EleNa: Elevation-based Navigation

Mani Prathi

Anushka Aravelli

Twinkle Reddy

Problem Statement

Objective: Build a route optimization software system focusing on elevation gain preferences for hikers and bikers.

Key Feature: Users input start and end locations; the system provides a route that maximizes or minimizes elevation gain within a specified distance constraint.

Motivation

Personalized Navigation: Tailor routes based on elevation and distance preferences.

Health and Fitness: Support users' fitness goals by customizing elevation gains.

Accessibility: Improve accessibility for individuals with mobility challenges.

Efficient Route Planning: Ensure routes meet preferences without compromising efficiency.

Exploration and Discovery: Encourage exploration of new paths.

Environmental Impact: Contribute to reduced energy consumption.

Technological Innovation: Advance navigation technology.

Algorithms

Dijkstra's Algorithm:

- Efficiently computes the shortest path between vertices in a graph.
- Serves as a fundamental baseline for route calculation.
- Known for its simplicity and reliability.
- Adaptable to incorporate additional criteria such as elevation

A Algorithm*:

- Enhances pathfinding by integrating a heuristic function.
- Prioritizes paths closer to the goal, improving efficiency.
- Specifically tailored to accommodate elevation preferences.
- Optimizes routes based on both distance and user-specified criteria.

Testing and Evaluation

Frontend Testing: Focus on UI component functionality.

Backend Testing: Verify map rendering, coordinate to address conversion, and algorithm performance for elevation preferences.

Performance Evaluation: Assess API response times across different setting like with different algorithms and elavations preferences.

Frontend Testing

Focus on vital UI components for consistency.

Testing will include:

- Heading component styling confirmation.
- Input field rendering and placeholders.
- Functionality of Reset and Search buttons.
- Check the display of the metrics in the output.
- Usability of UI features like radio buttons for preferences.

Backend Testing and Performance Evaluation

Backend Testing:

- Tests include Map Rendering and Coordinates to Address conversion verification.
- Integration tests validate A* and Dijkstra algorithms for generating paths with elevation preferences.

Performance Evaluation:

- Evaluation of API response time for optimal path coordinates, focusing on different algorithms and elevation settings.

Thank you