

Review on Automatic and Customized Itinerary Planning Using Clustering Algorithm and Package Recommendation for Tourism Services

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Abstract – Itinerary planning is a strongly studied problem concerned with how to create the most optimum itinerary for a user taking into account their various preferences. There are number of constraints which are to be considered such as maximum monetary value user willing for paying, maximum duration to spend, and details about different POIs. Since the search space of all probable itineraries is too costly to fully explore to make straightforward the complexity most work assume that user's trip is incomplete to some significant POIs and will complete within a days. Therefore to overcome this problem, in this service, each POI is considered and ranked based on the user's preferences. Since the many users are planning for a trip with different requirements then their search complexity is increased. To overcome this limitation, the concept of grouping or clustering the users based on user's requirement similarity is proposed. To reduce the processing cost, a two-stage planning scheme is been proposed. These are preprocessing stage and online stage. This paper also proposes the work that concentrates on recommending an itinerary to a user given the user's travel preferences and constraints. Finally packages containing optimum tour path satisfying customer needs are generated efficiently.

Keywords– team orienteering problem, itinerary planning, clustering, recommendation

1. INTRODUCTION

Planning a trip can take a lot of time and effort. One needs to explore points of interest (POIs) that one wants to visit, where they want to stay, and how they want to travel. They may also have restrictions on how much time they can spend at a locations, and what their budget for the trip is. Among the available POIs, there can be certain categories of attractions that a user would not like, or perhaps they have non-mainstream interests. Even though the travel agency makes available efficient and expedient services for experienced travelers the itineraries provided by the travel agency lack customization and cannot fulfill individual provisions.

Therefore, to attract more customers, travel agency should permit the users to customize their itineraries. The itinerary planning service returns top-K trip plans satisfying the requirements. In this service, all POIs are considered and ranked based on the users' preference.

Present planning algorithms only consider a single day's trip, whereas in real cases; most users will schedule an n-day itinerary. The travel agents tend to favor the popular POIs. Suppose we have N available POIs and there are m POIs in each single day's itinerary averagely. It becomes expensive to evaluate benefit of each itinerary and choose optimal one. Also handling new emerging POIs was tricky in previous approaches.

To overcome such problems, here[1], a novel itinerary planning approach is proposed. The design philosophy of proposed approach is to generate itineraries that reduce the gap between the agents and travelers. Hence this approach can be summarized as follows.

Searching the optimal itinerary can be converted into the team orienteering problem (TOP), which is an NP-complete problem without polynomial approximations. Hence, a two stage scheme is applied. In the preprocessing stage, POIs are organized into an undirected graph, G also all candidate single-day itineraries are iterated using a parallel processing framework, MapReduce. In the online stage, design

an approximate algorithm is designed to generate the optimal itineraries. The approximate algorithm adopts the initialization-adjustment model.

Also here another method for efficient itinerary planning clustering algorithm such as FKM Clustering or nearest neighbor clustering is used. Clusters of Relevant user's and POIs are made.

This work also aims to explore using top-k package selection to select a set of POIs that will adhere to the user's preferences, time, and money constraints. There are three different stages to the itinerary recommendation process. The first stage is to train the algorithm by finding user preferences from previous trips that the user took. The second stage is the top k package recommendation where sets of POIs are selected to create a package. Finally, the third stage is to order the POIs logically, to create an itinerary.

At last, various packages are generated and recommended for different users depending on their various requirements.

2. RELATED WORK

Following are some pre-existing studies and approaches related for automatic itinerary planning, clustering, and package recommendation:

2.1 Grouping and Clustering

In [2], R.Rajeswari proposed the concept of grouping or clustering the users dependent on user's requirement similarity. The novel modified clustering is been used for grouping the user as per their requirement similarity. Here, the POIs that user wants to visit are gathered, after which the location information from the users, K-means clustering has been applied to group the nearest locations together. The membership values are cleared for clustering process and it's based on the users. It is used to reduce the search complexity as well as time complexity of the system.

2.2 Recommendation of Top-k Packages

SampoornaBiwas in [3] aims on recommending an itinerary to a user, depending on given user's travel preferences and constraints. This scheme mainly aims to explore using top-k package selection to select a set of POIs that will adhere to the user's preferences, time, and money constraints. The itinerary algorithm used here expects inputs as-maximum monetary value the user is willing to spend on tour, Maximum duration, details about various types of attractions and place user wants to visit. Three stages of itinerary recommendation process are also mentioned. Initially algorithm is trained by finding user preferences from history of user. Next top-k package recommendation is done where sets of POIs are selected to generate a package. Finally, in last stage POIs are ordered logically, to form an itinerary.

2.3 Recommendation Using Flickr

In [4], Steven Van Canneyt, propose a system that recommends tourist attractions based on the moment that the user visits a given city. They started from a large collection of georeferenced photos on Flickr, and use Mean Shift clustering to determine points of interest within a city. Then they estimated the probability that a random user would visit a given place within a given temporal context.

Here, the possibility of using temporal context factors to better predict is been explored which POIs might be of interest to a given user. The experimental results determine that significant improvements over this baseline system whose only criterion is the complete popularity of the place can be obtained.

2.4 Greedy Local Improvement and Weighted Set Packing Approximation [5]

Here presented an approximation algorithm for the weighted k-set packing problem that combines two paradigms by starting with a first greedy solution and then repeatedly choosing the best possible local improvement. Considering neighborhoods of sets of vertices in local improvement stage reduce the additional term in performance ratio.

2.5 MapReduce: Data Processing Tool

Dean J. [6] has described the details of Mapreduce. Mapreduce is a programming model for processing and generating large data sets. Users define a map function that processes a key /value pair to generate a set of intermediate key /value pairs and a reduce function that integrates all intermediate values associated with the same intermediate key. Mapreduce gives many significant advantages over parallel databases.

2.6 Metaheuristics for the Team Orienteering Problem[7]

The extension of the Orienteering Problem to the case of multiple tours is known as the Team Orienteering Problem (TOP). Here among the metaheuristics proposed for the solution of combinatorial optimization problems, tabu search has been shown to be best for vehicle routing problems.

Another goodmetaheuristic is the variable neighborhood search.

3. CONCLUSION

When planning a trip, tourists often want to avoid the headache and time cost of having to slow research and plan their trip. However, prepackaged itineraries often don't take their own travel preferences, time cost, and monetary budget into account. The service creates a customized multiday itinerary dependent on the multiple user's preference. As there need to search for the optimal solution, a two-stage scheme is used. In the preprocessing stage, iterate and index the candidate single-day itineraries by using mapreduce framework. After the preprocessing stage, the TOP is transformed into weighted set-packing problem, which has efficient approximate algorithms. In next stage, simulate the approximate algorithm for set-packing problem. The algorithm follows the initialization- adjustment model and can generate a result. By using the top-k package generation algorithm and package ordering, algorithms considering time and money constraints as well as travel preferences in generated itineraries.

4. REFERENCES

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