



AI-Powered Voice and Chatbot Ordering System

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Abstract: AI-Powered Voice and Chatbot Ordering System presents an AI-driven grocery ordering system that enables users to place orders through voice commands and chatbot-based interactions. The system integrates Natural Language Processing (NLP), speech recognition, and a web-based interface to simplify product search, order placement, and user communication.

A Flask backend manages authentication, product information, inventory updates, and order processing, while SQLite is used as the database layer. The platform reduces manual effort, supports hands-free operation, and offers a more accessible alternative to traditional grocery ordering applications. The results demonstrate improved usability and efficient processing of voice and text-based queries.

Keywords: Voice Ordering, Chatbot Application, NLP, Speech Recognition, Flask Framework, AI-Based Ordering System

I. INTRODUCTION

Conversational systems such as chatbots and voice assistants have become increasingly common in modern applications due to their ability to automate user interactions and simplify digital processes. Grocery shopping often requires frequent searches and manual typing, which can be time-consuming for users. To address this, the proposed system introduces a voice-enabled and chatbot-supported grocery ordering platform.

The system uses NLP to interpret user requests, retrieve matching products, and guide the user through the ordering process. Vendors can manage inventory and product details, while customers can register, log in, search for items, and place orders. The platform is designed to offer a simple, accessible, and efficient method for digital grocery ordering.

Primary features of the system include:

- **Voice-Based Ordering:** Users can place orders using speech, which is converted into text for processing through NLP-based models.
- **Chatbot Interaction:** A conversational chatbot assists in product search, answering user queries, and managing the order flow.
- **Product Search Engine:** The system interprets keywords from user statements and retrieves relevant product information.
- **User Authentication & Order Handling:** Customers can sign up, log in, add items to the cart, and place orders securely.
- **Vendor Inventory Management:** Vendors can add new products, update existing ones, and maintain stock levels.
- **Basic Recommendation Support:** The system can provide simple suggestions based on frequently selected items or related products.

II. RELEVANT LITERATURE

A. *Conversational Interfaces in E-Commerce*

Research studies show that conversational systems reduce user effort by replacing manual input with natural language communication.

B. *NLP in Product Search and Query Interpretation*

NLP-based methods improve the understanding of user intent, enabling systems to correctly identify product names, quantities, and actions.

C. *Order Management in Digital Platforms*

Literature highlights the importance of efficient order flow, accurate inventory updates, and real-time product visibility for user satisfaction.

D. *AI-Assisted User Interaction Systems*

Machine learning and AI techniques are widely used to support interactive systems by enhancing query handling and improving user engagement.



III. SYSTEM DESIGN AND METHODOLOGY

The system follows a modular methodology that begins with identifying user and vendor requirements, followed by designing the conversational interface for voice and chatbot interactions. NLP techniques are used to interpret user queries, while the backend processes these commands for product retrieval, cart updates, and order management. The Flask server handles API communication between the frontend and database, ensuring smooth data flow. SQLite stores all user, product, and order information, enabling consistent access and updates. The entire system was developed in iterative stages—design, integration, testing, and refinement—to ensure accurate command interpretation and reliable ordering performance.

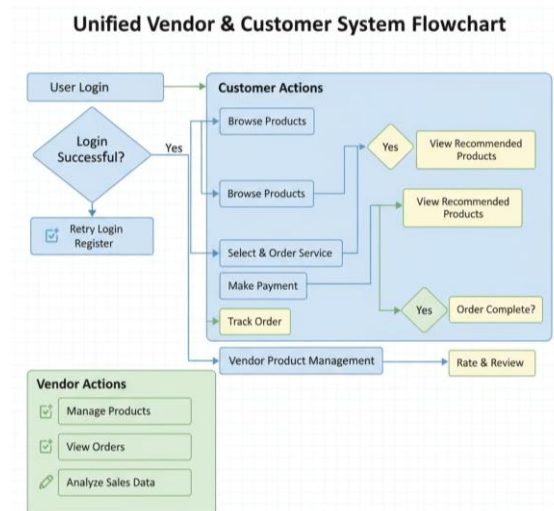


Fig 1. Generic user flow diagram

A. Training Stage

Training is a very important phase in formulating the framework, as shown in the workflow diagram.

It consists of five main steps:

1. **Data Collection:** Product data, sample queries, and user text commands were collected to support model training.
2. **Data Preprocessing:** Text clean-up, tokenization, and normalization were applied to prepare inputs for NLP processing.
3. **NLP/ML Model Training:** Models were trained to recognize user intent, extract product names, and interpret voice-transcribed text.
4. **System Integration:** The trained models were integrated with the backend through REST APIs, enabling communication between components.
5. **Testing & Evaluation:** The entire system was tested for response accuracy, database correctness, and stability of the voice/chatbot workflow.

B. Definition Phase

It lays down the path of the user query completely. The complete design of the system. This phase involves identifying system requirements, defining user tasks, mapping workflows, and outlining vendor functionalities. Key requirements included user authentication, product search processing, voice command interpretation, and secure order placement.

1. **User Query Input:** The system accepts user input either through the chatbot text box or through voice commands. Voice inputs are converted into text using a speech-to-text engine before being processed.
2. **NLP-Based Intent and Entity Extraction:** The input text passes through the NLP module, which identifies the user's intent (e.g., search, add to cart, view item) and extracts key entities such as product names or quantities.
3. **Backend Processing and Request Handling:** The Flask backend receives the interpreted request and triggers the appropriate function. It interacts with the SQLite database to fetch products, validate user details, update carts, or manage orders.
4. **Database Interaction and Data Retrieval:** Based on the user's intent, the system retrieves relevant data such as product availability, item details, or order history. The SQLite database ensures fast and lightweight data operations.



5. **Response Generation and Delivery:** The backend constructs a structured response, which is sent back to the user through the chatbot interface. For voice mode, the system can convert the response back into speech, completing the interaction loop.

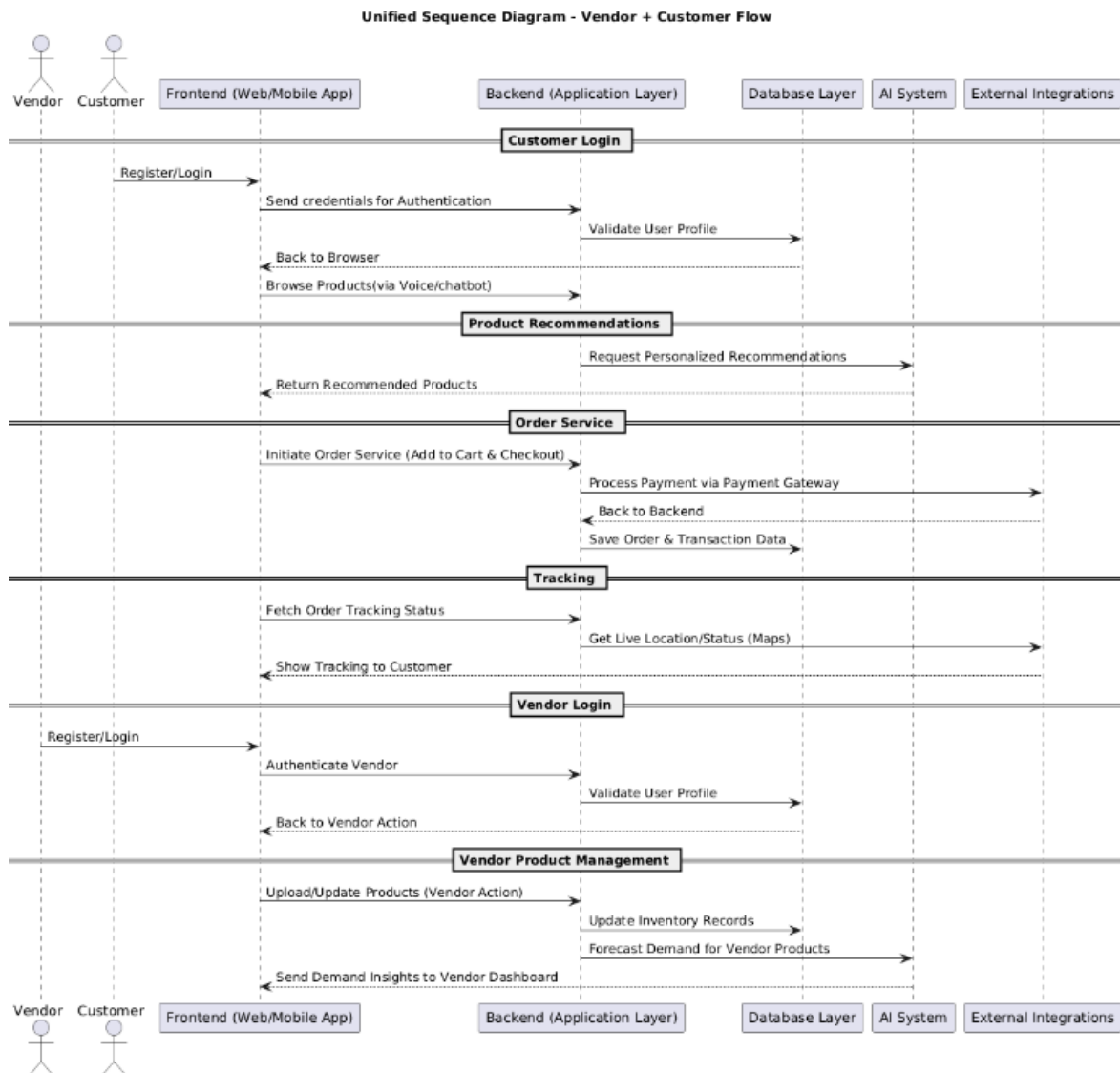


Fig 2. High level design

IV. RESULTS AND DISCUSSION

Testing confirmed that the system accurately processed user commands in both voice and text formats. Voice recognition worked effectively in quiet indoor environments, and the chatbot successfully handled general product queries. Product search matched relevant items based on extracted keywords. The ordering process—from cart creation to order submission—performed reliably during repeated tests. Vendors were able to modify product details, which updated immediately in the system. Overall, the system improved accessibility, reduced manual interaction, and demonstrated strong potential for real-world use.

V. CONCLUSION AND FUTURE WORK

The AI-powered voice and chatbot ordering system provides an efficient approach to digital grocery ordering by integrating NLP, speech recognition, and a structured backend framework. It reduces user effort, enhances accessibility, and supports essential vendor operations.



Future enhancements include adding multilingual voice support, improving recommendation accuracy, integrating additional payment options, and expanding the chatbot's ability to understand more complex sentence structures.

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