lies in the seamless integration of autonomous navigation and real-time cost tracking, features that are typically handled separately in existing systems. The use of UV and IR sensors to follow a human shopper introduces a new level of automation, making the shopping process hands-free. This feature is particularly beneficial for elderly customers or those with physical limitations.

Incorporating a barcode scanner into the trolley, connected to an Arduino system, further enhances the shopping experience by providing real-time price tracking. Unlike traditional shopping carts, which offer no insight into the total cost of items until checkout, this system allows users to stay informed of their expenses throughout the shopping process. The OLED display serves as an easy-to-use interface, showing all relevant information, making this a comprehensive solution that addresses both convenience and budget management in a retail setting.

This combination of features provides a novel approach to retail shopping, making the experience more efficient, user-friendly, and transparent.

MODULES DESCRIPTION:

1. Proximity Sensing Module:

- Function: Detects the distance between the trolley and the customer using UV and IR sensors, allowing the trolley to follow the user.

- Output: User position data to the direction control module.

2. Direction Control Module:

- Function: Determines the trolley's movement direction based on the user’s position, ensuring it follows accurately.

- Output: Movement commands to the trolley motors.

3. Barcode Scanning Module:

- Function: Scans barcodes on products using an integrated scanner, enabling real-time tracking of items.

- Output: Product data to the database lookup.

4. Database Lookup:

- Function: Retrieves product details such as price and description based on the scanned barcode.

- Output: Product information to the display module.

5. Display Module:

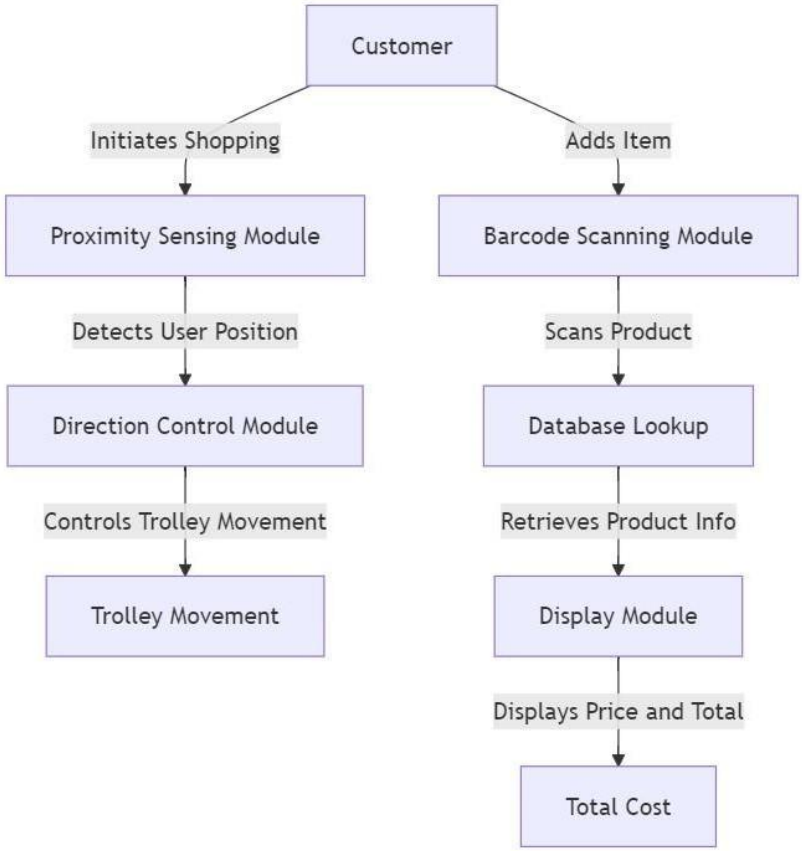
- Function: Shows product details, individual prices, and the accumulated total cost on an OLED screen.

- Output: Real-time updates to the user during shopping.

6. Trolley Movement:

- Function: Executes the movement commands received from the direction control module, allowing the trolley to navigate efficiently.

Diagram:



DETAILED ALGORITHM:

1. Initialization:

   Start the system and initialize the LCD display.

   Set up serial communication and pin modes for sensors and motors.

2. Proximity Sensing:

   Continuously read UV and IR sensors to detect user presence.

   Adjust trolley direction based on user position.

3. Barcode Scanning:

   Monitor for scanned barcodes.

Store and compare with database product codes.

4. Product Identification:

   Update product count and total cost if a match is found.

   Display product information on the LCD and activate trolley motors.

5. Remove Product (if applicable):

   Decrement count and total if a product is removed; update display.

   Show a message if the product isn't found.

6. Display Information:

   Continuously update OLED display with the total cost and user feedback.

7. Motor Control:

   Adjust motor speeds and directions based on proximity data for smooth navigation.

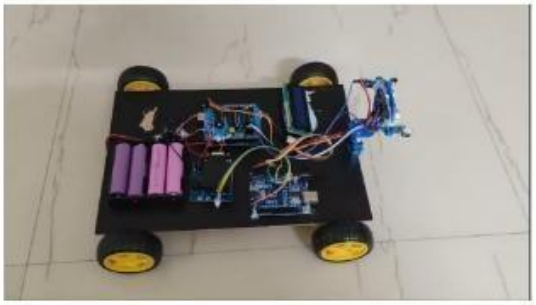
8. Loop:

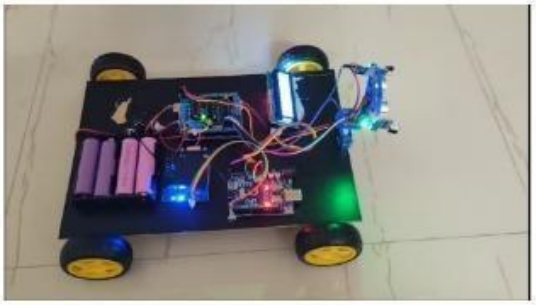
   Repeat steps 2 to 7 for real-time operation.

BUDGET DETAILS:

Product	Price(Rs)
Arduino UNO	1400
Motor	920
Ultrasonic sensor	200
ServoMotor	500
IR sensor	400
Jump wires	750
Battery Pocket	155
Arduino Nano	1410
Maikrt Embedded QR code Scanner	3800
0.96" I2C OLED Display	750
Bread Board	830
Bucket	331
Motor Driver	500
Total	12000

100% IMPLEMENTATION:





OUTCOMES:

1) Operational Smart Trolley: The project aims to deliver a fully functional autonomous trolley capable of following the customer seamlessly using advanced UV and IR sensors. This innovative feature not only alleviates the physical burden of manually pushing a trolley but also enhances user convenience, enabling a hands-free shopping experience. The trolley will effectively adjust its movement in real-time based on the customer's position, ensuring a responsive and intuitive interaction.

2) Instant Price Tracking: A key outcome of the project is the integration of a barcode scanning system that allows for immediate identification of products as they are added to the trolley. This system will provide real-time updates on the total cost of items in the cart, empowering customers to monitor their expenses continuously. Such functionality aims to reduce the likelihood of budgetary surprises at checkout, facilitating better financial management during the shopping process.

3) Clear User Interface: The project will include an OLED display that serves as a user-friendly interface, presenting vital information such as product details, individual prices, and the cumulative total cost. This display will enhance the shopping experience by providing customers with immediate visibility into their spending, making it easier for them to make informed purchasing decisions as they shop.

4) Enhanced Shopping Efficiency: Ultimately, the combination of autonomous navigation and real-time expense tracking is expected to significantly streamline the shopping process. By integrating these functionalities, the smart trolley will not only improve the overall efficiency of shopping trips but also create a more enjoyable and less stressful environment for users. This innovative approach aims to transform the traditional retail experience into a more modern, efficient, and user-centric process.

CONCLUSION:

The Human Following Smart Trolley with Barcode Scanner successfully integrates automation and cost tracking to enhance the shopping experience. By utilizing UV and IR sensors, the trolley autonomously follows the user, eliminating the need for manual control. Additionally, the barcode scanning system enables real-time price tracking, ensuring customers are aware of their total expenditure throughout their shopping journey.

This project provides a hands-free, efficient, and user-friendly shopping experience, particularly benefiting elderly individuals and those with mobility challenges. The OLED display ensures clear visibility of product prices and the total bill, reducing checkout surprises and improving budget management.

Through the seamless integration of autonomous navigation and barcode-based billing, this smart trolley enhances shopping convenience, reduces physical effort, and brings innovation to the retail industry. Future enhancements may include RFID-based item detection, AI-driven navigation, and smart payment integration to further improve usability and efficiency. This project lays the foundation for smart retail automation, contributing to the evolution of modern shopping experiences.