PREDICTING PERSONALITY TRAITS AND RECOMMENDING SEQUENTIAL TRAVEL PACKAGE USING SOCIAL MEDIA

[1]Dhivyabharathi.S, [2]Dr.P.Ilanchezian,

[1]PG Scholar, Dept Of Information Technology, Sona College Of Technology, Salem,

[2]Associate Professor, Dept Of Information Technology, Sona College Of Technology, Salem.

ABSTRACT

In view of the defects of the traditional user modeling technology in personalized recommendation system, this paper introduces an ontology-based user modeling method. In order to retrieve the most interested goods from a large amount of information for the user, a recommendation model is designed which combines the ontology technology and tourism information. This paper mainly studies the knowledge representation in tourism field and ontology-based model building method. This paper describes the implementation procedure of how to use the ontology editor tool Protégé to construct OntoTRec, and points out the procedure and method how to realize it. The feasibility and effectiveness of recommendation algorithm proposed in this paper have been verified on real-world data sets, and it achieved higher prediction accuracy compared with existing recommendation algorithms.

Keywords: Ontology; Personalized recommendation; Collaborative filtering; Web crawler; Preference prediction.

1. INTRODUCTION

Tourism industry is highly dependent on information, because in later stages of tourism products, just to provide the information of product without providing the product itself. At present, how to use the network to provide intelligent and personalized service has become a hot research point in computer industry and in tourism industry[1]. With the rapid development of Internet technology, travel information has exploded, so the amount of information about travel on the Internet is large and scattered. But people hope to get accurate information and help them to arrange their tourism activity reasonably through the network, Instead of being buried in a pile of network data. How to find the useful information to meet the individual tourist needs from these massive data? Personalized recommendation technology is considered an effective way to solve such problems, which has been extensively academic studied in tourism industry[2]. Based on Collaborative Filtering, the recommendation system can automatically predict the user interest and preferences by collecting the evaluation information from other similar users. The basic assumption of Collaborative Filtering is that users will be more like the goods of those similar users prefer. Collaborative Filtering has been widely used in some large and well-known business systems, such as Amazon and Alibaba[3]. Currently, algorithm of Collaborative Filtering (abbreviated CF) include memory-based, model-based and hybrid recommended techniques[4]. The most popular model used by Collaborative filtering recommendation system is k-nearest neighbor (abbreviated kNN) collaborative

filtering technology[5], including two techniques, one is user-based recommendation and another is project-based recommendation.

The term Ontology is originally from the field of philosophy. Now it is used widely in other field, for example, artificial intelligence, information retrieval, semantic Web, natural language processing and so on[6]. Ontology has the property of clarity, formalization and sharing.

2. RELATED WORK

The application of personalized recommendation in the field of tourism, including recommended both individual products, such as monomer attractions, hotels, restaurants, flights, etc., and integrated products, such as destinations, travel plans, travel packages. In the field of tourism, the two most successful recommendation system technology is tripmatcher of triplehop (is applied www.ski-europe.com) and expert advice platform MePrint of VacationCoach (is applied travelocity.com). These two recommendation systems are trying to simplify searching process for holiday destinations by simulating discussion between traditional travel agency and customers[9]. Existing studies include: recommending tourist routes based on the sensitive search, tourists needs, or attractions popularity[10]. In order to provide travelers satisfied personalized recommendations, scholars conducted extensive research and exploration. Most of them applied artificial intelligence techniques. Zhou summed up the role and connotation of travel information, which include tourist information, the awareness of tourism destination and tourist behavior relationship; Chen conducted a case study of Meizhou, wrote algorithms and achieved system integration by analyzing system demand, designing system function and system space, and successfully applied it in Tourism information system of Meizhou. Luo discussed key technologies necessary in the establishment of tourism information systems in 2005, such as 3S technology, multimedia technology, and network technology, pointed out the significance of studying "digital tour". Lin explored how to build tourism information system on the platform of geographic information system, based on Changle City, Fujian Province. Qun and Yuan comprehensively reviewed the research progress of Tourism Information System in China, and put forward to the further development of tourism information system. Huang[16] integrated Bayesian network and semantics web and provided personalized recommendations of tourist attractions on the Internet. Xu established a tag recommendation system based on user preference model; In order to adapt the characteristics of tourism and overcome limitations in traditional recommendation techniques, Wang proposed a tourism recommendation system based on constraint, and designed recommendation engine in detail, which could access to all kinds of knowledge in tourism areas and recommendation rules through visualization tools. Xu[19] proposed a secondary recommended method based on ontology. This method introduced ontology to describe tourism resources, achieved the association of user-need information and filter conditions in recommendation. Users could make evaluation to recommend results. Zhang proposed personalized recommendation algorithm which merged timing behavior and trusts, so improved user satisfaction. In his another literature, he proposed a social networking recommendation algorithm which merged a variety of context information. So improved the accuracy of recommendation. All of researchers are trying to solve the problem of how to build accurate contact between users' preferences and recommended content in personalized recommendation. Middleton proposed Quickstep and Foxtrot systems, which based knowledge and made Ontology represent users' interest field. Noor Proposed a

personalized recommendation system, which combined social networking technologies and the Semantic Web, and which built a bridge between user preferences and personalized searching. Castells developed aceMedia recommendation system, described the characteristics of user preference as a conceptual ontology vector. García-Crespo used fuzzy logic method to find a link between user preferences and characteristics of hotel, which focused on solving personalized matching based on user preference.

3. MODEL ANALYSIS

Construction of tourism ontology This paper adopts skeleton method to build knowledge ontology in tourism field. Firstly, determines the scope and purpose of ontology, and analyzes knowledge ontology; Secondly, establishes ontology, using Protégé software express the concepts and relationships, saves as a OWL file; Finally, integrates the established ontology and travel personalized recommendations system. After analyzing all the concepts, property or relationship involved in tourism ontology, we get the main things involved in tour recommendation.
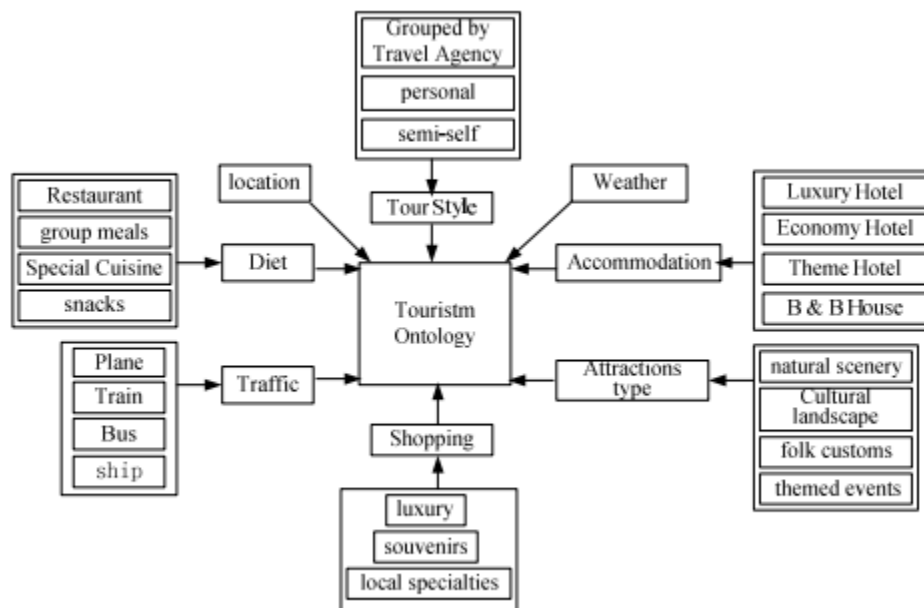

Fig.1. Construction of Tourism Technology

They are: traffic, attractions, accommodation, diet, shopping, tour style, weather conditions...ect. The tourism domain ontology data described in Figure 1. After establishing tourism information ontology, the system also establishes tourists information ontology. Because tourists are main characters in various tourism transaction processes, so establishing a tourist-centered information ontology database can provide system more extensive information to facilitate intelligent query and knowledge reasoning. For more detailed information about tourists, some personal information and other important information are included in the tourists database, such as age, gender, time preference, income, occupation, hobbies, travel interests, travel style, consumption habits, and so on. Tourists information ontology the entire recommendation model

can be divided into three levels. They are user layer, network service layer and data layer. User layer mainly faces for user, provides users with tourism products that personal interested; Network service layer makes the data match between user's personality characteristics and knowledge-base, under the control of a central control module, completes the relevant recommendations queries; Data layer mainly consists of ontology, using pre-build tourism commodities, improves user satisfaction of a personalized match.

4. RESULT ANALYSIS

This paper using web crawlers makes an extraction for tourism information from e-commerce website, and corrects HTML document on the web pages, and then converts the information into a DOM tree, removes noise and filters out irrelevant information, matches Word Segmentation results under the rules of Ontology matching, stores the ontology concepts and their attributes in the database. In this paper, we
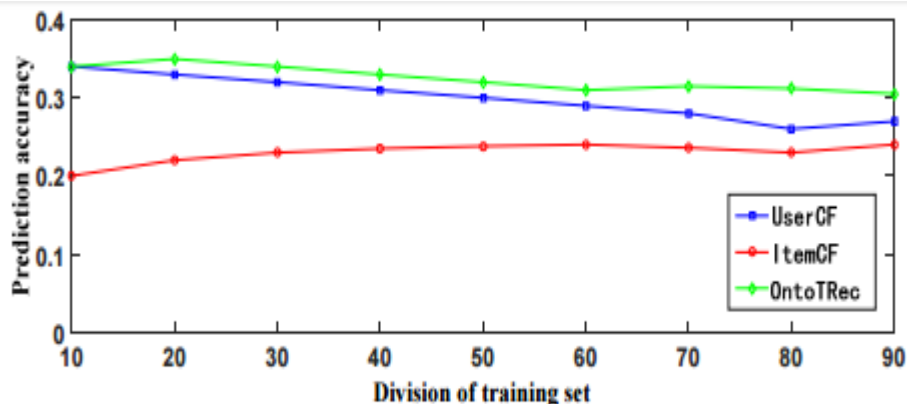

Fig.2. Prediction Comparison

divide the data set, training set accounted for 10%, 20% ... 90% of the data set respectively. The prediction accuracy of OntoTRec recommendation algorithm, UserCF algorithm and ItemCF It is easy to see, regardless how to divide the training set, the prediction accuracy of OntoTRec recommendation algorithm is higher than UserCF and ItemCF algorithm. In addition, the prediction accuracy of UserCF algorithm is higher than ItemCF algorithm.

CONCLUSION

This paper summarizes personalized recommendation technology and ontology technology, and makes a good combination of the two technology, expecting to improve the accuracy of recommendation system. We use the tool of ontology editor Protégé to build tourism domain ontology, and establish personalized recommendation tourism Model. The experimental results on real data sets show that the recommendation accuracy of recommended model algorithm is applied to travel website, the web can provide users with

personalized produces and services and guide tourists get what they need rapidly. Moreover, recommendation tourism Model can help travel enterprise promote tourism products and improve tourists loyalty in the fierce competitive electronic commerce environment. To build a certain field ontology which can meet a wide range demand of users is an extremely complex task. Tourism ontology constructs in this paper is relatively simple, we will further improve it in the future in order to further improve users' satisfaction with tourism recommendation result.

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