Geographical Recommender System Using User Interest Model Based on Map Operation and Category Selection

Kenta Oku, Ritsumeikan University, Japan
Rika Kotera, Micware Co. Ltd., Japan
Daisuke Kitayama, University of Hyogo, Japan
Kazutoshi Sumiya, University of Hyogo, Japan

ABSTRACT

Digital map services and geographical information search services are widely available on the Internet. Users can retrieve appropriate geographical information from digital maps using certain map operations and category selection methods. However, it can be difficult for users to find specific geographical information when a map region contains a large amount of information. Furthermore, a user’s interest in a region or a category may change. Therefore, the authors propose a method for recommending geographical information to users based on their map operation or category selection history. The authors developed a model to determine a user’s interests and used it to recommend suitable regions and categories.

Keywords: Digital Map, Geographic Information Retrieval (GIR), Local Search, Recommendation, User Operation

INTRODUCTION

Users can currently retrieve geographical information from online maps by changing the displayed region or by selecting specific categories. For example, a user may need to search for hotels and restaurants if they plan to travel. This can be achieved using local geographical information search services, such as Yahoo! Maps and Google Maps. These services allow users to change map regions and categories to find appropriate geographical information. However, the user’s interest in the retrieved information may change after the user confirms the object’s location and category.

There are two basic display control methods, i.e., a static control method and a dynamic method.

Modern conventional services use a static method, which considers the distance between
the center of the region and the geographical information in the map region obtained by filtering a category. However, this standard control method does not take a user’s interests into consideration. Furthermore, it is difficult to find relevant geographical information located outside the map region or information that does not belong to the selected categories.

We propose a dynamic display control method, which suggests a region or category of possible interest to a user. Our proposed method displays geographical information on the basis of the interests retrieved from a user’s retrieval histories. Thus, a user’s operations are used to extract user interests. The method changes the map region and the selection category based on the user’s interests.

We previously proposed a method for updating user interfaces (Oku, 2010). However, the method was heuristic and we did not determine its viability. Thus, we updated the model after collecting experimental data and analyzing questionnaires given to participants. In this paper, we consider more specific regions and categories that are not noticed by the user. Furthermore, we propose a recommendation function based on our user interest model. Our method suggests geographical information to users based on the Event-Condition-Action (ECA) rule. We use the model to make suggestions of region or category selections. We indicate geographical information displayed in a map region by selecting an object category.

This paper is structured as follows. First of all, we describe the motivation for this research and provide an outline of our study with a description of related works. Secondly, we describe our user interest model. Thirdly, we provide details of the recommendation method using our user interest model. Fourthly, we describe our experiments and discuss the effectiveness of our method. Finally, we conclude this paper with a brief summary and some indications of future work.

OUR APPROACH AND RELATED WORK

Geographical Information and User Operation

We define geographical information as an object with an object name, category name, and location data. The object name is the name given to the geographical information. Category names are the categories to which the object belongs. An object may belong to multiple categories. For example, the geographical information “Asian style bar” could be listed under the categories of “Asian” and “Bar.” Location data is the latitude and longitude of the object, i.e., the location data is the object’s address.

A category has a layered structure, so objects belonging to its child categories are displayed on the map region when an upper category is selected. An upper layer category has multiple subcategories. For example, the category “Restaurant” has several sub-categories, e.g., “European,” “Asian,” and “Ethnic,” as shown in Figure 1.

The types of user operations are category selection, map changes, and object selection. Category selection refers to clicking on a desired category and objects belonging to that category are displayed in the map region. If a user wants to retrieve restaurant objects, the user selects the category “Restaurant” and objects belonging to that category are displayed in the map region.

An object is displayed when its location data matches that of the displayed map region, and when its category name (or names) matches the selected category. Objects belonging to its child categories are displayed on the map when the user selects an upper category. We also allow multiple category selection. Thus, if a user selects “Italian food” and “French food,” objects belonging to both categories are displayed in the map region.
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