

CSD416 Project Phase II Project Evaluation

TOUR ROUTE OPTIMISER USING TSP HEURISTIC ALGORITHMIC APPROACH

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Abstract

- Tourism significantly impacts the global economy. Efficient itinerary planning is crucial for travel experiences.
- This project focuses on using the Traveling Salesman Problem (TSP) in tourism which aims to find the best route for tourists and minimizing time.
- Objective: Develop software to optimize tourist itineraries by solving the TSP.
- Data collection includes tourist attractions and distances.

Domain of Project & Topic

Domain:

Travel And Tourism Trip Planning Application Using TSP

Project Topic:

Tour Route Optimizer Using TSP Heuristic Algorithmic Approach

Relevance of the Topic

- **Convenience:** Users can plan their entire trip in one place, from finding attractions to booking accommodation.
- **Information access:** The system provides a central hub for all tourism related information, making it easy for users to find what they need.
- **Business promotion:** Entrepreneurs can reach a wider audience of potential customers through the system.

Introduction

- Tourism Planner is an innovative and user-friendly platform designed to simplify and enhance the travel planning experience.
- Seamlessly integrating cutting-edge technology, it offers a dual-sided interface catering to both administrators and users.
- Administrators play a pivotal role by providing and updating essential travel data, while users leverage the system to access, customize, and visualize information through an interactive map.
- This dynamic platform empowers users to plan their journeys efficiently.

Proposed Project

- The project redefines travel planning by addressing challenges through the Traveling Salesman Problem (TSP).
- TSP is an NP-hard problem that finds the shortest route among given points.
- The software integrates data on attractions and distances using the TSP algorithm.
- Users can customize adventures, prioritize attractions and manage time constraints.
- The innovation transforms travel by offering optimized itineraries to explore the world efficiently.

The Project

Problem Statement:

To develop a software using the Traveling Salesman Problem (TSP) to assist tourists in creating optimal travel routes. This software aims to improve the efficiency of exploring tourist attractions.

The Project

Proposed Solution:

- TSP Application
- Project Focus
- Combinatorial Optimization
- Data Collection and Curation
- User Flexibility
- Software Benefits

Literature Review

IntechOpen, Travelling Salesman Problem:

- The Traveling Salesman Problem (TSP) applies mathematical techniques to solve real-world scenarios involving optimal routes for visiting multiple cities, reflecting everyday situations where ordering affects total cost.
- Its practical applications in diverse fields emphasize the significance of TSP research, demonstrating its relevance and impact on optimizing costs in various everyday situations.

Literature Review

On solving TSP by genetic algorithms:

- Introduced a genetic algorithm for the Traveling Salesman Problem, initially generating strong but not optimal solutions for problems with a specific city count, later enhanced for improved performance.
- Through experimentation, showcased the algorithm's capability to solve medium-sized problems efficiently, achieving optimal solutions within acceptable time limits for smaller city counts while providing an approximate solution for larger problems.

Literature Review

An expert system for tourists using Google Maps API:

- **eTourism Significance and Software Development:** The passage emphasizes the importance of highlighting tourist destinations in eTourism and the growing need for swift software development to meet customer demands in this field.
- **Google Maps API and Expert Tourist System:** It introduces the utilization of Google Maps API, driven by AJAX, for map-based services.

Project Design

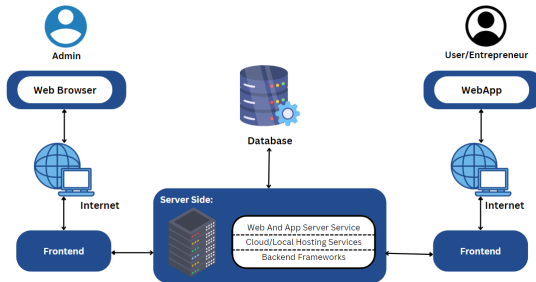


Figure: Web Application Architecture: General

Project Design

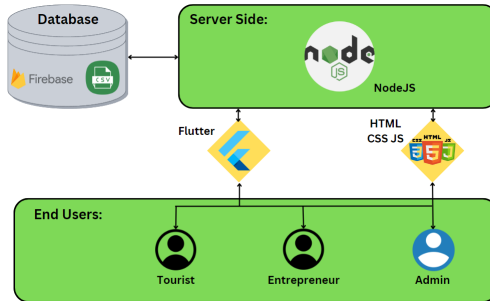
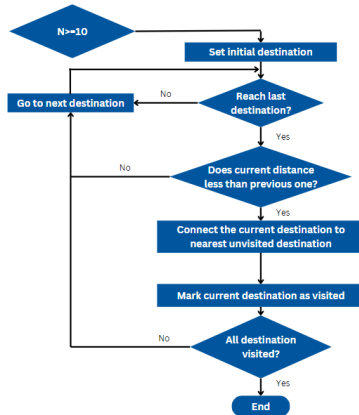
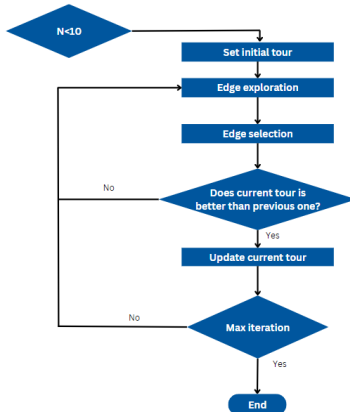


Figure: Web Application Architecture: Precise to project

Algorithm Flow



Algorithm Flow



Nearest Neighbor - Approximation

Main Algorithm (nearestneighbor):

Start with an initial city (can be chosen randomly).

Create an empty path.

Mark the initial city as visited.

While there are unvisited cities:

Find the nearest unvisited city from the current city.

Add this city to the path.

Mark this city as visited.

Update the current city to the newly visited city.

Add the starting city to the end of the path to complete the cycle.

Return the generated path.

Main Function (main):

Initialize coordinates and paths.

Print the given coordinates.

Apply Nearest Neighbor algorithm to find the path.

Nearest Neighbor - Approximation

Calculate the total distance of the generated path.

Print the generated path and its total distance.

Plot the generated path.

Execute the Main Function:

Run the main() function to start the process.

Lin-Kernighan Heuristic - Optimization

Main Algorithm (linkernighan):

Start with an initial path, which can be generated randomly or by any other means.

Begin the loop for optimization:

Initialize a flag improved as True.

While improved is True:

Set improved to False.

Iterate through the path:

Consider all possible swaps of subsequences in the path and check if the resulting path is better than the current path.

If an improvement is found, update the path and set improved to True.

Repeat until no more improvements can be made.

Return the optimized shortest path.

Lin-Kernighan Heuristic - Optimization

Main Function (main):

Initialize coordinates and paths.

Print the given coordinates.

Generate an initial random path.

Calculate the initial total distance of the path.

Apply Lin-Kernighan algorithm to find the shortest path.

Calculate the shortest total distance of the optimized path.

Print the shortest path and its total distance.

Plot the optimized shortest path.

Execute the Main Function:

Run the main() function to start the process.

Data Flow Diagram

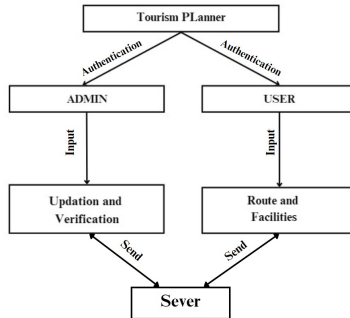


Figure: Data Flow Diagram Level 0

Data Flow Diagram

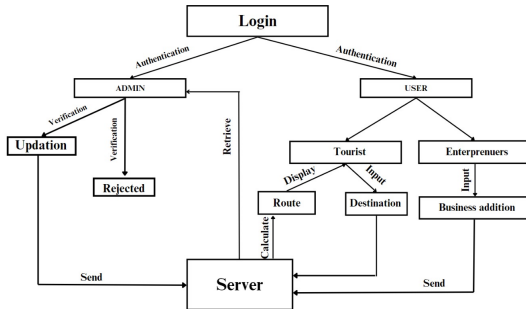


Figure: Data Flow Diagram Level 1

Data Flow Diagram

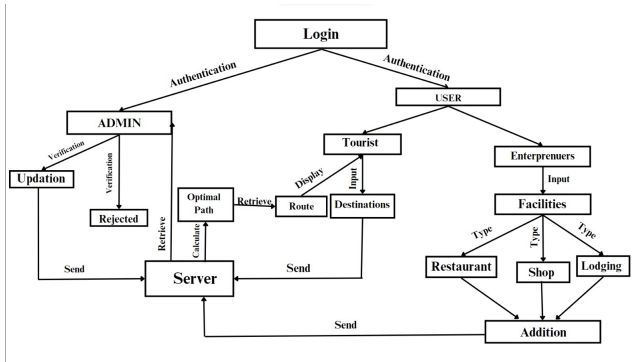


Figure: Data Flow Diagram Level 2

ER Diagram

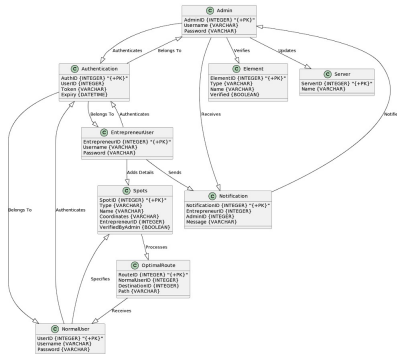


Figure: ER Diagram

Hardware Specifications

- Smartphone(with android 8 or more)
- Laptop(processor i5 or greater)
- RAM 8gb or more
- Hard-disk 160gb or above

Software Specifications

- Development tools such as Visual Studio Code (VSCode) for coding and project management.
- Fronted framework - Flutter, HTML, CSS, JavaScript
- Backend development framework used for web and application development - NodeJS and Hive
- Database Management System used for data storing and retrieval Firebase and CSV
- Web hosting platform provided through the GitHub Student Pack or from College server.

Work Schedule

- **October to December (2023):** Get Familiarized with Google Maps API features. Analyzing various approximation and optimization algorithms related to tsp. Review and understand the best algorithm for implementation. Begin designing the project, including conceptualization and initial UI/UX planning.

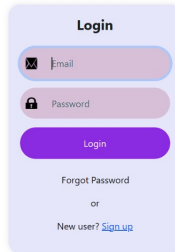
Work Schedule

- **January to April (2024):** Get Familiarized with HTML, CSS, JavaScript, Flutter and NodeJs. In-depth learning of Python. Commence the project development phase. Work on user interface development and Implementation of data structure and algorithm visualization. Address any technical challenges that arise during development. Then we enter the debugging and testing phase.

Development Progress

- Installation of Node Modules
- Front-End Development
- Back-End Development
- Apis
- Testing
- Hosting on Cloud Server
- App Development

Login page



A login form UI mockup with a light purple background. It features a title 'Login' at the top. Below the title are two input fields: the first is labeled 'Email' with an envelope icon, and the second is labeled 'Password' with a lock icon. Below these fields is a purple 'Login' button. Under the button is a link 'Forgot Password'. Below that is the word 'or'. At the bottom is a link 'New user? [Sign up](#)'.

Login

Email

Password

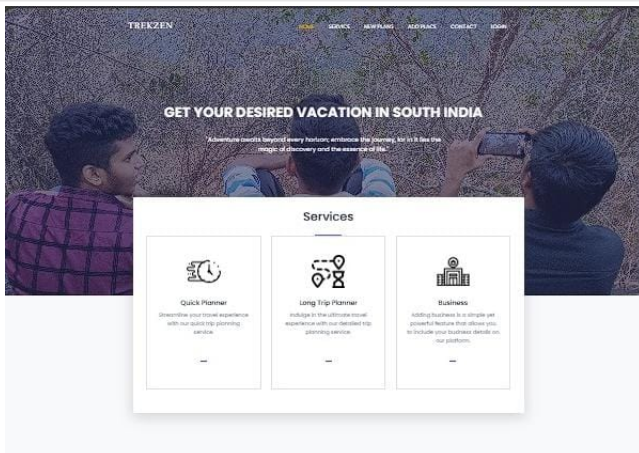
Login

[Forgot Password](#)

or

New user? [Sign up](#)

Homepage



Profile Page

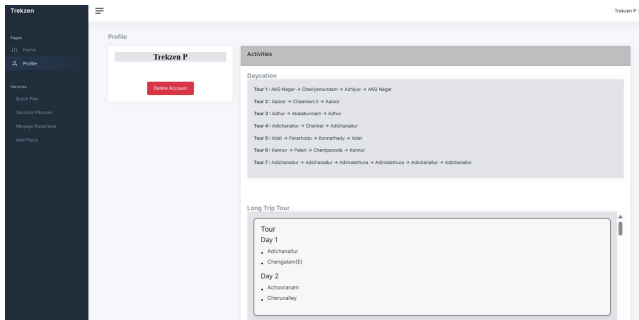


Figure: Profile Page

Quick Plan Page

Trekzen

Pages
Home
Profile

Services
Quick Plan
Vacation Planner
Manage Business
Add Place

Quick Plan

Place to visit

Starting location
Addthipparam Surya Temple

Select District:
All Districts

Categories
Place

Select Destination:
Kandam

[Add to Route](#)

Starting Location: Addthipparam Surya Temple

[Cancel](#) [Set as Starting Location](#)

☐ Nattakom [Delete](#)

☐ Vakkattam [Delete](#)

☐ Kandam [Delete](#)

[Show Tour](#)

[Start New Tour](#)

Map navigation controls: Zoom in, Zoom out, Full Screen, Location, Street View, Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

Navigation instructions:
Drive northeast on NH183 (Bennett Road)
Exit the roundabout onto NH183 (Bennett Road)
Turn right onto NH183 (Bennett Road)
Continue on NH183
Turn left onto NH183 (Bennett Road)
Keep right to take SR9
Turn left onto Kollam Puthappally Road

Figure: Quick Plan Page

Vacation Planner page

Figure: Vacation Planner page

Add Business page

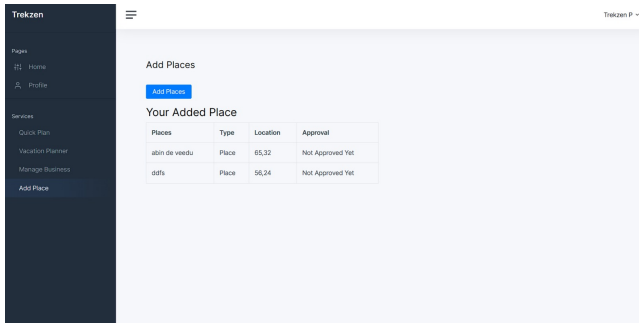
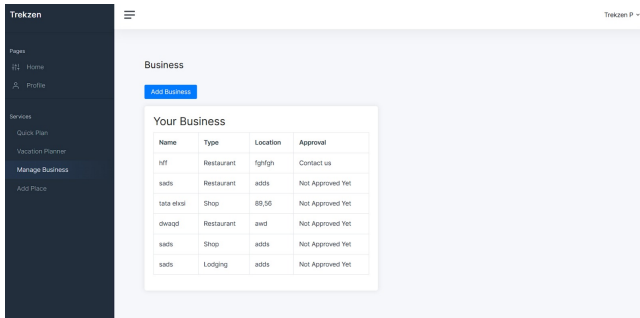


Figure: Add Business Page

Manage Business page



Trekzen

Pages

- Home
- Profile

Services

- Quick Plan
- Vacation Planner
- Manage Business**
- Add Place

Business

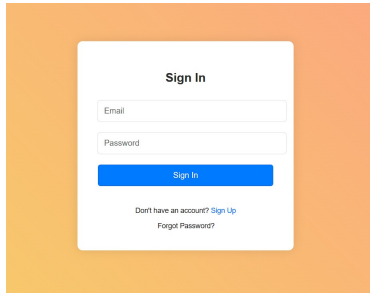
[Add Business](#)

Your Business

Name	Type	Location	Approval
hff	Restaurant	fhgh	Contact us
sads	Restaurant	adds	Not Approved Yet
tata eksd	Shop	88,56	Not Approved Yet
dwaqd	Restaurant	awd	Not Approved Yet
sads	Shop	adds	Not Approved Yet
sads	Lodging	adds	Not Approved Yet

Figure: Manage Business Page

Admin Login page



A mockup of an Admin Login page. It features a white rectangular form centered on an orange-to-yellow gradient background. The form has a title 'Sign In' at the top. Below the title are two input fields: 'Email' and 'Password'. A blue button labeled 'Sign In' is positioned below the password field. At the bottom of the form, there is a link 'Don't have an account? Sign Up' and a link 'Forgot Password?'. The entire form is set against a dark blue header bar at the top of the slide.

Figure: Admin Login page

Admin Main page

Business Requests				
Business Name	Location	Type	Approval	
Express Way	78,28	Shop	Not Approved Yet	Edit
Darko	98.67	Restaurant	Not Approved Yet	Edit
Qwailty	28,63	Shop	Not Approved Yet	Edit




New Places Requests			
Place Name	Location	Type	Approval

Figure: Admin Main page

Conclusion

The completion of the Tour Route Optimizer project marks a significant advancement in travel planning, harnessing TSP heuristic algorithms to provide users with an intuitive platform for vacation, business trip, and weekend getaway planning. Seamlessly integrating across both app and website interfaces, the system offers robust functionality. This successful implementation underscores the transformative potential of heuristic algorithms in enhancing tourism and travel route planning experiences.

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