OrientSTS-Spatio Temporal Sequence Searching for Trip Planning

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ABSTRACT

For a satisfactory trip planning, the following features are desired: 1) automated suggestion of scenes or attractions; 2) personalized based on the interest and habits of travelers; 3) maximal coverage of sites of interest; and 4) minimal effort such as transporting time on the route. Automated scene suggestion requires collecting massive knowledge about scene sites and their characteristics, and personalized planning requires matching of a traveler profile with knowledge of scenes of interest. As a trip contains a sequence of stops at multiple scenes, the problem of trip planning becomes optimizing a temporal sequence where each stop is weighted. This article presents OrientSTS, a novel spatio-temporal sequence (STS) searching system for optimal personalized trip planning. OrientSTS provides a knowledge base of scenes with their tagged features and season characteristics. By combining personal profiles and scene features, OrientSTS generates a set of weighted scenes for each city for each user. OrientSTS can then retrieve the optimal sequence of scenes in terms of distance, weight, visiting time, and scene features. The authors develop alternative algorithms for searching optimal sequences, with consideration of the weight of each scene, the preference of users, and the travel time constraint. The experiments demonstrate the efficiency of the proposed algorithms based on real datasets from social networks.

KEYWORDS

Optimal, Personal Profiles, Personalized, Sequencescene Features, Social Networks, Spatio-Temporal, Trip Planning

1. INTRODUCTION

Efficient and personalized trip planning becomes increasingly important with fast increased pace of life. Ideally, personalized trip planning can help tourists to visit as many favorite scenes as possible, with minimal time and effort. In reality, it is difficult for efficient and personalized trip planning. Most tourists will simply follow others’ trajectories by word of mouth, commercial brochures, travel blogs, or touring books, thus it is difficult to figure out scenes of interests and best routes that connect the scenes before-hand. For example, a tourist plans to travel on a holiday, but does not have a specific destination in mind. In order to plan an efficient and pleasant trip, she scans the touring routes on the Web or seeks advices from travel agents. She then chooses a popular travel trajectory suggested by others, with little consideration of her own interests. Such planning can easily lead to following

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problems: i) waste of time on scenes not interested; ii) missed scenes of interest; iii) extra time due to random stopping at scenes and connection between scenes; and iv) unnecessary increased cost. For a satisfactory trip planning, the following features are desired: i) automated suggestion of scenes or attractions; ii) personalized based on a tourist’s interest and habits; iii) maximal coverage of sites of interest; and iv) minimal effort such as transporting time on the route.

To achieve these goals, in this paper, we present our work on a novel spatio-temporal sequence (STS) searching system OrientSTS to support optimal personalized trip planning. OrientSTS provides a knowledge base of scenes with their tagged features, and season characteristics represented by probabilistic combination of tags. Such information is provided through collective knowledge from social network websites. By combining personal profiles and scene features, OrientSTS generates a set of weighed scenes for each city for each user. OrientSTS can then retrieve the optimal sequence of scenes in terms of distance, weight, visiting time, and scene features. The goal is to provide the traveler with a STS that passes through as many chosen favorite scenes as possible with maximal weight and minimal distance within available travel time. As a result, a traveler can make efficient and personalized trip planning based on her own profile before she starts to travel.

To demonstrate our approach, we show a trip planning scenario in Figure 1. When a traveler arrives at a city, the system automatically presents scenes with weights according to scene features and a user’s profile. Here six scenes of interests with large weights are chosen: scenes \( o_1; o_2; o_3; o_4; o_5; o_6 \) with weights \( w_1; w_2; w_3; w_4; w_5; w_6 \) respectively. Given these six selected scenes, the database that stores the features of scenes will provide an efficient search of an optimal STS, i.e., the red sequence in Figure 1. Mean-while, there is another sequence created by following others’ general trajectory, shown as the blue sequence. The time cost of touring includes both the stopping time at each scene and the transitional time between scenes, as demonstrated in the rectangles on the timelines.

Figure 1. Two different sequences (red, blue) include six chosen scenes with different weights and timelines. Scenes of each sequence which have been visited are presented in the order of visit. On the timelines, transitions between tourist scenes are depicted by rectangles and visiting time is in minutes.
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