VOICE/TEXTUAL BOT MOBILE APP

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Abstract

Abstract This paper describes the design and deployment of a Voice/Textual Bot Mobile App that was aimed at revamping the way people order food using advanced speech recognition, NLP, and real-time cart management. This application allows for users to browse categorized menus and place orders in addition to being able to command and manage shopping carts through voice or text inputs. This app features secure authentication, user-friendly navigation, and real-time cart updates for users of all kinds, even the physically or technologically challenged. It bridges the gap between advanced technology and convenient everyday food delivery systems by focusing on efficiency and user satisfaction. Keywords : Voice/Textual Bot, Android Application, Speech Recognition, Natural Language Processing, Real-Time Cart Management, Food Delivery System.

1.INTRODUCTION

1.1 PROJECT DESCRIPTION

The Food Chatbot Android application is the most innovative application where there is voice recognition technology so one can actually use it while staying handsfree interacting with ordering systems. Designed to be convenient for users, the app features a simple and intuitive interface that enables users to browse through a wide menu, add items to the cart, and place orders using voice commands. Registration and login ensure that only authorized users can access the app's features, maintaining privacy and security.Once successfully logged in, the app greets the user with a drop-down menu that contains tremendous detailed information about available items of food with descriptions and prices so that it makes all this work utterly easy and informed. The app boasts the distinguishing characteristic of voice input. Users can add and remove items from their cart using natural language commands thus eliminating manual interaction. The cart automatically updates the display of selected items, their quantity, and total cost for clear and organized ordering. The Food Chatbot Android Application aims to enrich the user experience by combining conventional food ordering with modern technology. For anybody, whether computer-savvy or not acquainted with mobile apps, this approach is quick and easy to help place food orders on the fly.

1.2 MOTIVATION

It is through making the process easier and more fashionable to order foods that the motive behind the development of the Android Food Chatbot was driven.These kinds of gadgetry and increasingly hectic lifestyles make the need for quick, easy ways to accomplish these tasks increasingly important. Voice recognition technology is a method that is available to everyone and does not require any one's hands at any time, whether it is someone with disabilities or a non-techno literate. By bringing voice commands to food ordering through the app, it saves not only time but also increases the convenience and interaction of the users. This project is motivated to create an easy, intuitive experience that combines practicality with the best of technological developments.

1.3 PROBLEM STATEMENT

It has long been established how ordering food has become so uncool to traditional methods that everyone wants in through apps; nowadays, these conventional methods seem even more hectic to the technophobic and handicapped users in modern society.
Since most applications, especially for delivering food, primarily depend on using manual navigation as well as inputs from the users and may not present an intuitive approach or even easy to use; it's lacking innovative features of voice input often. This project fills the gap by offering a Food Chatbot Android Application which integrates voice recognition technology, thereby enabling users to browse menus, add or remove items, and place orders using simple voice commands. The application is simplifying the interaction process and reducing dependence on manual inputs to deliver a modern, efficient, and inclusive food ordering solution.The focus is on customer satisfaction improvement through the convergence of convenience, accessibility, and technological innovation on one platform.

1.4 SCOPE

The scope of the Food Chatbot Android Application is therefore to create an easy-to-access food ordering interface that is simple and convenient for users.
It is an app allowing users to see food menus, add or remove items, and issue orders with voice commands, making it appropriate for various users who are either physically challenged or technologically not so savvy.
The primary features of this app include registration for the user, login facility, dynamic carting, and real-time voice interaction to enhance order processing speed. This is a project meant to make ordering food much easier by fusing intuitive design with advanced voice recognition technology. In this way, the system can be both user-friendly and accessible to all users.

1.5 OBJECTIVES

➢ Simplify the food ordering process through an intuitive Android application.➢ Offer a menu with a categorization list of food items, along with their descriptions and prices.

➢ Users should be able to dynamically manage their cart by adding or removing items using voice commands.
➢ Access will be secured through user registration and login functionality
➢ Accessibility will be easy and convenient for all users, irrespective of their technological background
➢ A modern, efficient, and user-friendly food ordering experience

2.PROJECT SUMMARY

Requirement Gathering and Analysis

2.1.Requirement Gathering

In the development of the user-centric and efficient application, it is crucial to understand the requirements and problems of the existing food ordering system that the users are facing. Therefore, it involves carrying out surveys and interviews on participants with a variety of background: frequent users of food delivery applications, not-so-technologically-inclined people, and physically users.The surveys were designed to identify pain points in the ordering process, such as complex navigation, the inability to manage orders dynamically, and the lack of accessibility features like voice commands. For better understanding, further feedback was solicited from the customer service officers working in food delivery companies. It was revealed that the most complained-about issues from the users included the tedious nature of searching for the menu items one by one, entering payment information multiple times, and handling items in the cart. It has also been noticed that people nowadays prefer hands-free operations, as most of them are multitasking while using such applications. Key takeaways from this phase were that a voice-enabled interface should be designed in a way to make interactions easy, save time while using the app, and also be user-friendly for those who are either physically or technically constrained. In addition, users were more interested in the real-time cart management of orders so they can review, change, and confirm their orders in one flow. This served as a basis of functional and non-functional requirements of the application. It made sure the solution satisfied all forms of needs.

2.2Analysis

After gathering requirements, there was an analysis of the existing systems like Google Assistant, Siri, and Alexa. These systems were picked because they represent the state-of-the-art in voice recognition and conversational AI. A proper analysis based on operational strengths will be included, such as extremely high accuracy in speech-to-text conversion, natural language understanding, and handling multi-step commands. These included the limitations that presented themselves as failed recognitions of accents, inability to handle background noises, and complex or ambiguous commands. They broke down user needs into actionable functional requirements. For instance, "Add a large pizza and a soda to my cart" could be broken down into entities like item type, size, and quantity. Analysis of this type made sure the app could take in complex inputs but was very simple in responses. Non-functional requirements, including satisfying response times for 2 to 3 seconds as well as achieving an intuitive feel for the interface, were formulated to meet expected user needs. This phase also involved an analysis of prevailing market trends and technological developments. It was observed that although many applications provide simple voice interactions, they lack robust features such as real-time error handling, dynamic cart updates, and secure user authentication integrated with voice commands. All these insights helped in the design and development of the Voice/Textual Bot Mobile App so that it could fill the gaps in the existing solutions and offer a better user experience.
The development team synthesized the gathered data and analyzed current systems to establish a clear roadmap for creating a solution that prioritizes user convenience, accessibility, and technological innovation. This structured approach ensured that the application was built with a deep understanding of user needs and market opportunities.

3.System Design

It has the architecture well thought out to ensure that users enjoy a flawless and efficient interface. It consists of three main sub-components: front-end user interface, back-end framework for the application, and the module for speech to text. Combining these pieces gives robust functionalities which satisfy all technical and access need

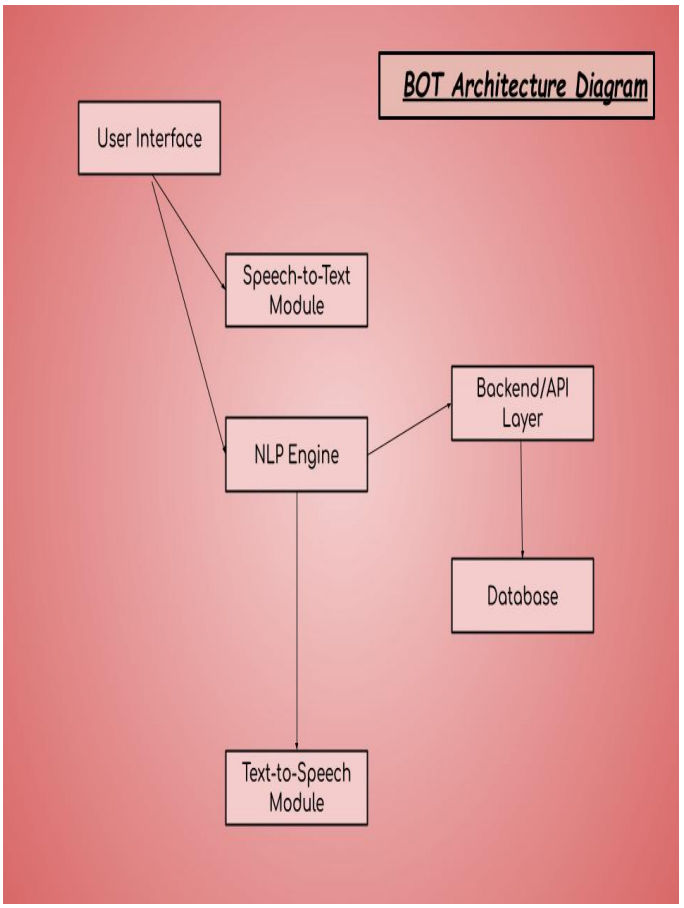


Figure 1. Architecture of Voice/Textual Bot Mobile App

3.1.Front-End Design

Front-end is referred to as the interface, and its design is done in XML, which is a very popular programming language among many developing android applications. The user interface is all about user experience. Major functionalities include:Menus grouped into categories like appetizers, main courses, beverages, and desserts with their names, description, price, and images, which are optional.This way of categorization of menus will allow easy navigation on the menu of the items by the user.
•Interactive Components: Buttons and icons, voice command interaction highly emphasized on microphone icon, though touch input exists for those who opt for traditional method.
• Responsiveness: The app's design is responsive to different sizes and resolution on the Android screen; thus there is consistency on varied multiple Android devices.
•Real-Time Feedback: Any change within the cart is reflected on the interface in real-time, whether it's to add or delete items, and this clarifies and gives user confidence.

3.2.Back-End Functionality

The back-end runs the application with SQLite and Java, so data is kept secure and is retrieved efficiently. Some of the major features of the back-end are as follows:

•SQLite database management that keeps track of the user passwords, order histories, menu, and cart-related details. In the design perspective, it allows fast data fetching and updating because of which on devices with very less resources it still runs efficiently.
•Dynamic Cart Management by the back end because dynamic cart data will be computed about taxes and additional amounts on the server-side.This implies that users are always aware of their purchases.
•Natural Language Processing: NLP algorithms interpret voice and text inputs to identify entities like food items, quantities, and actions. This allows the app to process complex commands such as, "Add two large pizzas to my cart."
•Security Features: User information will be encrypted for protection, and session validation mechanisms to ensure the proper entry into the app only by authenticated users.

3.3.Speech-to-Text Module

Speech-to-text module enables the use of the app with hands-free usage. It uses the Android native speech recognition API to get some of the major functionalities:.
• Voice Command Capture: The module captures the speech input from the device's microphone through its processing within the speech recognition engine. Optimized for diverse accents and speaking speeds.
• Speech-to-Text Conversion: This captured speech is then transcribed into text, processed within the back-end, and brings actionable commands-such as show a category or add to the cart-to be displayed on the website.
•Command Parsing: This module, along with NLP algorithms, parses the input and picks out key elements, such as food items and quantities, so that commands are properly understood and executed.
•Error Handling: Whenever the speech is not clear or there is some background noise, a fallback mechanism asks the user to clarify or repeat the command, and everything goes smoothly.

3.4.Integration and Workflow

All these modules are put together to provide a seamless experience. For instance, if a user says something like, "Add a large pizza to my cart," the speech-to-text module will capture that and translate it into text. The back-end then processes that command and updates the cart in the database by calculating the total. This is because now the front-end reflects updates immediately, so a user gets real-time feedback and has a smooth experience. It makes the app more accessible, efficient, and convenient to all the users.

4.Development Methodology:

Development of the Voice/Textual Bot Mobile App follows a structured, modular development process, where each component is first designed, then implemented and tested, and then integrated.Such an approach guaranteed that efficiency in the overall process of development was heightened as well as ensured reliability and centeredness around key functionalities for the app. This process covered these important modules:

4.1.Voice Command Processing

This module is at the heart of voice interaction capabilities inside the app. It uses APIs for speech-to-text to decode natural language input from users.
•Speech Recognition: It captures spoken commands through the microphone of a device and sends them to be processed using built-in speech recognition APIs in Android. These convert spoken words into text real-time, setting the foundation for further processing.
•Entity Extraction: After converting speech to text, the system identifies actionable entities within the command. For example, in the command, "Add three large pizzas to my cart," the entities extracted are:
oAction:
oQuantity:
o Item:
Add Three Large pizzas
•Real-Time Processing: The speech-to-text module is optimized for speed, ensuring that commands are processed and executed within seconds to provide users with immediate feedback.
This feature allows individuals to use an application without doing much navigation when using voice prompts, thus helping the application itself to be a bit more reachable.

4.2.Natural Language Processing (NLP)

Application integrates advanced natural language processing that enables it interpret and act correctly on user prompts and commands.

•Intent Recognition: The NLP system recognizes the intent behind each command of the user. For example, a command like "Can you add a Coke to my cart?" is recognized as an intent to add a beverage to the user's cart.
•Context Understanding: NLP algorithms keep context in multi-step interactions. For example, if a user adds multiple items sequentially or modifies an order, the system keeps track of the ongoing session.
•Variability in Phrasing: Users phrase their commands differently. The NLP system accounts for such variations, so commands like "I need three burgers" and "Add three burgers" are treated as identical.
Multi-Language Support (Future Scope): Though the current version is only for English, the NLP framework is designed to be extendable to other languages, which makes the app more versatile in the future.The integration of NLP ensures an application can capture all user commands regardless of whether the user is perfunctory or conversational in their choice of words.

4.3.Dynamic Cart Management

The cart module is an important module, as it allows users to maintain real-time control over their orders.
•Add, Modify, and Remove Items: Users can add items to their cart, update quantities, or remove items altogether through voice or text commands. The system reflects these changes within the cart interface in real-time.
•Real-Time Price Update: Whenever there is a modification of the contents in the cart, the final price with any applicable taxes and discount is recalculated and displayed at real time. This will promote trust and clarify for the customers exactly what is their order.
•Visual Feedback: The front end interface of the cart is dynamically updated, showing users visual feed-back of any change made due to their command.
•Cart Session Management: The system monitors the cart session for each customer so that his order information will not be lost until he successfully completes the checkout.
Dynamic cart management is a vital function that facilitates user experience, as it renders the ordering process transparent, interactive, and efficient.

4.4.Error Handling Mechanism

The app also contains an error handling mechanism in order to prevent user interactions from becoming jerky in case of commands being interpreted or unclear.
•Requesting Clarification: If the app does not understand a command, it requests clarification from the user. For example, if a user says, "Add a drink," the system may ask, "What type of drink would you like to add?"
•Fallback Responses: It gives fallback responses in case it cannot process the command. Such responses guide a user on how to rephrase a request. For instance, "Please specify the quantity and type of item you want to add."
• Noise and Ambiguity Management: The presence of background noise or ambiguity in commands will interfere with the speech recognition. The app will identify this occurrence and prompt the user to repeat the command.
• Logging for Improvement: All unrecognized commands are logged during the test and update sessions, which aid in improving the understanding of the app over time.
The robust error handling mechanism ensures that the application is still user-friendly when dealing with difficulties such as unclear or incomplete inputs.

4.5.Integration and Workflow

All these modules were developed independently to allow focused design, coding, and testing. Once individually validated, the modules were integrated into a cohesive system. The workflow ensures smooth interaction between components:
1. The Voice Command Processing module captures the input from the user and sends it to the NLP module for interpretation.
2. The NLP module determines the intent and actionable entities that are then forwarded to the Dynamic Cart Management module for execution.
3. In case of errors, the Error Handling Mechanism comes into play and resolves the issue, ensuring a seamless user experience.

5.Testing and Results

Testing and extensive testing processes were largely adopted in proving the features and developing the Voice/Textual Bot Mobile Application compliant to the needs it was designed for in respect of its described functions, performances, and user satisfiability requirements. This is the most important phase in testing because it can find all the potential issues with concerns while enhancing the confidence of users in a reliable and satisfactory app.

Functional Testing
Test the functionality of the application and ensure that every functionality works precisely as expected. The testers analyzed different scenarios of core functionalities from adding items to the cart to removing items, quantities, and moving through menus.

Test Scenarios: These are pre-defined scenarios developed to represent actual usage. For example:
Scenario 1: The user says, "Add two burgers and a soda to my cart." The application will carry out the command and pass it over to the cart; thus the cart is updated by the new order and the sum is shown as $15.
Scenario 2: A user says, "Remove fries from my cart." The app then identifies the product to be deleted and updates the cart. It then calculates the total amount.
Scenario 3: The user types: "Add three pizzas and a large Coke." This application automatically scans the quantity and items that should be added to the cart and calculates the new total.

Boundary cases were also considered in functional testing. For instance, commands containing extreme large quantities or half-filled inputs are boundary cases. For instance,

Command: "Add 100 pizzas to my cart."
Result: It successfully adds items but gives the confirmation message by warning the user about the large number.
In these tests, it was seen that the application performed very accurately and reliably in interpretation of commands and performing the task which depicts its preparedness for performance in real-world scenarios.
Performance Test
For checking response time and smooth handling of multiple user interactions, this performance test was performed. It assesses the response time, resource utilization, and conditions for stability.
Response Time for Voice Commands: 2-3 seconds for both voice and text-based inputs
This meant the minimum possible latency would be produced to enrich user experience, especially in events of the kind where every minute counts.
Dynamic Updates: There were a number of tests run on real-time cart updates. For example, whenever items were added, removed, or changed, the cart interface was updated immediately to show the right totals and quantities.
Stress Testing: The application was tested with high-demand scenarios, such as dealing with a cart of 50 items or more, and performing commands in rapid succession. The system was stable and always performed well without crashing or significant delays.
Compatibility of Device: The application has been tested in different devices that vary from having lower configurations with older versions of Android, but it still executed properly in each one, and therefore shows efficiency and scalability in its design.
Usability Testing
The usability testing entailed feedback acquired from participants with diverse technical knowledge and also participants with different disabilities. It tried to see how intuitive or accessible the application was to the various user demographics.

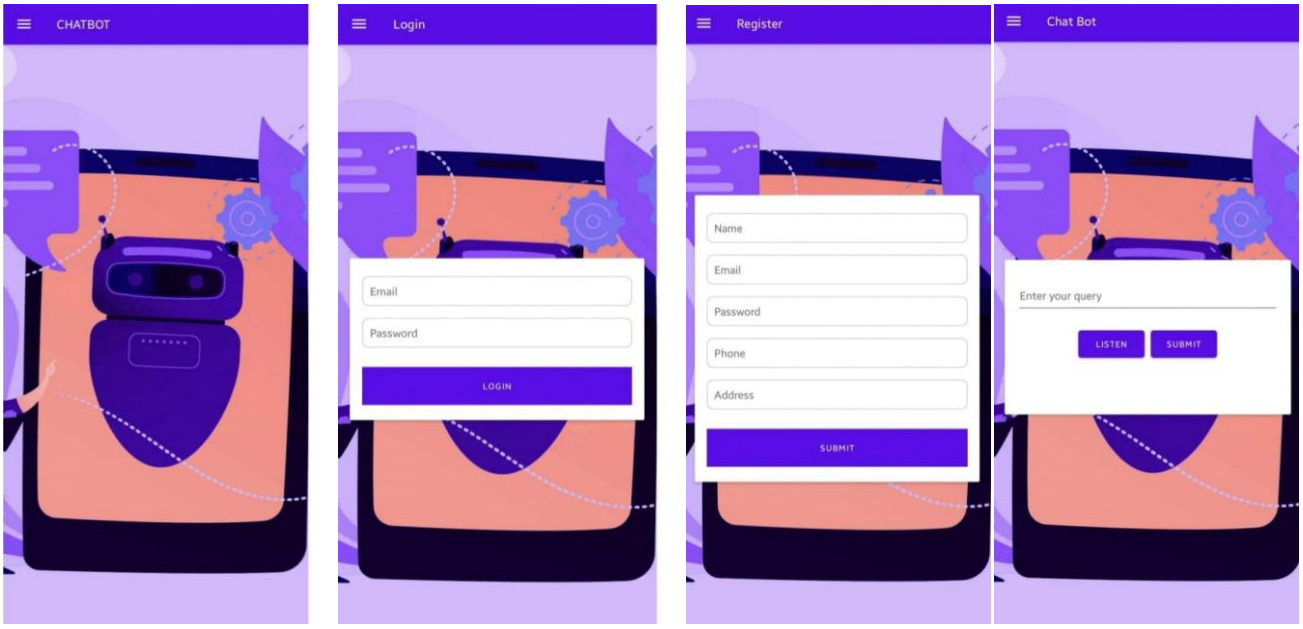
Interface evaluation: Users appreciated the well-structured interface in which every menu had to be categorized; the icon of the microphone should dominate the center.
Voice Command Accuracy: One of the very impressive things in the application was the accuracy by which it picks up voice commands even when a bit different phrasing or accent might be used, for example: "Add a Coke" versus "Can you add a Coke to my cart?.".
Error Handling: The people who were testing the application liked that it handled obscure or ambiguous input very well. For example, if a person said, "Add a drink," it requested to know which kind of drink they would want to add, then it prompted with options that include soda, juice, and water.
Accessibility: This feature was appreciated by those who have some physical disability and those who are multitaskers. Users said that voice commands removed the tedious navigation process so that the app became an inclusive one.
Overall, it can be stated that usability testing reflected the fact that the application was intuitive and reliable and brought it within reach of a mass user group.
End
The comprehensive test phase proved that the application could deliver on its objectives, which led to several key outcomes:

Food Ordering was made easy because the application simplified the process for users whereby they could input information through natural voice or text. This made it possible to reduce time taken and effort compared to the traditional process.
It opened up access to more people, the physically challenged and non-tech savvy people, with voice commands.
Real-Time Updates: Dynamic cart management would ensure that any changes such as addition or removal of items from the cart are updated in real-time on the user's screen, thereby creating transparency and confidence.
User Satisfaction: The users were satisfied and reported high levels of satisfaction during the test due to an intuitive app interface, precise execution of commands, and response times.
Flexibility: This application provided voice or text input options to users for their multiple needs and diverse scenarios.
Data Security: The application had included user authentication, and it had used secure encryption for the information, be it log-in detail or even an order detail for maintaining confidentiality of such details.
Scalability: Modular architecture would also prove agile enough in integrating new features and third-party services into the system to keep it going over a long term.
Such results showed that the Voice/Textual Bot Mobile App met and even exceeded all the set targets, making it one of the most reliable and innovative applications within the food delivery domain.

Therefore, through such a great extent of testing and attaining the outcome, Voice/Textual Bot Mobile Application presents itself as the new benchmark in the platform of accessibility and efficiency, and the users' experience on ordering systems associated with the food industry. Therefore, the performance level demonstrated by this application can serve to be a leader in establishing new scenarios for food delivery systems for more accessible and user-friendly scenarios.

Table 1. Sample Test Cases

Query	Response
"Add two pizzas to my cart"	"Two pizzas have been added to your cart. Total: $20."
"Remove fries from my cart"	"Fries have been removed from your cart. Updated total: $15."
"What's in my cart?"	"Your cart contains two pizzas and one soda. Total: $23."
"Add a Coke from the drinks section."	"One Coke has been added to your cart. Total: $25."
"Clear my cart."	"Your cart has been cleared. Would you like to start a new order?"
"Show me the dessert menu."	"Dessert menu: Ice Cream - $5, Brownie - $6, Cheesecake - $7."
"Apply a 10% discount to my order."	"A 10% discount has been applied. Your new total is $22.50."
"Where is my order?"	"Your order is on the way and will arrive in 15 minutes."
"Add two sodas and remove one pizza."	"Two sodas have been added, and one pizza has been removed. Total: $18."



(a) (b) (c) (d)

Figure 2 (a) Home Page (b) Login Page (c) Registration Page (d) Enter the Query to Order

6. OUTCOMES

Voice-Based Food Ordering: Users can easily place food orders using voice input, thereby making it more convenient and accessible.
Voice Command Cart Management: The user can add or remove items from the cart through voice commands, making the shopping experience more interactive.
Total Amount Calculation: The cart automatically calculates and displays the total amount when users add or remove items.
User Authentication: Only registered and logged-in users can use the food ordering features, thereby ensuring security and a personalized experience.
Better User Experience: Voice input is a hands-free and efficient way of interacting with the application, making it more usable.
Real-time update: the sum price will automatically change every time the item is added or removed from the cart so that immediate feedback to the user can be received.
Android Optimization: The app will be developed to ensure smooth running on an Android gadget and is natively available in such devices.
The system uses NLP so that it would be able to understand and interpret the commands a user gives and, therefore more accurate and effective in its commands.
It would potentially increase usage and interaction of voice-enabled features with the application to increase its general engagement.

7.CONCLUSIONS AND FUTURE SCOPE

Hence, the food ordering application on Android would be developed with voice commands and personal features so that it becomes user-friendly. The users can input their queries in voice form so that they can interact with the app, and thus the whole ordering process would be much smoother and easier for the users to access. The real-time feedback is given by dynamic price updates when items are added or removed from the cart, which makes the overall usability of the app even better.This new access is thus safe and provides every user with a personalized experience of using the registration and login system. Advanced layers of understanding by NLP have been added to voice commands, so the system is accurate enough to interpret and respond to any user request appropriately. This is an efficient and enjoyable way of ordering food, making the app stand out from the traditional text-based interfaces. This project has been a starting point for further new innovations in voice-based applications and utilizes the rapid evolution of technology.It signifies how the integration of machine learning, voice recognition, and mobile app development can together provide seamless user experiences in an often mundane task, such as ordering food. It will be a big step toward intuitive, accessible, and engaging interactions for users with this system, across all different demographics.

8.FUTURE ENHANCEMENT

The future scope for this food ordering application is wide and can be spread in many aspects to enhance user experience and functionality. One would be the extension in the area of advanced machine learning algorithms with regard to the more personalized offerings of food as per user preferences or dietary restrictions, or past orders. This would make the dining experience more personalized, so that users are always presented with suggestions they are likely to enjoy. Moreover, the voice recognition feature can be further enhanced to accommodate multilingual and different accents so that the application reaches a wider global audienceThat way, the features of NLP would be bettered to execute more complexly demanding commands or conversations. Along with this is the delivery of features such as real-time food tracking, providing special offer or promotion schemes, and lastly, by integrating a simple payment gateway option for having a perfect checkout experience.

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