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博士論文概要

論文題目

Information Extraction Method for Capturing User Preferences and Recommender System Application

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Recommender systems are becoming an indispensable application and re-shaping the world in e-commerce scopes. Recommender systems are primarily directed towards individuals who lack sufficient personal experience to evaluate the potentially overwhelming number of alternative items. With the explosive growth and variety of information available on the Internet, a pressing need emerged for providing recommendations derived from filtering the whole range of available alternatives. Personalized recommender systems have been considered to be one of the most promising approaches for the individualized services, including try to predict what the most suitable products or services based on the user's preferences and provide the suggestions for an individual user.

Capturing user preferences is a crucial task in recommender systems. Simply asking the users what they want is too intrusive and prone to error, and then finding meaningful patterns is difficult. The existence of a user model is central to every recommender system; the way in which this information is acquired and exploited depends on the particular recommendation technique. Capturing accurate user preferences is however, an essential task if the recommender systems are to respond dynamically to the changing needs of their users.

Although many algorithms proposed in recommender systems literature have grounded in the problem domain of recommending academic researches, a well-known problem, cold-start recommendation is still seek to solve. Furthermore, a recent and notable question in this research area focuses on how to take into account not only information about users and products but also incorporate contextual information into the decision-making environment. While most existing recommender system research papers overemphasize the similarity between the user preferences and the item features to improve the recommendation accuracy, the importance of recommendation diversity are often overlooked.

To address the aforementioned issues, this dissertation aims to design the innovative recommendation methods take into consideration from the particular point of view for improving the quality of recommendation. A tracking recommendation approach based on Formal Concept Analysis for new user and gray sheep problems in existing recommender systems is introduced. An affect-based recommendation approach for eliciting user's transitional preferences is presented. A hybrid recommendation approach

that increases recommendation diversity while maintaining an acceptable accuracy level is described. To demonstrate effectiveness of the proposed approaches, a movie recommendation application was illustrated as an example. Moreover, this dissertation employs the comprehensive metrics to achieve evaluation of recommendation quality. The experimental results show that the proposed approach improved the accuracy and diversity of recommendation than traditional recommendation approaches.

The contents of the thesis, which consist of 7 chapters, are introduced as follows.

Chapter 1 introduces the research background, motivation, objective, and the structure of this thesis.

Chapter 2 reviews the related research for this work. This includes an in-depth investigation on existing recommendation techniques and their drawbacks by examining the recommender systems within the literature.

Chapter 3 describes three problems to be solved in this research, including cold-start recommendation problem, which attempts to present items that are likely of interest to the new user; context-aware recommendation problem, which aims at improving accuracy of recommendations by tailoring these to the particular context; and diversity recommendation problem, which detects user's crossover preferences to avoid providing too similar items for individual user.

Chapter 4 presents a new tracking recommendation approach to provide the relevant items for new user cold-start problem. A new recommendation model based the synergistic use of information from repository, which includes user's few history records, and items' two-level property was constructed. The hierarchical structure map based on the classificatory attribute of items generating by Formal Concept Analysis (FCA) is used to discover the candidate items that the user may be interested. And an appropriate recommendation returned to new user utilizes the filtering techniques based on the descriptive attribute ranking these candidates. The experimental study includes simulating a prototype recommender system for implementing the proposed approach and testing its performance. Experiments using two datasets show our approach help to improve the precision and the recall rates compared to

traditional collaborative filtering approach by up to 15.3% and 12.5% respectively under new user cold-start conditions.

Chapter 5 focuses on exploring an affect-based approach for context-aware recommendation problem. The presented approach attempts to catch users' transitional preferences and guide timely recommendations based on the transformation of user preferences. Firstly, the conceptual network of each items based on their descriptive keywords are created using WordNet and color theory. Secondly, color orders of each item are generated via the spreading activation. Thirdly, a characteristic sequence consisting of color nodes was extracted from color orders of users' record for inferring the contextual information; this information is subsequently used to perceive the changing of user preference. The performance of the proposed approach was illustrated using the example of a movie recommendation application. The performance test results show that the proposed approach outperformed approximate 15% than traditional collaborative filtering approach in terms of accuracy.

Chapter 6 discusses a new hybrid approach that incorporates multidimensional clustering into a collaborative filtering recommendation process for diversity recommendation problem. The presented approach aims to detect the users' crossover preferences from diversification view to meet their potential demands and provide the target user with highly idiosyncratic or more diverse recommendations. The proposed hybrid recommendation procedure has been partitioned into three phases: i) data preprocessing and multidimensional clustering; ii) choosing the appropriate clusters; iii) collaborative filtering recommendation process for the target user. Convergence and Coverage are defined as two pruning criterion respectively to prune the initial clusters set. The performance of proposed approach is evaluated using a public movie dataset and compared with two representative recommendation algorithms. The comprehensive empirical evaluation demonstrates that the proposed approach increased 15%-20% diversity as compared to the traditional recommendation approaches while maintaining 75% of recommendation accuracy.

Chapter 7 concludes this thesis by collating the evidence for the proposed recommendation methodology and summarizing their advantages. The future direction for the work detailed within this thesis is then discussed.