A Mobile Social Search Scheme Based on Popularity and User Preferences

He Li[1,2], Misun Yook[2], Jieun Han[2], Minje Ahn[2], Jongtae Lim[2], Kyoungsoo Bok[2], Jaesoo Yoo[2]*

[1] Nanjing University of Aeronautics and Astronautics, China, [2] Chungbuk National University, Korea,

E-mail : lihelol@gmail.com, {misun, jieun24, mjahn, jtlim, ksbok, yjs}@chungbuk.ac.kr

1. Introduction

The rapid development of wireless communication technology and smart phones makes it possible to access the internet anywhere and anytime. Since most of the mobile devices are equipped with GPS functions, it is easy to obtain the location information of mobile users. Recently, mobile social network services are growing quickly due to the ubiquity of mobile users. The location based mobile social search is very important for the mobile users of mobile social network services. Different from the conventional web search, the mobile social search analyzes user preferences according to social data, and then takes into account the user preferences to search the optimal results for users.

Recently, several studies have been conducted to provide mobile social search services [1-3]. The popularity and experts rating based method is used for the mobile social search [1]. The popularity is evaluated by analyzing contents published in social network services and historical searching keywords. The related experts are selected based on the keywords and rating information. Then, the public popularity and experts rating are used for improving the mobile social search. However, we have the problems that the popularity and experts rating information cannot represent the personal preferences of each mobile user. The similar profile information of users is used for the mobile social search in [4]. In this method, when the mobile social search is performed, the information of users with similar profile information is used. It has the problem that user profile information is not changed with the change of user preferences when time passes. Therefore, it cannot represent the preferences of mobile users well.

In order to resolve the problems of the existing methods, in this paper we propose a mobile social search scheme based on popularity and user preferences. The popularity is calculated by analyzing real visiting records of mobile users. The user preferences are evaluated by analyzing the existing social data which can be collected by social network services. The proposed scheme ranks mobile social search results by combining both user preferences and popularity.

2. The proposed mobile social search scheme

In this section, we introduce the proposed mobile social search scheme in mobile environments. The proposed scheme consists of four steps. First, the candidate location sets are generated according to the analysis of the historical social data, in which the unavailable locations are removed. Second, the popularity of each candidate is evaluated by the visiting records of mobile users. Third, the meaningful locations are selected by using skyline processing, and user preferences are evaluated by analyzing the existing social data collected by social network services. Finally, the search results are provided to users according to ranking values which is computed by considering both the popularity and user preferences.
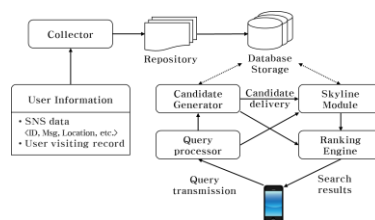

Fig. 1. Overview of the proposed scheme.

Figure 1 shows the overview of the proposed scheme. The collector module is used to gather user information from the submitted contents of social network services constantly. User information, location, and visiting records of users are stored in databases. Mobile users use mobile devices to search the requested contents. There are four modules used to process search queries from mobile users. The query processor module is used to evaluate keywords,

time, and location from mobile users. The candidate generator module is used to evaluate suitable candidates and popularity values. The skyline module is responsible for assigning weight values according to user interests. The ranking engine module is used to compute search results according to the popularity values generated from the candidate generator module and user preferences generated from the skyline module.

3. Performance evaluation

In order to show the superiority of the proposed scheme, we compare it with the existing scheme [1] through performance evaluation in the same experimental environment. All of the experiments were coded in Java 7.0 and MySQL databases were used to store the check-in data. The check-in data is shown in Table 1, which is collected by using Gowalla API in Stanford University. Gowalla is a mobile application used to support location based social services.

[Table 1] CHECK-IN DATASET IN GOWALLA

Parameter	Values
Total number of check-in users	196,591
Total number of check-in records	6,442,890
Collection period	2009.02~2010.10
The number of check-in in New York	142,386

In order to show the flexibility of the proposed scheme, the experiments are performed under various types (type1 - type8) with different user preferences and search frequencies. From type 1 to type 4, the user preferences are consistent with the search frequencies. Conversely, various user preferences with the same search frequency are used from type 5 to type 8. The search location is 10011 14th St New York in the USA, and the search radius is within the New York City. Figure 2 shows the top-20 results of mobile social searches. A high search frequency implies that the user preference focuses on low prices or short distances. A low search frequency implies high prices or long distances, which is consistent with general user habits. Since neutral user preferences and extreme user preferences are assigned for type 5 and type 6, the differences of the price and distance of search results are distinct. Conversely, since the user preferences of type 7 and type 8 are not slanted, the differences of the price and distance of search results are negligible. Since the existing method does not consider user preferences, the price and distance of search results are high.
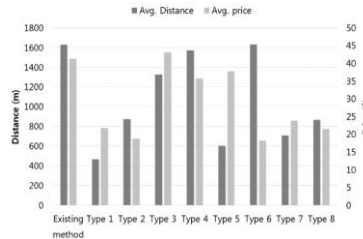

Fig. 2. Average ranking according to various types.

4. Conclusions

In this paper, we proposed a social search scheme considering popularity and user preferences. The popularity is calculated by collecting the real visiting records of mobile users. The user preferences are evaluated by analyzing the existing social data collected by social network services. The experimental results have showed that the proposed scheme is more feasible than the existing scheme. In the future, we will evaluate the proposed scheme in various experimental environments.

5. References

[1] P. Shankar, Y. Huang, P. Castro, B. Nath, and L. Ifto, "Crowds Replace Experts : Building Better Location-based Services using Mobile Social Network Interactions," Proc. of IEEE International Conference on Pervasive Computing and Communications, pp.20-29, 2012.
[2] A. Khodaei and C. Shahabi, "Social-Textual Search and Ranking," Proc. of International Workshop on Crowdsourcing Web Search, pp.3-8, 2012.
[3] Y. Joung, S. M. Chen, C. Wu, and T. H. Chiu, "A Comparative Study of Expert Search Strategies in Online Social Networks," Proc. of International Conference on Advanced Information Networking and Applications, pp.960-967, 2013.
[4] T. Vu, and A. Baid, "Ask, Don't Search: A Social Help Engine for Online Social Network Mobile Users," Proc. of IEEE Sarnoff Symposium, pp.1-5, 2012.