



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 4, April 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 ijirset@gmail.com

 www.ijirset.com

Smart Travel Planner with a Ratings-based Recommendation System along with Navigation and Safety Features using Flutter

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ABSTRACT: This paper presents the design and implementation of an Intelligent Travel Planning Mobile Application along with a Rating-based Recommendation System along with Emergency Features. There are various existing systems providing necessary features for Finding, and planning the perfect trips. Even though the existing systems help users plan trips efficiently, they don't include every feature that supports the user to plan efficiently and explore new areas with flexibility, and safety features. Most of the systems just recommend plans but do not allow the user to create their custom plans. Some also lack the features of finding nearby services like Restaurants, Hotels, Vehicle Rentals, and other services. Traveling is not joyful when it is not safe, but there are existing systems that still don't have emergency features like ambulance access, SOS, Rescue, and On-Site Vehicle Services that are near the user. The user has to have a clear idea of what kind of area they are going to and also while traveling, they should know what is the current situation of those places. According to our research, Most travel applications do not even think to include this in their application. Each system lacks any of these features which is a limitation for the Smart Travel Planning systems. The proposed application integrates verified trip plans from travel agencies with user-generated trip plans, providing a comprehensive platform for planning and navigating trips. Additionally, the application incorporates features such as location-based services, safety alerts, and interactive 3D avatars to ensure user convenience and safety throughout their journey and make their journey more fun-oriented and exciting. The system leverages user ratings to recommend tourist spots, restaurants, hotels, service centers, and hospitals, enhancing the overall travel experience. We describe the architecture, functionality, and key features of the application, along with implementation details and user interaction scenarios. Experimental results demonstrate the effectiveness and usability of the proposed system in facilitating seamless and enjoyable travel experiences.

KEYWORDS: Flutter, Recommendation, Navigation, Location Based Services, Safety and Emergency Features.

I. INTRODUCTION

Traveling is a widespread trend that undertakes more than 1.18 billion international tourists not to mention the people who travel for businesses, education, Transport, and much more. Also, long personal rides with families for vacation and not to mention the trend among youngsters cruising in their bikes for a long distance exploring the unexplored. Creating and organizing a travel plan is a messy process and people often struggle with choosing a location, Restaurant to eat, Hotel to stay in while they are traveling, and much more as there are more sources on the internet to find a good spot. Most travel agencies travel planner websites or mobile applications provide their package, but can't be customized by the users. Travelers, apart from tourists like Business travelers, Education Travelers(Students), Cargo Transporters, Bike Riders, etc. cannot approach these agencies or use these mobile applications for travel plans. Travel planning apps that support customized travel plans lack emergency features. The

Smart Travel Planner Application comprises these features into a single application. The application allows the user to personalize their travel plans thereby letting them plan their whole trip from where they are going to where they are staying. Users can use services in Restaurants, Hotels, Hospitals, Service Centers, Vehicle Rentals, etc. based on the Recommendations generated based on user ratings. The user will also have the leverage of emergency activities like Rescue, Medical, SOS, hazard alert, and much more. Also, traveling has to be more fun-oriented, and to add more fun using the app, the app also integrates Augmented Reality where the user's chosen avatars will interact with the users like Taking a picture, Doing Emotes, narrating about the place, etc. Thus, integrating every feature to ensure organization, better navigation, safety, fun, and improved quality of the user travel experience. The main scope of the project is to cover all areas in the traveling business and provide safe, fun, non-messy, well-organized travel plans with the necessary features for a great travel experience.

II. RELATED WORK

The paper [1] is mostly similar as most of the ideas are already implemented. However, the system lacks features like restaurant and hotel selection and other service recommendations. Also, it does not implement safety features. The paper [2] discusses the idea of recommending Restaurants and trip planning based on user preference. [3] This paper's main objective is to optimize itinerary recommendations using Metaheuristic algorithms for optimization. [4] This research shows how to implement recommendations for points of interest using the Top K approach. [5] This paper is based on research on a memetic algorithm for a tour trip design plan. The paper [6] on Trip Tour focuses on implementing the recommendation system for itineraries based on previous POI visits. [7] This is a paper on Jessy – An Intelligent Travel Assistant made specifically for Sri Lanka for independent backpackers to book hotels, and restaurants and get other services It includes features like a chatbot, Virtual guide, etc. The paper [8] has conveyed a general proposal for a traveling guide mobile application. [9] This system implements an Adaptive Genetic Algorithm for Itinerary Planning.

III. PROPOSED SYSTEM

This particular section stargazes and develops procedures for the application to be built, tailed by methodologies that achieve every objective assigned. It delivers the objectives attained by the end of each phase in the progression. Here description of the analysis of the application and then of the designed models are obtained and then a sequence diagram, use case diagram, and also flow chart representing the whole system. This elucidates the implementation prototype scheme with code findings.

a. System Design:

The Smart Travel Planner consists of several components ensuring the users get every necessary feature for smooth and fun traveling. The whole system comprises Navigation, Data Storage, and the UI for better understanding. The project is developed using Flutter for the Front End and also to connect to the databases and to do CRUD operations to store, retrieve, modify, and manage the data in the Database. This system specifically uses Mongo Database for Storing and Managing the data. Navigation is important for a travel planner application and this system uses MapBox one of the best open-source Maps API service providers for navigation. The interactive Augmented Reality part of the app is made using the Unity Game Engine and embedded in the Flutter application. In summary UI, Navigation, Database, CRUD Manager, and Augmented Reality are the main components of the application.

b. Recommendation Methodology:

Unlike other systems, the Smart Travel Planner Application uses a User-rating-based recommendation system for recommending different services like Restaurants, Hotels, Vehicle Rentals, etc. It is done by a program that collects the rating data for each place and computes the given formula to get the average rating.

$$\text{Average Rating} = \frac{1 \times a + 2 \times b + 3 \times c + 4 \times d + 4 \times e}{a + b + c + d + e}$$

Where,

- a = Total User Count for 1-Star
- b = Total User Count for 2-Star
- c = Total User Count for 3-Star
- d = Total User Count for 4-Star

e = Total User Count for 5-Star

The flow diagram of the Recommendation System is given below

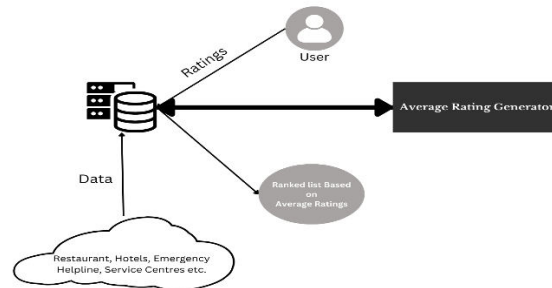


Fig: 1 Architecture of the Rating Model

For the Ranking algorithm, It provides the following result for each place in the database.

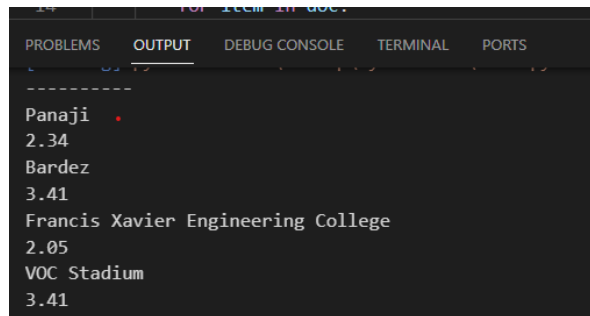


Fig: 2 Output of the Rating Model

C. Navigation and Location-Based Service Module:

The system is integrated with a navigation feature using MapBox API for setting up navigation between the user and the end spot which may be a Tourist Spot, Restaurant, Hotel, etc. Apart from basic navigation, MapBox API is used to Navigate to nearby places like Restaurants, Hotels, Hospitals, and much more. Along with MapBox, Flutter map is used to show the places that the user has selected for their journey. The system has its limitations with recommendations of places as it can't recommend restaurants, hotels, or others as they are fetched from MapBox API directly. The places from the databases can be provided as a ranked list based on user ratings for users to select places accordingly.

d. Safety and Emergency Features:

Smart Travel Planner is not only a Trip Planner but also a trip partner that guides the user and helps the user whenever needed. The main feature of this proposed system will be that the user has 24/7 emergency services for the rest of their trips if available. The user can make calls to emergency services with a single-click phone call that contacts services that are in that region based on user location. Also, the application provides alerts to the user about the place they are currently in to warn the user whether to approach a place cautiously, about no network regions, and Hazard Alerts like disasters.

IV. SYSTEM OVERVIEW

System architecture consists of five modules:

- A. Trip Planning
- B. Navigation
- C. Safety and Emergency
- D. Alerts
- E. Trip Handler

- F. Database
- G. Ratings Manager

A. Trip Planning:

The Trip Planning module consists of various sub-modules that work in sync to give the user to create or select a better itinerary list for their travel. It mostly works to add an itinerary to the plan, modify trips, or access a pre-built plan. These data are stored in a Database and can be accessed and modified by the planner.

B. Navigation and Location Services:

The Navigation and location-based services are handled by MapBox API and Flutter_Maps package. The MapBox API handles the navigation part while the Flutter_Maps packages handle showing places in the map tiles. The Location of the user is used for various purposes and is handled by the GeoLocator package.

C. Safety and Emergency:

The Safety Emergency module is the important module of this system. It makes it easy for the user to make a single-click call to the emergency service providers. This module uses the location services to help the user to access the services nearby. This has various supports like Medical, Cops, SOS, Mechanical Services etc.

D. Alerts:

The alert module is used to alert the user during their travel about the location they are currently in. It gives alerts like Hazards, No Network Zone, High Crime Zone, Most Under Rated Zone, etc. The location also collaborates with this module as the module creates alerts to the user based on the region they are currently in.

E. Trip Handler:

The Trip Handler module is the main part of this app which handles the travelling part. This is where the user knows where to go next, Navigate to that place, Rate that place, Get the Details of that place, Access to emergency Features, and Current location in a map view. It's designed to act as a travel guide

V. RESULT

At Smart Travel Planner System we evaluate not only the planning efficiency portion of the system but also the safety chances it can provide. Indeed the project revolves around the safety measure that helps the user during their travel.

The following figures show the output of this Smart Travel Planner with Safety Features and Rating System in a brief way.

1. User Authentication:

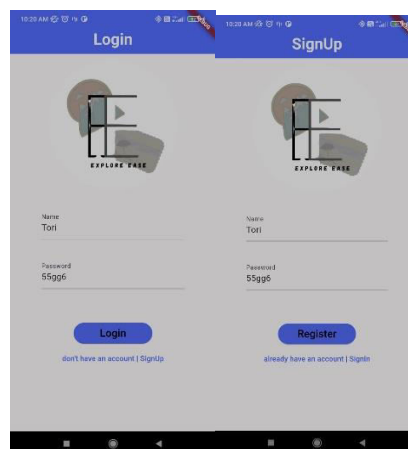


Fig 1. a

Fig 1. B

The above figures represent the user authentication module of this application. Each user can create their own unique identity and all their data can be accessed through only their identity and password.



2. Trip Planning:

The planning part includes the pre-built trips and the planning part of the user. But mostly the planning part.

2(a). Home:

The home page includes three portions as shown below to display the list for each categories like Fig 2.a shows the built-in, Fig 2.b shows the vendor provided, and Fig 2.c shows the user list of trips.

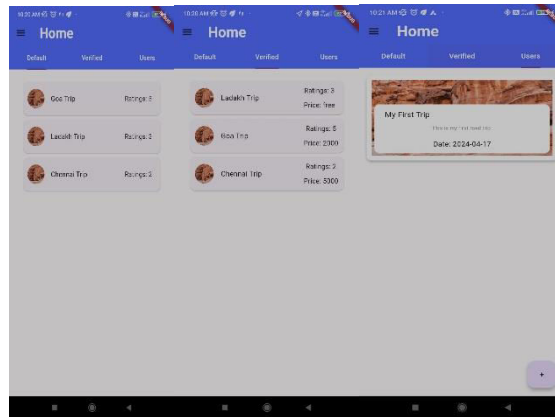


Fig 2. a

Fig2. b

Fig2. C

2(b).

Fig 2.f shows the list of regions the user is going to travel to. This page is the same for all three cases. Fig 2.d is mostly applicable for user cases only as they are empty at first and trips can be added using this page and can be viewed in Fig 2.c. Users can add regions they are going to visit using Fig 2.f which can be viewed in Fig 2.g. The spots for each regions can be added on the go using Fig 2.h and can be viewed in Trip Handler.

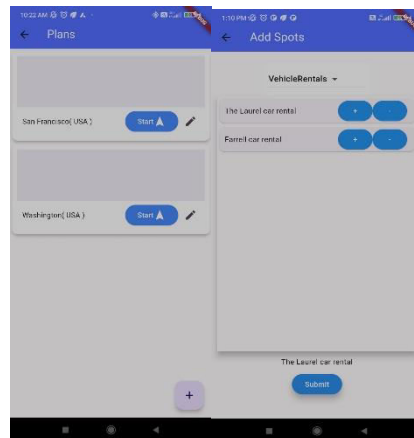


Fig 2.g

Fig 2.e

3. Trip Handler:

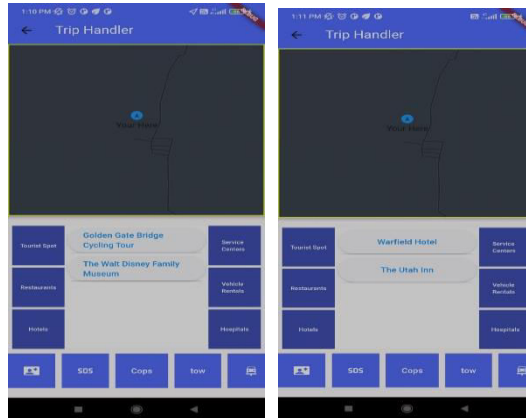


Fig 3.a

Fig 3.b

The above images show the trip Handler of the application. This page is mostly designed to make things handy so that the user can know where he is exactly at that time, can view places he chose to visit, can make a single click call to the emergency services and also other stuff.

4. Navigation:

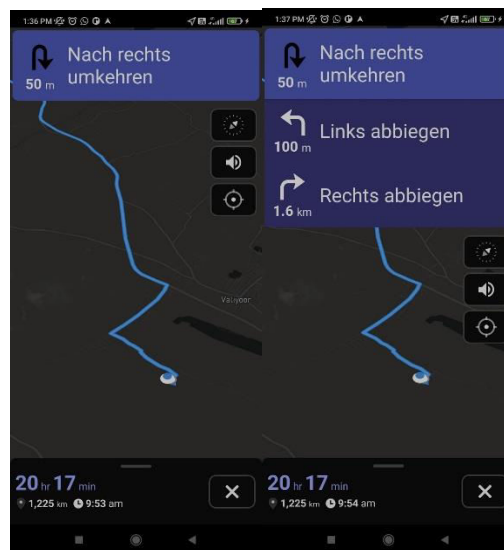


Fig 4.a

Fig 4.b

These modules display the navigation part of the application. The application has a navigation module implemented using the MapBox API. The module displays the route and updates during movement and also provides voice instructions for the destination. The user can select the place from Fig 3.a, Fig 3.b to set navigation to that place.

Apart from this there are Back ground Services which keeps track of permission and check necessary services enabled in the users phone to provide accurate location based services.

5. Place Description:

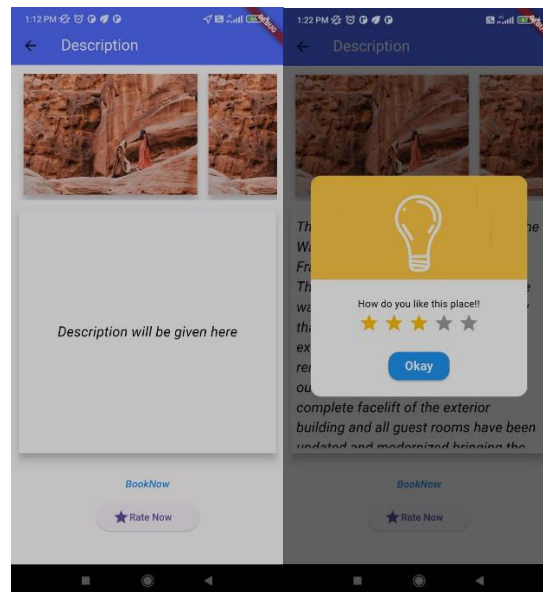


Fig 5.a

Fig 5.b

The above images shows description part of the application when it deals with the bookings, Ratings, Images of those places, Details about those places. These Ratings module update the ratings details in the database and from those data the an average rating will be set to that particular place.

6. Alerts and Emergency Services:

VI. CONCLUSION

The Smart Travel Planner Application is an evolution of the current Travel Planner System. It helps the user not only to plan their whole journey themselves but share their experience with other users through a rating based recommendation system. For users who just want a package the application provides its own pre-built travel plans and also from different Travel Agencies which are even customizable by the user. At its core, the Smart Travel Planner provides a flexible platform for the user to create or use a trip plan, It mainly focuses on making the trip more secure and safe by using its safety and Alert modules. These features help the user to know where they are what kind of place they are in and how to secure themselves from harm. The system provides a necessary feature for the user to contact the emergency services whenever needed and only those are near them for fast access. This system provides a wide range of applications in the travel department as it could be useful for not only Family Trips, Solo Trips, and Personal Trips but also Cargo Transportation, Educational trips, Business Travel, Emergency, SOS, and much more. Future applications could include adding data about various places around the globe, Implementing upgraded safety features, adding data security, AI implementation to commute with, Voice command feature to automate most processes, Integrating AI and AR to make the application more interactable and sharing their trip plans across global users. As per recent activities in several countries, This security model implementation in traveling applications could help people move securely without worries. The effective implication of this can help the user to travel among different places around the globe to explore various places without any worry and also knowing what coming next can make them secure themselves from harm during traveling and have a most fun-oriented, joyful trip.

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