Travel Planning System Considering Experience Flows Based on Driving Histories

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Abstract
While many people use a navigation system to travel by automobile, the existing systems support nothing but a route guidance. Hence, a user must determine specific destinations and it makes hard to create an itinerary because he/she does not know where, when and what he/she can experience. We have developed a travel planning system for drivers called "Xnavi" that takes into account experience flows. Xnavi extracts keywords related to the travel area using natural language processing based on the TF-IDF method and suggests appropriate combinations of keywords for the driver as experience flows using association analysis based on driving histories. We created a prototype system in which a tourist create an itinerary by selecting experience flows. The results of a user study show that the planning time was significantly shortened and the average satisfaction was increased when using this prototype in contrast to examining the area on his/her own.

Author Keywords
Travel planning; Driving Histories; Experience flows; Association Analysis; Automobile; UI

ACM Classification Keywords
H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous

Introduction

A tourist using an automobile can travel around a target area easily, so that it is hard to narrow down the choice of possible attractions and determine the best itinerary. However, the existing navigation systems do not tell where, when and what he/she can experience. Many people need to search for travel information using the internet and consider the best order of a plan before taking a trip. In response to this, we consider three functions required by a system for good automobile travel planning. (a) A function to consider experience compatibility so that the best next experience after a specific experience can be determined. (b) A function to search for interesting experiences within a travel area. Chang et al. implemented this function by presenting a recommendation mechanism that calculates the similarity between users and their trustability[1]. It then analyzes information in social networks to recommend topics. (c) A function to help a tourist determine a schedule and routes in order to easily generate a travel plan. Kurata et al. implemented this function by proposing a travel planning service that automatically generates a plan according to travel style[2]. However, there is no system that meets all three requirements simultaneously. Specifically, the first requirement has not yet been considered in existing travel systems. Hence, we built a system called Xnavi, which means a navigation system based on experience, to simultaneously implement these three functions for automobile travel.

Travel Planning System Considering Experience Flows

Experience flows

In this report, we propose a travel planning system for drivers referred to as Xnavi (Figure 1). Xnavi is designed to implement the three functions for automobile travel. It supports planning by separating experience flows into small units

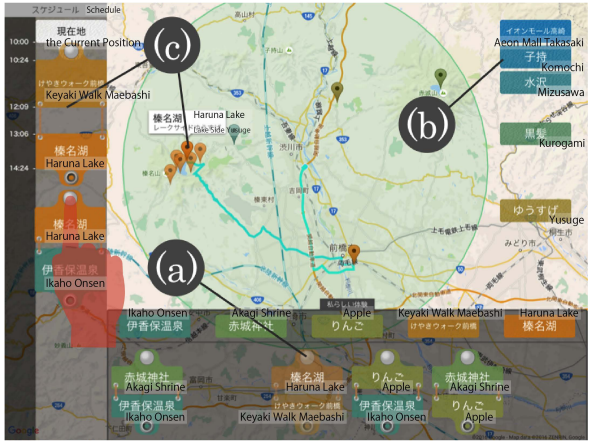

Figure 1: A screenshot of Xnavi: keywords are disposed on the left, keyword units on the bottom and a schedule on the left.

that consist of combinations of experiences; for instance, experience A and experience B (which is a good experience to follow A) (Figure 2). A good example is the experience of warming up in hot springs after skiing in the cold mountains. To obtain appropriate units such as this, a system needs to know a user's interest in specific experiences and behavioral principles that represent the compatibility between experiences. Our aim is easy and satisfactory planning by creating and using these units.

Overview

A unit described in the previous section is presented as a unit of keywords in the proposed system. A unit of keywords is created by merging a tag flow, which represents a behavioral principle, and a keyword, which represents something a user is interested in. A tag is an attraction attribute such as "spa," and a keyword is a travel experience

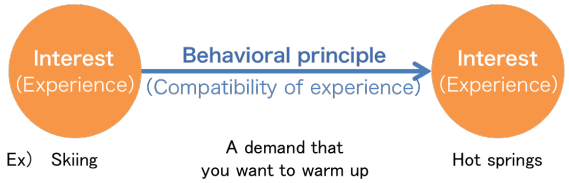

Figure 2: Combination of experience.

such as “Faywood Hot Springs.”

We designed Xnavi as follows (Figure 3): In the first process, the system generates tag flows and summarizes them into clusters. We implemented a function in this process to consider the compatibility between experiences. In the second process, the system generates keywords, which represent interesting experiences. In this process, we implemented a function to search for interesting experiences within a travel area. The system then creates units of keywords from the results of the two processes and creates clusters, which are composed of units of keywords. In the third process, a user chooses his/her favorite cluster and creates an itinerary using the keyword units that belong to his favorite cluster. We implemented a function to help the tourist determine a schedule and routes in this process.

System Processes

Here, we describe each process in Xnavi in detail. In the first process, we pinpoint stopping locations using driving histories and guess candidate tourist attractions. We then extract tag flows from these attractions and separate the tag flows by day. We also analyze these tag flows using association analysis, which is used to determine the relationships of the items. If we use association analysis once, we obtain a pair of tag flows that occurs on the same day. Hence, we use association analysis repeatedly to obtain a chain of tag

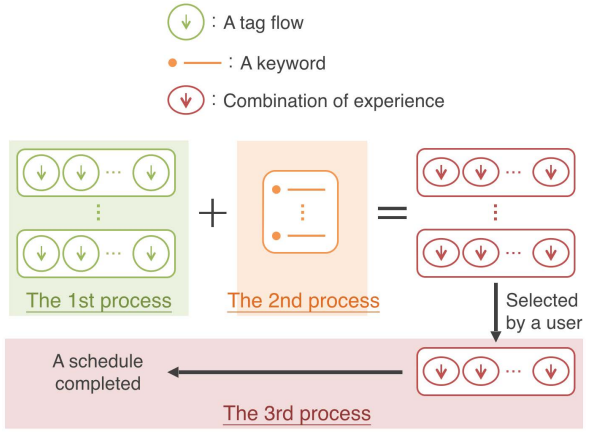

Figure 3: System overview.

flows that occur on the same day and create clusters that consist of a chain of tag flows.

In the second process, we obtain the names of all attraction in the target area within a radius of 20 km and divide the attractions into small areas. These small areas are arranged in a grid pattern of their radial interval. We then decompose the attraction names into morphemes using morphological analysis. The TF-IDF (Term Frequency, Inverse Document Frequency) method, which is an effective method used in information retrieval or sentence summary, is applied to the morphemes. As a result of the analysis, we can obtain characteristic morphemes as keywords to represent the target area.

In the third process, a user creates a travel plan by combining keyword units. Each keyword of keyword units is represented by a block to increase the visibility and adaptability of time restrictions in the plan. The block size indicates the

length of time and the block position indicates the time at which it occurs. A user can adjust a schedule by dragging the edge of a block. In addition, the attributions that each keyword includes are displayed on the map as a candidate to increase the visibility and adaptability of spatial restrictions. A user can select an attribution as a representative place of a keyword to adjust where to travel in the plan.

User Study

We examined whether a user can create an automobile travel plan easily and satisfactorily using a prototype of Xnavi. Twelve subjects were asked to imagine they were going to take a trip. We divided them into two groups: one created a plan using the prototype, and the other used Google search. We measured the planning time and asked how satisfied they were with their plan, which consisted of eight steps. Note that the experience combinations were made at random to evaluate the overall system simply.

A t-test on the results of the user study show that planning time was significantly shortened. In addition, average satisfaction with the plan was greater than for the group using Google search (Figures 4 and 5). However, the comfort

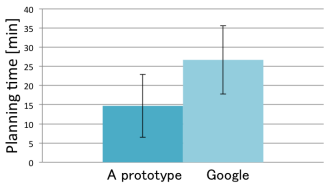

Figure 4: Planning time.

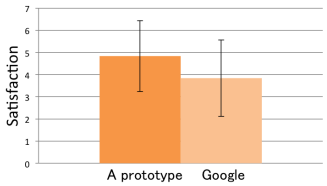

Figure 5: Satisfaction.

they felt during planning was the same between the two groups despite the fact that the planning time was different. We consider that the randomly chosen experience combinations limited the planning and caused stress. We plan to evaluate system again after we have implemented the recommended experience combinations.

Conclusions and Future Work

We proposed a travel planning system called Xnavi that supports planning based on experience. Xnavi generates keywords, which represent interesting experiences, and tag flows, which represent experience compatibility. A user can create a travel plan combining keyword units made by keywords and tag flows. In the user study, a prototype reduced planning time and improved average satisfaction. This result indicates that Xnavi can help a user generate an automobile travel plan easily and satisfactorily.

In the future, we plan to attach keywords to a map visually because travel tips is hidden in connection between an area and experience. We also plan to apply experience flows and find a new representation method for experience compatibility to make planning easier.

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