Recreational Vehicle (RV) Travel Data Analysis App

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Executive Summary

Our team created a web application that a RV Travel Data Analysis Web App that shows map visualizations of routes traveled by users of our sponsor's (Social Knowledge, LLC) mobile app *RV Trip Wizard*.

The application will intake historical route from RV Trip Wizard's users. The input data comprises of the routes RV-ers have traveled on. The application will then generate visualizations of the data in meaningful ways.

This includes, but is not limited to, the following:

- computing the most popular routes, and
- displaying a heatmap transition of visited campgrounds over a specific time period

This data could then be used to optimize the computed routes within *RV Trip Wizard.*

Background

Recreational Vehicles (RVs) are large motorhome vehicles that people use for road trips across the country. Generally, RVs are much larger and heavier than regular cars and cannot use typical GPS services such as Google Maps or Apple Maps because these services do not account for the dimensions and weight of a vehicle.

Our sponsor, Social Knowledge, has created a GPS-based RV trip planning service called RV Trip Wizard that considers the RV dimensions and allows users to get a safe and suitable route for their RV.

This project will visualize historical data from RV Trip Wizard to identify RV traffic trends that can help new and existing users plan their trips better and provide safety conditions for users. Our visualization insights could be used by the sponsor to optimize *RV Trip Wizard*'s computed routes.

Experimental Setup

The RV Travel Data Analysis App is a web application system built using React that will intake latitude and longitude data and creates map visualizations.

Table 1. Features on our WebApp

Map	Description
Intersection Map	This map shows the intersections of RV routes people traveled through
Animated Intersection Map	This map shows the intersections over time illustrating the changes of traffic trends throughout the year
Arc Map	This map shows an arc using source and destination points of routes

Experimental Test Plan

The system comprises of 3 layers: Front End, Back End, and Preprocessing Data. In the Preprocessing Data layer, raw data from the sponsor is "cleaned up", formatted, and inputted into a database. In the Back End layer, the web app inputs data from the database and computes route overlaps before storing the insights in the database. In Front End, certain insights are displayed visually on a map at the user's request through an interactive web UI. Figure 1 illustrates the architecture.

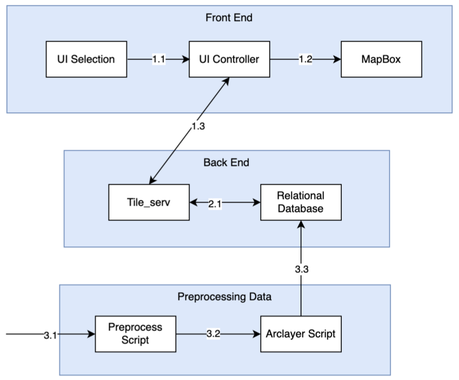

Figure 1: Diagram of Application's Designed Architectural Layers and Components

Table 2: Descriptions of Application's Designed Architectural Layer

Component	Description
UI Selection	Displays the dropdown menu that lists three different map displays for the user to choose from
UI Controller	Receives information from the UI Selection subsystem and sends that information to Tile server
MapBox	Displays data, received from UI Controller, on a map, to the user
Tile server	A RESTful-based tile server that uses UI queries to serve tiles stored in a PostgreSQL relational database
Relational Database	Stores data received from Populate DB Script and processes queries (e.g., requests for data or table modifications) using PostgreSQL
Preprocess Script	Processes sponsor's raw data, in hexadecimal, by converting it to JSON format and filter out all attributes except date, source, destination, distance (in meters), time (in seconds), elevation, and route (a list of longitude and latitude points)
Arclayer Script	Runs SQL commands and sets up the arc layer table that is inside the database

Experimental Results

Figure 2, 3, and 4 below are images that showcase our Web Application's Homepage, Intersections Map, and the Arc Layer Map.

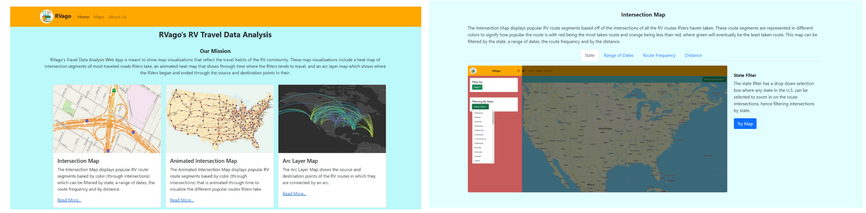

Figure 2: Screenshots of the Homepage

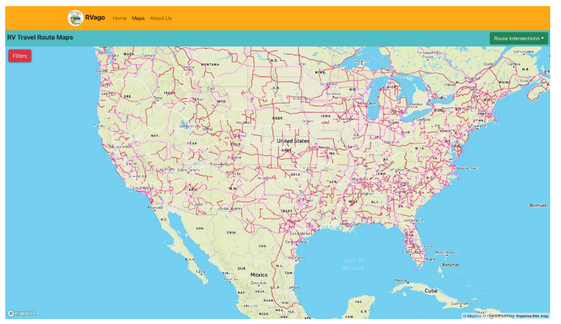

Figure 3: Screenshot of the Intersection Map

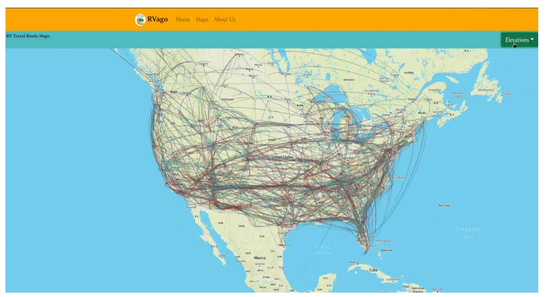

Figure 4: Screenshot of the Arc Layer Map

Conclusions

Our team's design fulfills the original requirements of our project's Sponsor as it displays visualizations of the provided data through the form of a heatmap. We have experimented with many types of map layers and have produced the best visualization methods, considering our Sponsor's requirements.