Context–Aware Approach for Restaurant Recommender Systems

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INTRODUCTION

A recommender system provides online consumers with product information and recommendations through online e-business website to in order to enhance customers' shopping intention and improve the customers' shopping experience. In the specific area of restaurant recommendations, recommender systems aim to find the best restaurant that meets a user's need such as food type, environment type and so on.

The Chicago Restaurants Union has been using a FindMe type (Burke, Hammond, & Yound, 1997) recommender system called Entrée, which is used to recommend restaurants to the customers. This recommender system makes use of a typical recommendation algorithm based on knowledge (Sarwar, Karypis, Konstan, & Riedl, 2001, pp.285-295), which only uses the online operations of users as a basis, and is therefore lack of using historical data of users. This paper uses a context-aware approach to consider users' historical data for recommender systems that provide suggestions for restaurants.

The rest of this paper is organized as follows: Section 2 provides background information restaurant recommender systems. Section 3 presents the recommender algorithms used in our experiments. Section 4 describes the Entrée dataset; present data scrubbing process and the user behavior mining on this dataset; report the experimental results. Section 5 discusses the value of the results, their potential applications, and challenges and weak-

nesses. Section 6 concludes the paper and proposes some future research directions.

BACKGROUND AND RELATED WORK

Upsurge of Recommender Systems

In the 90s of the last century, the field of electronic commerce began to flourish and personalized recommender system also rose its first wave. Some large e-commerce sites such as Amazon launched their own personalized recommender system. Literature reported that 35 percent of Amazon's incremental sales came from their recommender system (Figiel, Epstein, McDonald, 1998, pp.20-25). At the same time, a sensational paper published by Amazon in 2000, entitled "Item-based collaborative filtering recommendation algorithms" (Sarwar, et al., 2001), has become one of the most famous literature in this area. Ever since then, personalized recommendation technology has become an irresistible trend.

Restaurant Recommender System: The Entrée System

As mentioned above, in the era of the Internet economy, recommender systems have been widely used in various business areas, which also include food industry. Burke (1999) stated the restaurant recommender system, Entrée, "makes its recom-

mendations by finding restaurants in a new city similar to restaurants the user knows and likes" (p.69).
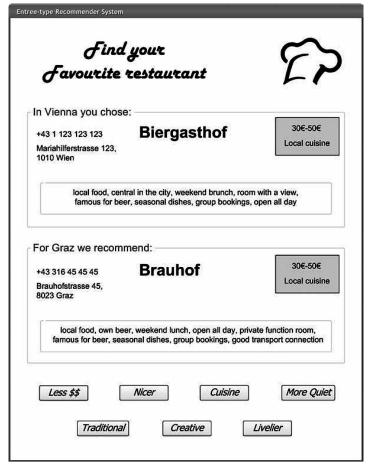
Entrée is a recommender system using FindMe approach to assist users browsing which allows users to navigate by stating their preferences with respect to a given restaurant, thereby refining their search criteria.

When using this system, firstly a user needs to submit an "entry point" which is a known restaurant. (Or, the system will give a default "entry point" for new users.) Then the system offers a range of criteria, and according to the criteria chosen by the user, it will display a few restaurants that meet the users' need. At the same time, the user would set their preferences until an acceptable restaurant is recommended.

As shown in Figure 1, the Entrée system finds a restaurant called "Brauhof" that is similar to a restaurant called "Biergastof" that the user used to choose. Then, if the user wants to find one that is similar to " Brauhof " but slightly cheaper, she can click the "Less $$" button. Figure 2 shows the result of such action. In the same way, the user can choose cheaper, nicer or more traditional restaurants by clicking the corresponding buttons. The system will refresh the recommendation results based on the user's operation, and finally help her to find the restaurant she desires.

The recommendation technology that Entrée use is knowledge-based similarity search. There are two basic search modes: one is based on the similarity retrieval, and the other is based on users' evaluation result. When finding some similar

Figure 1. Entrée: A FindMe type system (Jannach, Zanker, Felfernig, & Friedrich, G. 2010)

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