

CARTEASE

CPG number 162

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System Behavior:

- Customers place items in the shopping cart.
- The cart's camera modules continuously monitor the cart's contents.
- The object detection algorithm analyzes the images, identifying and classifying items placed within the camera's view.
- Upon successful identification, the cart displays the item's name, price, and adds it to the running total.
- Customers can browse product information displayed on the cart.
- Customers can apply coupons or promotional codes to their purchases.
- Customers initiate a secure payment process through various methods.
- The system transmits purchase information securely for transaction completion.

Objectives:

Functional Requirements:

- **Object Detection:** The cart's camera system needs to accurately identify and classify items placed in the cart using object detection algorithms.
- **Inventory Management:** The cart should track identified items and maintain a running total based on their recognized data (e.g., price per unit).
- **Product Information Display:** Based on the identified object, the cart should display relevant product information (e.g., name, price per unit, description).

- **Coupon Integration:** Similar to the previous version, the cart should allow users to apply coupons or promotional codes to their purchases.
- **Payment Processing:** The cart must facilitate secure payment processing through various methods (e.g., credit cards, digital wallets).

Non-Functional Requirements:

- **Security:** The system must ensure secure storage and transmission of customer data and payment information.
- **Usability:** The cart interface should be user-friendly and intuitive for customers. This might include clear instructions on how to place items within the camera's view for optimal detection.
- **Performance:** The cart should be responsive and provide real-time feedback on item identification, totals, and product information. Processing speed for object detection is crucial here.
- **Reliability:** The cart's object detection, inventory management, and payment processing functions must operate reliably.
- **Scalability:** The system should be able to handle a varying number of users and transactions efficiently. This might involve using powerful enough hardware to handle real-time object detection for multiple carts.
- **Hardware Requirements:** The cart's hardware (camera modules, processor, display, etc.) should be powerful enough for object detection tasks and function in a typical store environment.
- **Battery Life:** The cart's battery should last a full shift or provide sufficient power for extended shopping trips, considering the additional processing power needed for object detection.

Product Perspective:

The Smart Shopping Cart with object detection technology focuses on revolutionizing the shopping experience by:

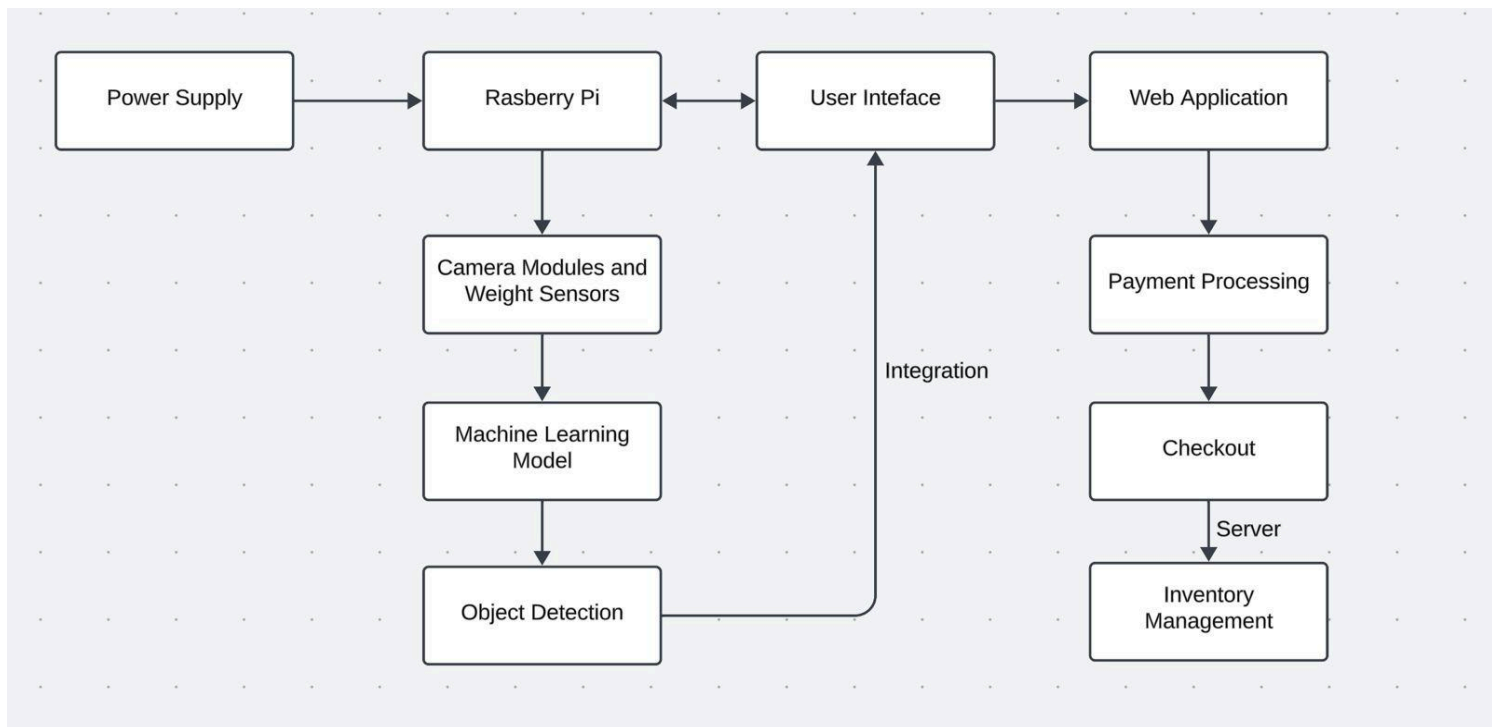
- **Eliminating checkout lines:** Customers scan and pay for items as they shop, saving valuable time.
- **Enhanced Convenience:** Streamlined shopping experience with real-time product information and potential integration with loyalty programs or personalized recommendations.
- **Increased Efficiency:** Faster shopping trips and improved store operational efficiency through reduced checkout congestion.

This innovative solution prioritizes customer satisfaction by offering a time-saving, convenient, and potentially more informative shopping experience.

Additional Considerations:

- **Training Data:** The object detection algorithm will require a vast amount of training data with images of various products from different angles and lighting conditions to ensure accurate identification.
- **Error Handling:** The system should handle situations where object detection fails (e.g., unclear view, unfamiliar item). This might involve prompting users to manually enter product information or retry placing the item within the camera's view.
- **Lighting Conditions:** The system might need to account for variations in store lighting to maintain consistent object detection accuracy.

BLOCK DIAGRAM

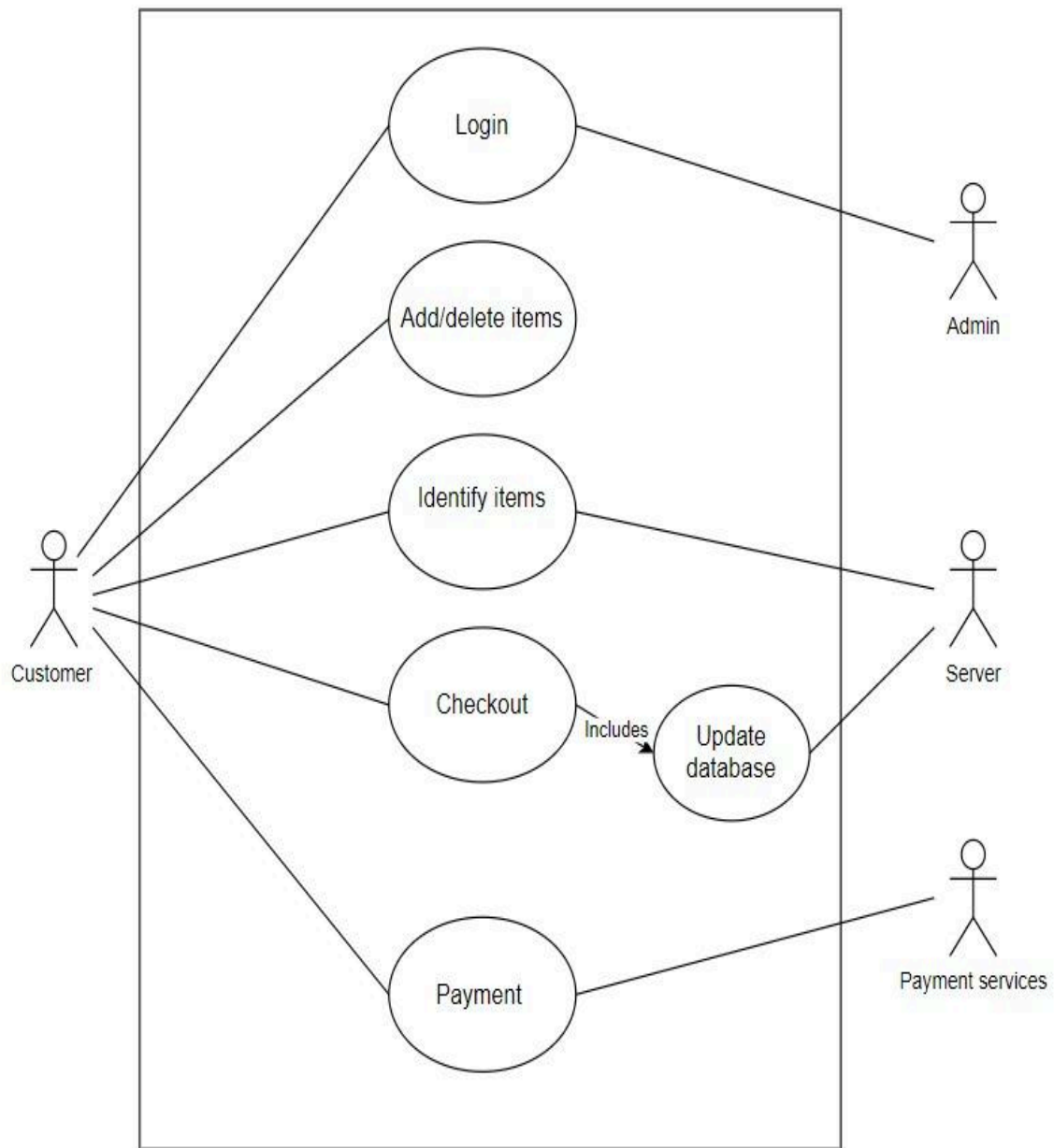


Components:

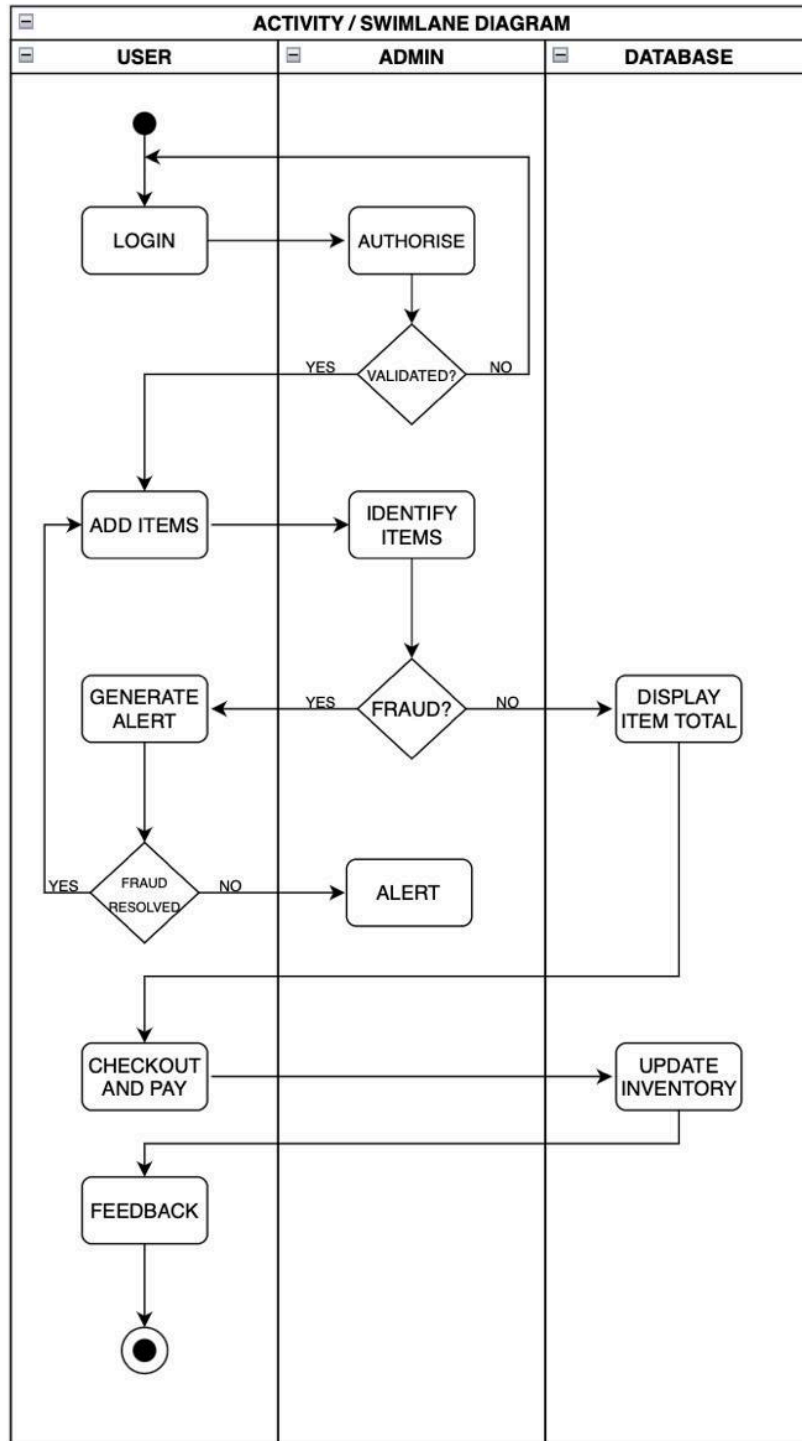
- **User Interface (UI):**
 - Touchscreen interface for customer interaction
 - Displays:
 - Product information (name, price, image)
 - Running total

- Coupons applied (optional)
- Allows for:
 - Coupon application (optional)
 - Payment initiation
- **Camera Module(s):**
 - High-resolution camera(s) positioned to capture clear images of the cart's contents from multiple angles (optional)
- **Object Detection Processor:**
 - Powerful processing unit with dedicated hardware (e.g., GPU) for real-time image processing
 - Runs object detection algorithms to identify items placed in the cart based on camera images
- **Inventory Management System:**
 - Database storing product information (name, price, description, etc.)
 - Receives identified items and their data from the object detection processor
 - Updates the running total based on identified items and their prices
- **Payment Processing Unit:**
 - Secure unit that facilitates various payment methods (credit cards, digital wallets)
 - Interacts with payment gateways for secure transaction completion
- **Communication Module:**
 - Enables communication between the cart and a central server for data exchange
 - Purchase information
 - System updates (optional)
- **Power Supply and Management:**
 - Provides power to all system components
 - Ensures efficient battery life for extended operation

2) USE CASE DIAGRAM



3)ACTIVITY / SWIMLANE DIAGRAMS



Screenshots of the Machine Learning Model

