Intripid: Road Trip Optimizer

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1 INTRODUCTION

Intripid is a system that provides the user with the optimal road trip route, combining user interaction, data visualization, and a greedy algorithmic approach to optimize time, cost, and enjoyment.

(1) Provide a web service that optimizes personalized road trips for users, recommending points of interest, keeping within time limits, and minimizing gas cost.
(2) Individual research has been done on the topics of route optimization and tourist site recommendation. The limit of these approaches is that they lack scalability and personalized user interaction.
(3) Intripid utilizes the Google Maps and Yelp APIs for route optimization and tourist site recommendations, compiling all into one simplistic user interface.
(4) Intripid is useful for anyone planning a road trip.
(5) Intripid will reduce time spent trip planning, reduce gas costs, and provide the user with enjoyment. User studies measure the success of Intripid. People familiar with the area will give feedback on the efficiency and accuracy of routes.
(6) No risks are present. Payoffs include an easily monetizable product and technical skills gained.
(7) No costs exist.
(8) Intripid will be completed in three weeks.
(9) The midterm check for success is accurately planning a route that integrates API metadata. The final checks for success are customizing user profiles and creating a comprehensive user interface.

2 SURVEY

2.1 Trip Optimization

Bao et al. proposes a shortest path algorithm where optimal route minimizes total distance and maximizes the popularity score of attractions [3]. This article is useful since it highlights the effectiveness of the greedy strategy for selecting popular attractions. We will improve upon this approach by weighting attractions based on Yelp ratings and reviews.

2.2 Gas Mileage

Allstate Insurance has patented a server for vehicles that optimizes gas mileage by suggesting specific refuel locations along a given route while taking into account user preferences [7]. This server will be helpful to Intripid by highlighting crucial variables used. It can be improved upon by relying less on data and more on forecasting gas prices.

Eveland expands on Allstate's patent by generalizing the intermediate stops such as gas stations, restaurants, and hotels, while forecasting gas prices [4]. Intripid will implement a similar forecasting procedure, improving upon the generic intermediate stops by accommodating user-inputs.

Halbey focus on the use of electric vehicles for long distance trips and the absence of a recharging schedule optimizer [5]. The article shows that the network for long-distance electric vehicle travel is too limited to have a reliable model. Intripid has

the opportunity to develop a recharging schedule but will be cautious as most of the limitations are due to non-available resources.

2.3 Low-Cost Vacationing

Francken and van Raaij discuss the decision of vacation location and activities on overall satisfaction, finding that 68% of travel preferences align with Intripid's goals [9]. Furthermore, they found that people still want to travel in tough economic times, meaning there is a market for Intripid. A shortcoming is that this paper was published 30 years ago. Although the data may be dated, we will use its core ideas to improve Intripid.

Pan researched how people find information related to a vacation online [8]. This information is useful designing Intripid to determine what information should be made available for travelers. A shortcoming is that their research focuses solely on activities in a predetermined destination, whereas Intripid expands this to the entire US.

2.4 Site Recommendations

Cyberguide is a mobile tour guide that utilizes several emerging technologies [1]. This article is helpful providing potential useful features such as visual and verbal interfaces. The shortcomings are in its limited availability, basic UI, and inability to effectively store data.

Intrigue is a web application that recommends tourist sites based on their travel preferences [2]. The most helpful aspect of this article is its support of a numeric calculation for rating a tourist attraction. This service gives recommendations based upon one location, where we will give recommendations based upon all locations on a planned route.

Huan presents a way to calculate best attractions for a potential tourist based upon a user's travel history [6]. This article will make the attraction recommendation more robust by recording where travelers go on their trips. However, the user interface is outdated, which we will improve upon with a modern UI.

3 PROPOSED METHOD

Intripid is better than the state of the art since it recommends routes based on time, cost, and predicted enjoyment. No other routing software explicitly combines these categories into a single user interface for the entire US.

Intripid aggregates data from various sources and communicates to the end user to build an ideal road trip. The user inputs desired travel locations, their car make and model, and an upper bound for the total cost of gas for the trip. Intripid queries the Google Maps API, a gas price dataset, and a gas mileage dataset to calculate a possible trip for all locations the user entered. If no trip through all locations exists that meets the cost bounds, the user is warned, and an option to calculate another subset of locations is presented. Additionally, a user is able to enter preferences for campgrounds and other entertainment. The yelp API and a campground dataset are queried to find entertainment and campgrounds that fall within a distance threshold of the travel vector obtained from the Google Maps API.

Intripid's minimalistic UI provides users with an intuitive way to get quick results. A user begins by visiting the website and immediately sees everything they need for the rest of their time using Intripid. The UI has a primary map of the US on the left along with user-input data on the right. After the user inputs their preferences, Intripid calculates an ideal trip and display the route, along with stops, on the primary map on the left. This allows the user to visualize their trip and get the most relevant facts about it. Intripid also has two or three mini-maps located on the bottom of the screen that display other similar trips that the user may be interested in taking. Clicking a map expands it to the larger map, providing users with a simple way to start planning a road trip.

Intripid's main innovations are outlined below:

(1) No other trip optimizer combines the visualization of a trip with gas expenditure as a constraint.

(2) Intripid makes it incredibly easy to see alternate routes and information about a user's roadtrip.
(3) Rather than just providing suggestions for activities at each location, Intripid provides the user with relevant stops along the drive to each location.
(4) Unlike other routing algorithms, Intripid is efficient and scalable to the entire US.

4 PLAN OF ACTIVITIES

The old plan is as follows. Sarah worked on building the routing algorithm. She tested this on local routes, ensuring validity before expanding to the entire United States. This took three weeks. Nick created a basic web interface that became the interactive UI. This took Nick five weeks. Will collected all data and gathered API keys for Google Maps and Yelp. He worked with Sarah for four weeks to integrate appropriate requests into the routing algorithm.

The new plan improves upon the old plan. Sarah finished building the routing algorithm. She will ensure validity through case studies and experiments during the next three weeks. Nick built the web interface and interactive UI. He will spend the next three weeks modifying the UI based on experimental feedback, creating a user profile page, testing edge cases, and ensuring no bugs remain in the final code. Will integrated all data and API keys into the algorithm. He will work for two weeks on integrating gas prices based on location and vehicle type into the algorithm, allowing the user to see an accurate expected trip cost. The last week, he will finalize the user guide.

5 EXPERIMENTS AND EVALUATION

We will implement two experiments to assess algorithm validity and user interface. In the first experiment, users familiar with popular road trip areas will rate the accuracy of the algorithm output. These areas are California, the southeast, Texas, and New England. For each region, we will select a pre-defined route, and users will answer the following questions:

(1) Rate the potential enjoyment of this route, where 10 is extremely enjoyable.
(2) Is this route an efficient use of your time? Or would you rather see more/less sites?
(3) Are any notable tourist sites missing?
(4) Is cost a significant factor in planning a road trip? Would you rather take a shorter, but cheaper route?

These tests will occur the week of April 9th. The experiments will test the UI and will be ongoing throughout the duration of the project. Users will test the UI and answer the following questions:

(1) Please enter details of your trip.
(2) Which enter button do you want to click on first?
(3) Tell me about the route. Can you easily determine stops and sites?
(4) Drag and zoom in on the map to navigate the surrounding area.
(5) What is the cost of the trip? Is it clear what the cost refers to?
(6) Learn more about the sites by launching external websites. Which launch button is more intuitive? Are these websites useful?
(7) Is the secondary route suggestion helpful?

We predict that we will have to tune the parameters in the algorithm to ensure the specified proportions of time, cost, and enjoyment give the best routes. We will also determine if any features are unintuitive, such as specific button layout, links to external websites, or route selection features.

6 CONCLUSION

All team members contributed a similar amount of effort. Due to losing a group member, we removed the scenic routing feature to ensure Intripid would be completed on time. However, our approach still makes large improvements on common routing algorithms and tourist recommendation systems. Future work should incorporate scenic routing,

advanced recommendations based on complex user profiles, and hotel and airfare data.

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