Smart Cart with QR/Barcode Scanning & ML-Based Recommendations

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1 Project Overview

In these recent days shopping has evolved, but coming to the process of adding things to our cart it is same as the beginning of this shopping era. It remained unchanged. As we all encountered that these QR codes and bar codes are widely used for payments, tickets, and some of the deliveries too. Most of the business stores now a days still using the same old tech to bill their products at the counter which in turn leads to the longer queues and delayed billings and need more men force. Our project mainly aims to integrate QR/barcode scanning into a smart cart, allowing all the items or things to be billed at the cart level itself. Besides this we are trying to implement an ML-based recommendation system which is going to suggest additional products for the customer which in turn increase sales too. Which is completely base on consumer's cart contents.

Key features include:

- QR/Barcode scanning for automatic item addition to the billing system.

- ML-based recommendations just to suggest relevant products that are added to the customer's cart.

- Real-time billing updates as for the item's addition or removal.

- Basic UI to display item details, prices, and recommendations.(future implementation)

So finally this system is going to enhance the shopping experience of customer as well as owner which leads to mutual benefit for both as recommendation is going to increase sales through targeted suggestions.

2 Significance

Retail stores now a days are facing major challenges for example consider a long checkout queues and some of the not efficient billing processes which is a major headache for retailers and wholesale as well. While barcode scanning has already been using at some of the payment counters, it is very rarely applied at the shopping cart level(only some of the big giants are applying these at the shopping cart level). implementing them in all the retail shopping places gives us both practical and cost-effective experience.

Benefits include:

- Reduces waiting time by eliminating all the manual scanning at checkout section.

- Enhances shopping experience with some of the smart recommendations similar to the online stores and boosts the business.

- Increases store efficiency by automating item additions and removal from cart including billing.

- • Affordable and scalable when this system is compared to expensive RFID-based solutions which exists these days.

While self-checkout kiosks that are existing these days in some shopping giants, they still require some manual scanning methods. Mobile app-based solutions do exist but completely belongs to shopping giants and costs way higher for some small retailers , a small note that not everyone choose to use their phone while shopping out things. By implementing this kind of QR/barcode technology which includes ML-based recommendations, this project is going to offer a more convenient and efficient alternative for small retailers too.

3 Objectives and Specific Aims

3.1 Long-Term Goal

The main and ultimate long-term goal of our project is to mainly develop a smart shopping system which is going to improve efficiency in retail stores by automating all the items tracking and enhancing all the shopping experience with some ML-driven product recommendations.

3.2 Specific Aims

As we got some time constraint of 10 weeks span. Our project is mainly focusing on building a working prototype which is going to showcase all the core things that the shopping cart can do. without full-scale implementation in a real store. The key objectives are:

3.2.1 Implementing ML-Based Item Recommendations

- Develop a machine learning model in order to suggest products based on consumer's current cart option which are already added.

- Training the model using some of the sample shopping datasets which are available publicly on the internet or some of the predefined product relationships and some of the patterns related to this tech.

- Display Display some of the recommendations in a basic UI (e.g., console output or simple web interface)(future implementation).

3.2.2 Simulating QR/Barcode-Based Item Entry

- Since full QR/barcode scanning integrating might not be as feasible as it seems, we will simulate the whole process by manually entering product codes or selecting some of them from a database.

- Store or retailer branch item details (name, price, category) in some local database or a specific CSV file for demonstrating things.

- • Ensuring that for an item is addition or removal, it is going to update a virtual shopping cart with the price constraint and offers and in addition some recommendations too.

3.2.3 System Integration & Hardware Setup

- Using a Raspberry Pi or ESP32 in order to manage all the data processing that is involved.

- Set up some basic embedded system just to handle all the products entry and some recommendation display.

- • Implementing a simple touchscreen UI (if time permits), or using some basic web/app interface for consumer cart interaction.

3.3 Testing & Optimization

- Validating the recommendation accuracy by testing out prototype with different shopping situations.

- Optimizing the database and queries related to the DB and ML based model performance just to ensure about the smooth functionality of the entire system.

- Conducting some basic user testing in order to evaluate effectiveness of the whole.

References

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