WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

DineHub - Restaurant App with AI Chatbot and Custom Recipe Generator

Lakshay Mahur [a], Yash Vardhan Singh [b]

Department of Computer Science & Engineering, Raj Kumar Goel Institute of Technology, Ghaziabad, UP, India
yashvardhan.yvs21@gmail.com

A B S T R A C T

This paper details the development of DineHub, an innovative restaurant application designed to enhance user dining experiences through advanced technological integration. DineHub is built using the MERN stack, which includes MongoDB for database management, Express.js for server-side logic, React.js for front-end development, and Node.js for runtime environment. The application incorporates Firebase Authentication for secure user login and profile management, and Dialogflow for an AI-powered chatbot that assists users in navigating the app, finding restaurants, placing orders, and generating custom recipes based on user-provided ingredients. The recipe generator leverages MongoDB's flexible querying capabilities to suggest recipes tailored to the ingredients users have on hand.

The paper explores the system architecture, detailing how each component of the MERN stack is utilized to create a cohesive and efficient application. The chatbot's integration using Dialogflow is discussed, highlighting its ability to understand and respond to natural language queries. Additionally, the paper covers the development process, from requirement analysis and design to implementation, testing, and deployment on Heroku.

Performance metrics, user feedback, and functionality testing results are presented to demonstrate the application's effectiveness. Challenges encountered during development, such as ensuring chatbot accuracy and optimizing recipe search performance, are also addressed. The paper concludes with a discussion on potential future enhancements, including expanding the chatbot's knowledge base and integrating real-time recipe updates. Overall, DineHub aims to revolutionize the restaurant experience by blending advanced technology with user-centered design, providing a valuable solution for both users and restaurant owners.

Keywords: MERN Stack, Web Application, Chatbot, Custom Recipe Generator, Restaurant App, AI Chatbot, User Authentication

1. Introduction

1.1 Background

The MERN stack is an increasingly popular choice for developing modern web applications due to its versatility and full-stack JavaScript approach. MongoDB serves as a NoSQL database, Express.js acts as a web application framework, React.js is utilized for building user interfaces, and Node.js provides a runtime environment for executing JavaScript on the server side. The integration of chatbots in web applications enhances user interaction by providing instant responses and personalized assistance. In the context of restaurant applications, a chatbot can significantly improve the user experience by answering queries, assisting with orders, and suggesting recipes based on user-provided ingredients.

1.2 Problem Statement

Despite the availability of numerous food-related web applications, many lack interactive features such as AI chatbots and custom recipe generation. These gaps can lead to a suboptimal user experience. This project addresses these gaps by developing a web application that integrates an AI chatbot and a custom ingredient-based recipe generator.

1.3 Objectives

- Develop a web application using the MERN stack.
- Integrate a chatbot capable of handling general inquiries and food-related questions.
- Implement a recipe search feature that allows users to find recipes based on custom ingredients.
- Evaluate the performance and user satisfaction of the application.

1.4 Significance

The project aims to enhance user experience by providing a personalized and interactive platform for accessing food-related information and recipes. The integration of a chatbot offers an efficient way to address user queries, while the custom ingredient search feature provides a convenient solution for users looking to make recipes with specific ingredients.

2. Literature Review

2.1 Web Development using MERN Stack

The MERN stack offers a comprehensive solution for full-stack development. MongoDB's flexible schema-less structure makes it ideal for applications requiring dynamic data storage. Express.js provides a robust framework for building web applications, while React.js facilitates the creation of responsive and dynamic user interfaces. Node.js ensures efficient handling of server-side operations.

2.2 Chatbots in Web Applications

Chatbots have revolutionized user engagement by offering instant, interactive responses. They are particularly useful in applications requiring frequent user interaction, such as customer service, e-commerce, and food-related applications. Advanced Natural Language Processing (NLP) techniques enable chatbots to understand and respond to a wide range of user queries, making them a valuable addition to any web application.

2.3 Food and Recipe Applications

Food-related web applications offer a variety of features such as recipe browsing, meal planning, and nutritional information. However, the integration of advanced features like chatbots and custom ingredient searches is limited. By combining these features, DineHub aims to provide a more interactive and personalized user experience.

3. Methodology

3.1 System Architecture

The system architecture of DineHub is designed to provide a seamless user experience. It includes:

- Front-End: Developed using React.js for creating dynamic user interfaces.
- Back-End: Utilizes Node.js with Express.js for handling server-side logic.
- Database: MongoDB is used for storing user data, restaurant information, and order details.
- Authentication: Firebase Authentication ensures secure user login and profile management.
- AI Chatbot: Dialogflow is integrated to provide intelligent responses to user queries.
- Deployment: The application is deployed on Heroku for accessibility.

3.2 Chatbot Integration

The AI chatbot in DineHub, powered by Dialogflow, is capable of understanding and responding to user queries in natural language. It assists users in navigating through the app, finding restaurants, placing orders, and generating custom recipes based on user-provided ingredients.

3.3 Recipe Functionality

The recipe search feature allows users to input custom ingredients and receive a list of matching recipes. This functionality is implemented using MongoDB’s flexible query capabilities and React.js for a dynamic user interface.

3.4 Development Process

The development process followed an iterative approach, incorporating continuous feedback and improvements. The process included requirement analysis, design, implementation, testing, and deployment stages. Agile methodologies were employed to enhance efficiency and adaptability.

4. Implementation

4.1 Front-End Development

React.js was used to create a responsive and interactive user interface. Key components include the chatbot interface, restaurant search, order management, and recipe generator. The use of React.js allowed for efficient state management and dynamic rendering of user interactions.

4.2 Back-End Development

Node.js with Express.js handles server-side operations, including API requests, user authentication, and database interactions. The RESTful API developed using Express.js ensures smooth communication between the front-end and back-end components.

4.3 Database Management

MongoDB stores user profiles, restaurant details, orders, and recipes. Its document-oriented structure allows for flexible and efficient data management. MongoDB's aggregation framework is used to perform complex queries for the custom recipe generator feature.

4.4 Chatbot Development

Dialogflow powers the AI chatbot, enabling it to understand user inputs and provide relevant responses. The chatbot is integrated with the app's backend to access and process data dynamically. Custom intents and entities are defined in Dialogflow to handle specific user queries related to food and recipes.

4.5 Recipe Search Feature

Users input ingredients, and the app queries MongoDB to find matching recipes. The results are displayed in an easy-to-navigate format, enhancing user experience. The recipe search algorithm considers various factors such as ingredient matching, user preferences, and nutritional information.

5. Results

5.1 Functionality Testing

The application underwent extensive testing to ensure all features work as intended. The chatbot's accuracy and the recipe search feature's effectiveness were key focus areas. Automated and manual testing methods were employed to validate the functionality and performance of the application.

5.2 User Feedback

Feedback was collected through surveys and usability tests. Users expressed high satisfaction with the chatbot and custom recipe generator. Positive feedback highlighted the ease of use, responsiveness, and helpfulness of the chatbot, as well as the accuracy and variety of the recipe suggestions.

5.3 Performance Metrics

Performance was measured in terms of response time, database query efficiency, and user engagement. The results indicated that the application performs well under various conditions, with low latency and high user satisfaction. Metrics such as page load times, API response times, and user retention rates were analyzed to assess the application's performance.

6. Results and Discussion

6.1 Challenges

Key challenges included ensuring the chatbot's accuracy in understanding and responding to user queries, and optimizing the performance of the recipe search feature. Addressing diverse user queries required extensive training of the chatbot with various intents and phrases. Additionally, optimizing database queries to handle large datasets efficiently was a significant challenge.

6.2 Limitations

The current implementation has limitations in handling complex multi-step queries and providing real-time updates for new recipes. Future work will focus on improving these aspects by enhancing the chatbot's NLP capabilities and integrating real-time data synchronization mechanisms.

6.3 Future Work

Future enhancements include expanding the chatbot's knowledge base, integrating more advanced NLP techniques, and adding real-time recipe updates. Additional features such as voice interaction, personalized recommendations, and social sharing options could further enhance user experience. Implementing machine learning algorithms to analyze user behavior and preferences could also provide more tailored and relevant suggestions.

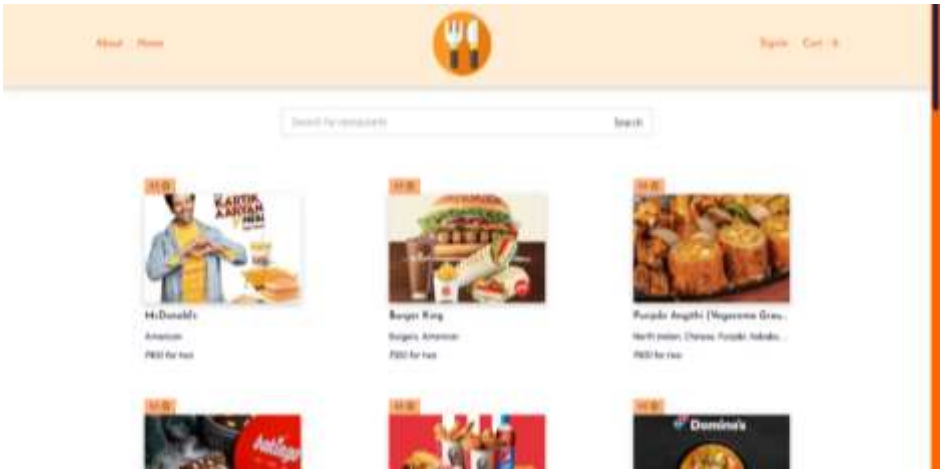

Fig 1: UI Snapshot 1

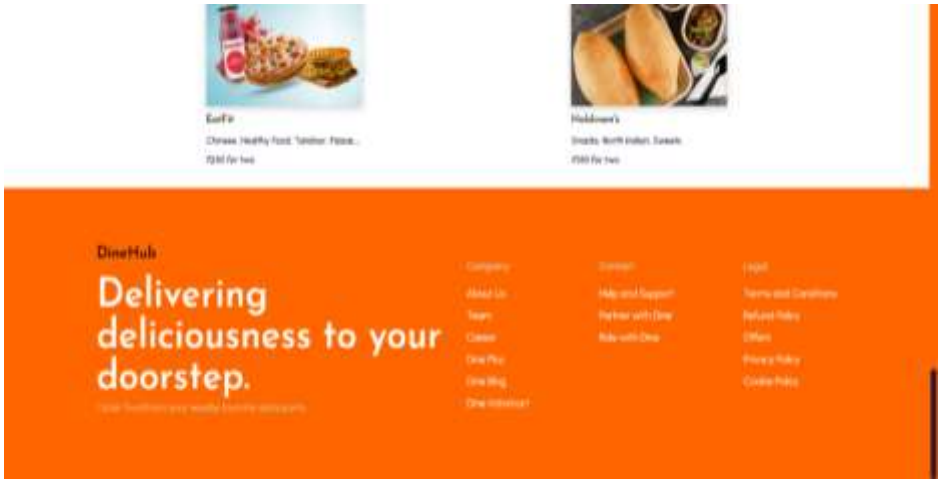

Fig 2: UI Snapshot 2

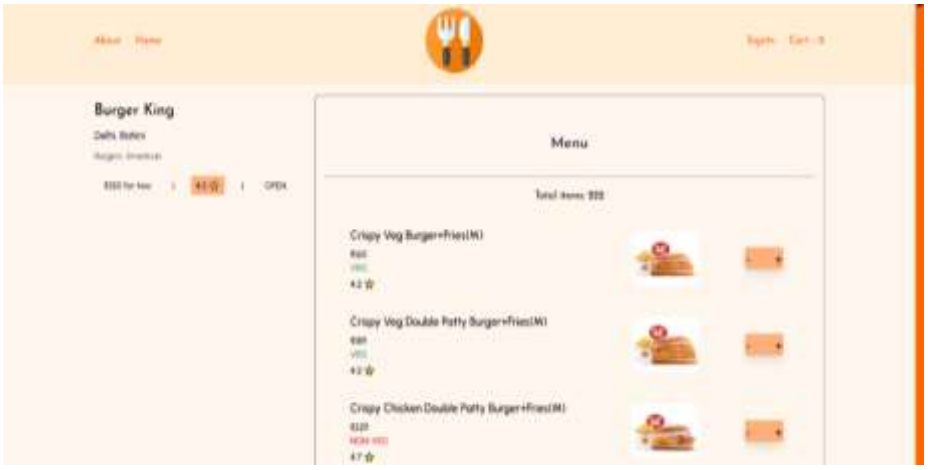

Fig 3: UI Snapshot 3

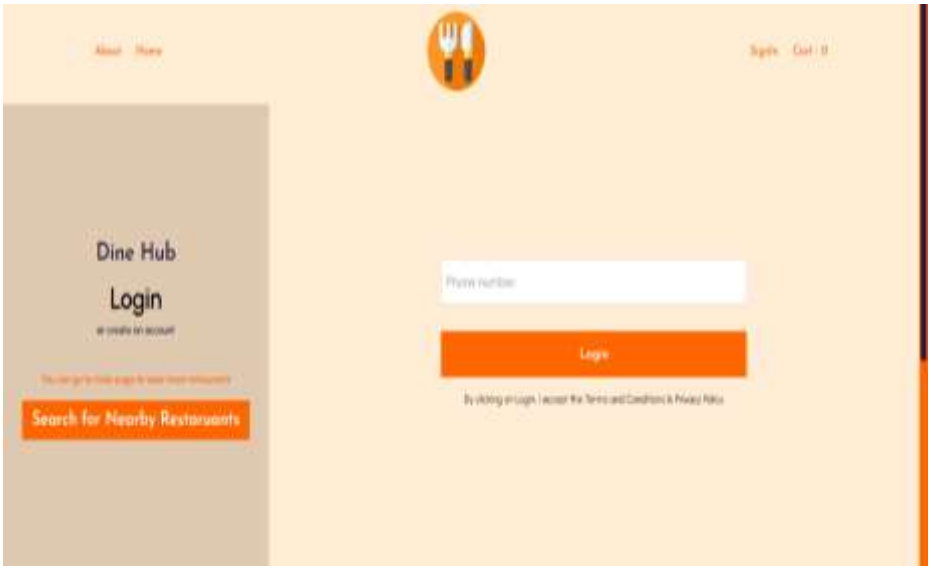

Fig 4: UI Snapshot 4

Fig 5: UI Snapshot 5

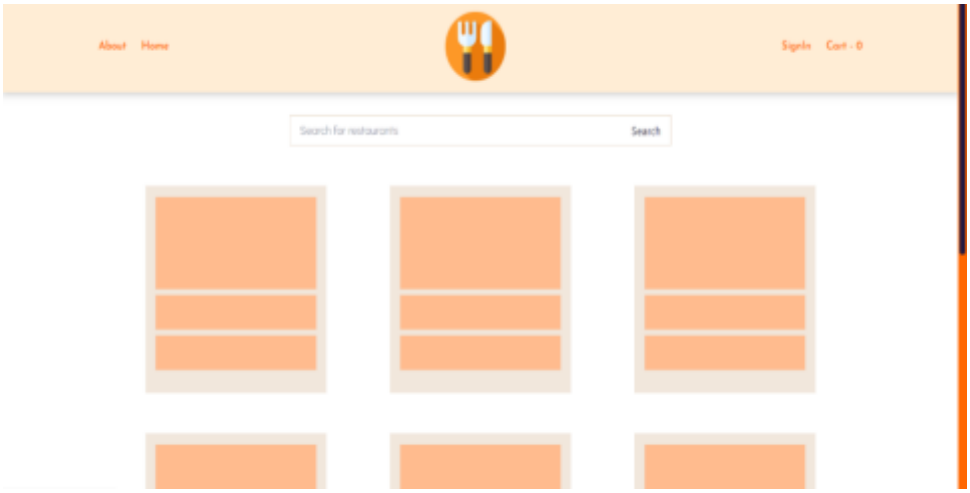

Fig 6: UI Snapshot 6

7. Conclusion

7.1 Summary

This paper presents the development of DineHub, a MERN stack-based restaurant application with an integrated AI chatbot and custom ingredient recipe search functionality. The application aims to enhance user experience in accessing food-related information and recipes.

7.2 Implications

The integration of a chatbot and custom ingredient search feature demonstrates the potential for improving user interaction and convenience in food-related web applications. The use of advanced technologies such as AI and NLP can significantly enhance user engagement and satisfaction.

7.3 Final Thoughts

The project showcases the effectiveness of the MERN stack in developing interactive and responsive web applications. The inclusion of advanced features such as chatbots can significantly enhance user engagement and satisfaction. DineHub provides a practical and innovative solution for both users and restaurant owners, demonstrating the potential for future advancements in the field of restaurant applications.

References

1. Charlene Li, Miranda Mirosa, Phil Bremer[1]. (2020). Review of Online Food Delivery Platforms and their Impacts on Sustainability. https://www.mdpi.com/2071-1050/12/14/5528

2. Lau Teck Chai and David Ng Ching Yat [2]. (2020). Online Food Delivery Services: Making Food Delivery the New Normal, Volume 1, Issue 1, 2020. https://link-fy.onrender.com/zCM0dHM40

3. Diana Gavilan, Adela Balderas-Cejudo, Susana Fernández-Lores, Gema Martinez-Navarro

[3]. (2021). Innovation in online food delivery: Learnings from COVID-19, Volume 24, 2021, 100330. https://www.sciencedirect.com/science/article/pii/S1878450X21000299

4. Amit Shankar, Charles Jebarajakirthy, Preeti Nayal, Haroon Iqbal Maseeh, Aman Kumar, Achchuthan Sivapalan [4]. (2022). Online food delivery: A systematic synthesis of literature and a framework development, Volume 104, 2022, 103240.

https://www.sciencedirect.com/science/article/abs/pii/S0278431922001025

5. Vincent Cheow Sern, Goh, See-Kwong, & Rezaei, Sajad [5]. (2020). Consumer experiences, attitude and behavioral intention toward online food delivery (OFD) services, Volume 35, March 2017, Pages 150-162.

https://www.sciencedirect.com/science/article/abs/pii/S096969891630285