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TravelZen AI- A Preference Based Travel Planning System Using Gen AI

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Abstract— Planning a trip usually takes a lot of manual work, such as researching places to visit, managing money, organizing the schedule, and keeping track of travel records.

Existing travel platforms offer separate solutions with little customization and automation. To tackle these problems, this paper introduces TravelZen AI, a web application that uses Generative AI to automatically create travel itineraries based on user preferences. The system uses the Google Gemini API to generate structured, day-by-day itineraries based on inputs like where to go, how long the trip is, how much money is available, and the user's interests. In addition to creating itineraries, the application also includes a system to manage preferences, a journal for travel notes, a gallery for photos, and a budget tracker, all in one unified platform. Built using React.js, Node.js, Express.js, and MongoDB, TravelZen AI offers a scalable, personalized, and user-focused travel planning experience.

Index Terms— Generative AI, Artificial Intelligence, Travel Planning Application, Personalized Recommendations, Preference Management, Web Application, Travel Journal, Memory Management, Open API

I. INTRODUCTION

Planning a trip involves making several decisions, such as choosing a destination, setting a budget, arranging the schedule, and keeping records of travel experiences.

Traditional methods of planning require users to check multiple platforms for suggestions, information about hotels, budget tools, and travel records. This scattered process often takes more time and effort, and it limits the ability to manage all travel-related tasks from one place. Moreover, most current travel apps give fixed recommendations that don't change as user preferences or real-time inputs shift. With the development of Generative Artificial Intelligence (GenAI), it's now possible to automate complex planning tasks by generating structured and context-aware information.

GenAI models can understand what users are looking for and create useful outputs like travel itineraries, schedules, and personalized recommendations. These capabilities make GenAI suitable for creating intelligent travel planning systems that can offer customized suggestions based on user constraints such as interests, budget, and trip length.

This paper presents TravelZen AI, a web application powered by Generative AI designed to automate the creation of itineraries and bring all travel functions into one place.

The system uses the Google Gemini Generative AI API to generate day-by-day itineraries based on user inputs like the destination, number of travel days, budget, and personal interests. In addition to itinerary generation, TravelZen AI offers tools to manage preferences, a journal for recording travel experiences, a memory management system for photo uploads, and a budget planner for expense tracking. By combining GenAI with a modern full-stack web architecture and external APIs, TravelZen AI aims to reduce manual planning efforts and provide a smooth, intelligent, and user-focused travel planning experience.

II. METHODOLOGY

The methodology of TravelZen AI is centred around automating the creation of travel itineraries using Generative AI while making sure the system is personalized, ensures data is kept, and offers a smooth user experience.

The process follows a structured workflow that starts with user input and ends with the creation, storage, and management of customized travel plans.

First, users register and log in securely.

After logging in, they provide trip details like the destination, dates, budget, and personal preferences, including travel type, group size, accommodation choices, and activity interests. These inputs are checked at the backend to make sure the data is consistent and securely stored in the database for further use.

The validated user inputs are then converted into a structured prompt and sent to the Google Gemini Generative AI API.

The AI model processes the information and creates a structured, day-by-day travel itinerary in JSON format. This response includes suggested activities, scheduling details, and travel recommendations that fit the user's preferences and limits.

The backend service checks and validates the AI-generated output before saving the itinerary in the database.

Users can view, review, and manage their itineraries at any time through the app's dashboard. In addition to generating itineraries, supplementary modules like a travel journal for notes, a memory management system for photo uploads, and

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a budget tracker are included and linked to individual trips. This integrated system ensures that all travel-related data is handled in one place, giving users a complete and intelligent travel planning experience.

III. MODELING AND ANALYSIS

The modeling and analysis of TravelZen AI were structured to improve the clarity, reliability, and practical use of AI-driven travel planning.

A. Understanding the Problem Statement

Travel planning often involves repetitive manual tasks, such as comparing destinations, managing budgets, and aligning plans with personal preferences.

These tasks are time-consuming and may lead to mistakes, making it hard for travellers to efficiently design customized itineraries. Present solutions usually offer fixed suggestions or require manual involvement, which limits how well they scale and personalize. TravelZen AI tackles these issues by offering a dynamic, AI-assisted system that can generate personalized travel plans based on user preferences, budget, and interests.

B. System Architecture

TravelZen AI employs a modular, three-tier architecture consisting of a frontend layer, backend layer, and database layer, integrated seamlessly with Generative AI services.

- Frontend Layer: Developed using React.js, the frontend provides an interactive and responsive user interface. Key modules include user authentication, trip input, preference management, itinerary viewing, journal entries, memory uploads, budget tracking, and profile management. Axios is used to communicate with backend APIs, ensuring real-time data flow and updates.
- Backend Layer: Implemented with Node.js and Express.js, the backend serves as the core logic component. It manages user authentication using JWT, processes trip data, preferences, journals, memories, and budgets, and integrates with the Google Gemini API for generating personalized itineraries. The backend enforces secure communication, validates data, and ensures reliable handling of all requests and responses.
- Database Layer: MongoDB is employed to store user profiles, generated itineraries, journals, memories, budgets, and preferences. Mongoose facilitates schema-based data modelling, maintaining structured and consistent storage of information.

C. System Design Diagrams

To comprehensively visualize the operational flow of TravelZen AI, a series of workflow diagrams have been created, each representing a distinct phase or module within the system. These diagrams collectively illustrate the user journey, backend processes, and integration points with external services such as the Google Gemini API.

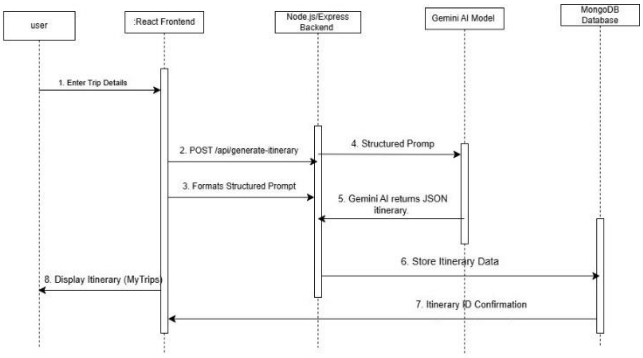

Fig.1: Sequence Diagram – AI Itinerary Generation flow.

This diagram provides a high-level overview of the interactions between the user and the TravelZen AI system. It identifies key actors, such as travelers and administrators, and outlines the core use cases including trip planning, itinerary generation, journal management, memory uploads, and budget tracking. The diagram serves as a foundational model for understanding system functionality and user-system engagement.

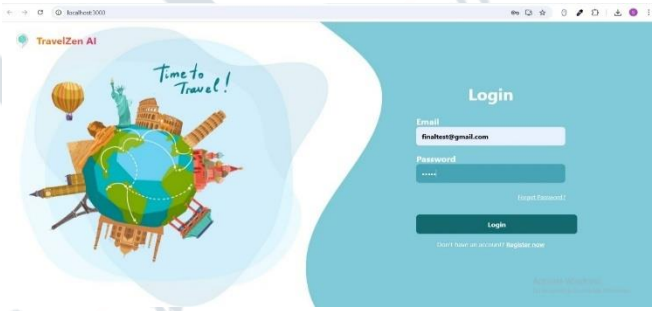

Fig. 2: User registration & authentication.

Fig. 3: Trip details & User Preference.

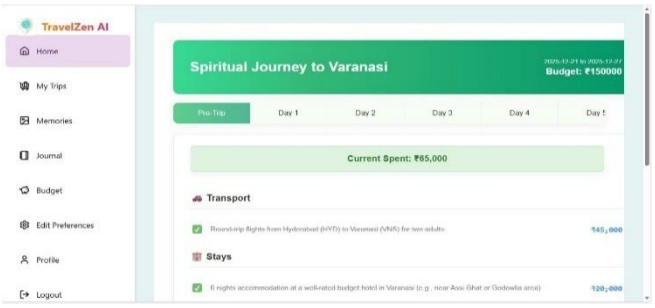

Fig. 4: Itinerary Generation.

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The generated itinerary.

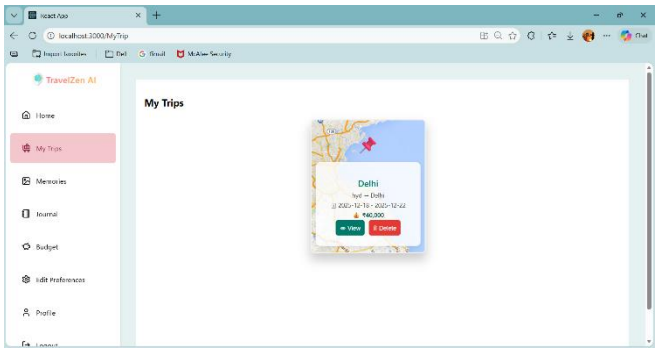


Fig. 5: My Trips of the User.

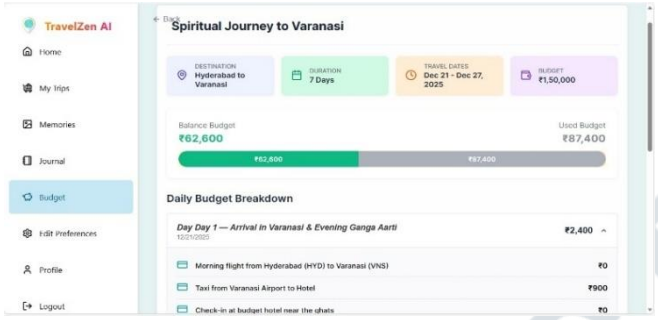


Fig. 6: Budget Analysis of the Trip.

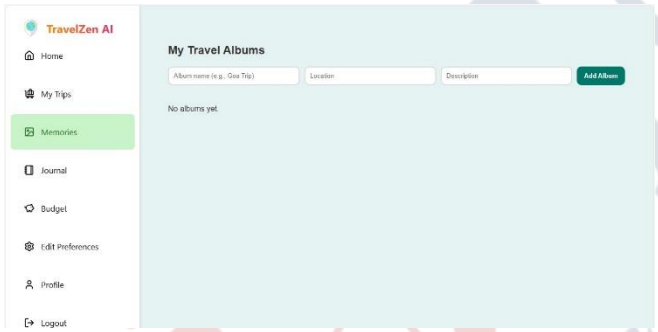


Fig. 7: Memories can be stored.

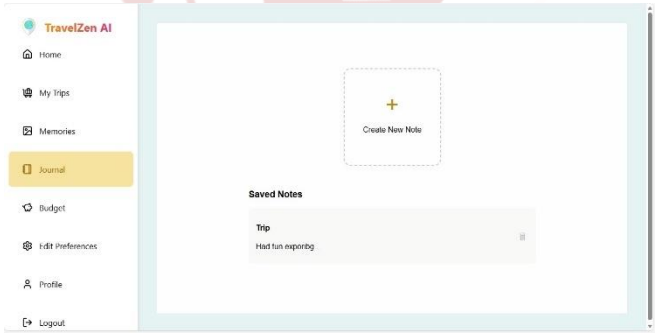


Fig. 8: journal.

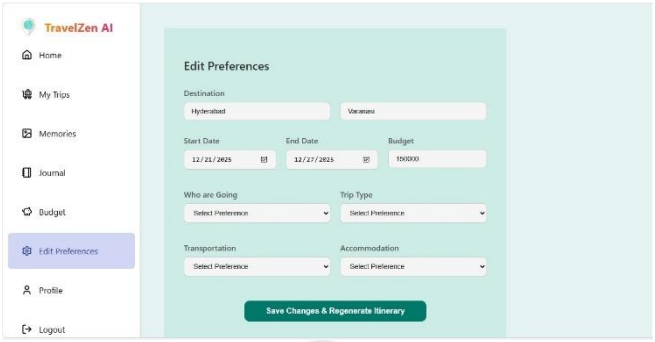


Fig. 9: Edit preferences

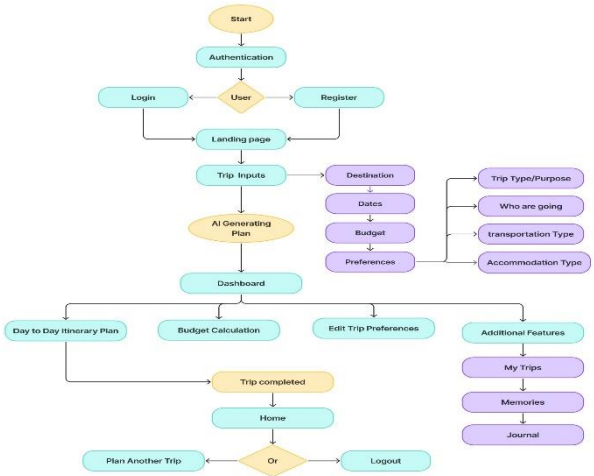
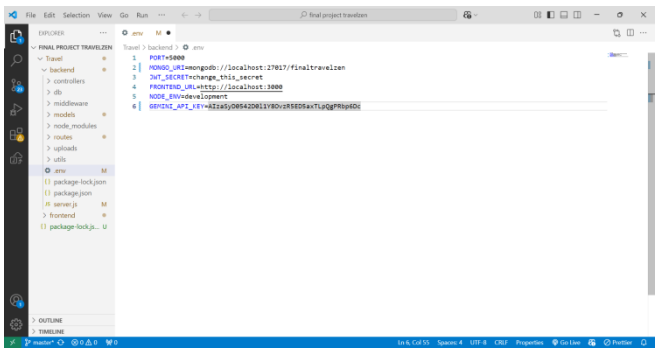


Fig. 10: Flowchart

D. Integration with Generative AI

The Google Gemini Generative AI service acts as an intelligent component that generates personalized itineraries based on structured prompts derived from user inputs. This enables TravelZen AI to dynamically recommend destinations, activities, and budgets tailored to individual preferences, enhancing usability and satisfaction.



E. Benefits and Analysis

This architecture ensures a scalable, reliable, and user-centric system capable of automating the travel planning process. By combining structured backend logic with AI-driven recommendations, TravelZen AI reduces manual

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effort, improves planning accuracy, and offers a personalized experience, demonstrating strong real-world applicability.

IV. RESULTS

TravelZen AI was successfully implemented and tested with a variety of user inputs and travel scenarios. The system demonstrated the ability to generate personalized, day-wise itineraries based on user-defined constraints such as budget, interests, and travel duration. The integration with the Google Gemini API proved effective in producing structured and context-aware travel plans. Key functional outcomes include:

- Dynamic Itinerary Generation: The system generated clear and logical itineraries, which updated immediately when users changed their preferences.
- **Preference Management:** Users could edit and update travel preferences, with changes reflected immediately in subsequent recommendations.
- **Travel Journal and Memory Module:** Functionality for storing notes and photographs was successfully implemented, enabling users to document and revisit travel experiences.
- **Budget Tracking:** The budget planner module allowed users to monitor expenses and receive AI-suggested adjustments to stay within financial limits.
- User Experience: The React.js frontend provided an intuitive and responsive interface, while the Node.js backend ensured reliable and secure data handling.

V. FUTURE SCOPE

To further enhance the functionality, accessibility, and intelligence of TravelZen AI, the following expansions are proposed:

- Voice Assistant Integration: Implementing a voice-enabled interface that allows users to interact with the system using natural language commands. This would enable hands-free trip planning, itinerary updates, and travel inquiries, making the platform more accessible and user-friendly, especially while on the go.
- Augmented Reality (AR) Previews: Developing AR-based visualizations that allow users to explore destinations, hotels, and attractions virtually through their smartphone cameras. This feature would offer immersive previews and real-time informational overlays, enriching the pre-trip planning experience.
- Multi-language Support: Extending language options to include widely spoken languages such as Spanish, French, Mandarin, and Hindi. This will improve accessibility for global users and adapt recommendations to regional cultural contexts and local travel norms.
- Machine Learning–Based Personalization: Enhancing the system's recommendation engine by incorporating user feedback, past trip behaviour, and implicit preference learning. Over time, the AI will deliver increasingly tailored and context-aware travel suggestions.
- Direct Booking Integration: Partnering with travel service providers to enable seamless in-app booking for flights, hotels, and activities. This would streamline the user journey from planning to booking, creating a unified end-to-end travel management platform.

VI. CONCLUSION

TravelZen AI introduces an intelligent, AI-powered solution to streamline and personalize the travel planning process. By integrating the Google Gemini Generative AI API within a modern full-stack architecture, the system effectively automates itinerary generation while offering dynamic preference management, travel journaling, memory storage, and budget tracking—all within a unified platform. The system significantly reduces the manual effort and fragmentation associated with traditional travel planning, delivering tailored, day-wise itineraries that adapt in real-time to user inputs. Evaluations confirm that TravelZen AI enhances usability, increases planning efficiency, and provides a highly personalized experience, establishing it as a practical and user-centric tool for modern travellers. Through its modular design and scalable implementation, TravelZen AI exemplifies how artificial intelligence can transform routine planning tasks into intelligent, adaptive, and engaging user experiences.

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