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Survey Paper on Website Recommendation System Using Browser History and Domain Knowledge

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Abstract: ***With the rapid growth of internet technologies, the web has become the world's largest repository of knowledge. So it is challenging task of the webmasters to organize the contents of the particular websites to gather the needs of the users. This paper presents a new framework for a semantic-enhanced Web-page recommendation. This proposed system consists of three models. First two models represent the domain knowledge. The first model shows domain ontology of website. The second model build semantic network of website using domain terms, web pages and relations between them. The third model is personalized meta-search engine, help users to pick up the useful information for them quickly by using their interest keeping in the database. The proposed system automatically discovers and constructs the domain and Web usage knowledge bases, and generate effective Webpage recommendations.***

Keywords: semantic network, web page recommendation, domain ontology, meta search engine

1. Introduction

As the World Wide Web continues to grow at an exponential rate, the size and complexity of many web sites grow along with it. For the users of these web sites it becomes increasingly difficult and time consuming to find the information they are looking for. User interfaces could help users find the information that is in accordance with their interests by personalizing a web site.

Some web sites present users with personalized information by letting them choose from a set of predefined topics of interest. Users however do not always know what they are interested in beforehand and their interests may change overtime which would require them to change their selection frequently. Recommendation systems provide personalized information by learning the user's interests from traces of interaction with that user.

Web-page recommendation has proved in recent years to be a valuable means of helping Web users by providing useful and effective recommendations or suggestions. The core techniques in web-site recommendation are the learning and prediction models which learn user's behavior and evaluate what users would like to view in the future. In particular, it can suggest interesting items from a large set of items based on the knowledge gained about an active user.

Web-site recommendation can automatically recommend Web-sites that are most interesting to a particular user based on the user's current Web navigation behavior. Good Web-site recommendations can improve website usage and Web user satisfaction.

This proposed system presents a novel method to provide better Web-site recommendation based on browser history and domain knowledge, which is supported by three new knowledge representation models. The first model is an ontology based model that represents the domain knowledge of a website. Domain ontology specifies the terms and relationship between them explicitly and officially, which show the domain knowledge for specific domain. Ontologies are implemented in OWL. The second model is semantic network of website which shows domain terms, web pages and relations between them. Based on relations between terms and web pages, we can conclude how closely the web-pages are semantically related to each other.

The third is personalized meta-search engine. Personalized meta-search engine is one search engine that we teach the machine to learn users' interest, so the search engine can help users to pick up the useful information for them quickly by using their interest keeping in the database. Personalized meta-search engine can sort the results according to user's interest, the results that user likes will be the top of the results.

2. Literature Survey and Related Work

How to make effective Web-page recommendations to Web users without excessive input from those users is a hot research topic. Significant effort has been devoted to developing effective Web-page recommender systems; however, a number of problems have been encountered in the development of existing Web-page recommender systems.

"New page" problem

Existing system [2] of Web-page recommendation uses tree structures and Web access sequences. If a user is visiting a Web-page that has not been accessed before, e.g. a newly-added Web-page, the user cannot obtain a recommendation. This phenomenon is often referred to as the "new page" problem. The reasons why such a phenomenon occurs are: (i) the recommendations are generated based on the recommendation rules obtained from the frequent Web access patterns discovered from the Web usage dataset; (ii) the new page is not included in the Web usage dataset so it

cannot appear in any discovered patterns; and (iii) the systems do not have a recommendation rule corresponding to the new page. Semantic enhanced approaches are capable to overcome the new page problem.

Challenges of manual ontology construction

Semantic knowledge of web pages has been constructed using domain ontology [4]. It improves the performance of the recommendation system than classic web usage mining algorithms. The drawback of existing system is ontologies have been constructed manually by domain experts. Manually building an ontology of a website is very complex task because there are a huge number of pages on one website as well as it is time consuming.

Recommender systems [3] (Mobasher 2007) were developed to learn Web user experience in order to model the interaction between users and items described on Web-pages and to recommend the interesting items to the users. The popularity of recommender systems is increasing with the rapid growth of the Internet since the mid-1990s. In the systems, recommended items may be Web-pages (links), articles, books or products. Markov models and tree-based structures are good models for transitioning between different Web-pages in Web sessions [6] (Borges & Levene 2005) [7] (Zhou & Fong 2006). Compared with other sequence mining algorithms, Pre-order Linked WAP-Tree Mining is excellent for Web-page recommendation [8], [9].

Semantic-enhanced Web-page recommendation is more powerful with the help of ontology. Integration of domain ontology with recommender systems can enrich the semantics of Web usage data to make valuable recommendations and produce promising results [10]. In personalized recommendation system [11] makes use of representations of items and user-profiles based on ontologies in order to provide semantic applications with personalized services. The recommender uses domain ontologies to enhance the personalization.

Domain ontology can be constructed by manually or automatically, for example, ontologies have been developed for distance learning courses [12], course content [13] and personalized e-learning [14]. Distance learning courses provide a brief introduction on formalisms (classes, relations, formal axioms, and instances) for knowledge representation on the ontological level. In course content, ontologies can be used to represent knowledge about content, supporting instructors in creating content or learners in accessing content in a knowledge-guided way. In this domain experts develop ontologies rather than ontology engineers for use in the delivery of courseware content. Personalized E-Learning introduces domain ontology to describe learning materials that compose a course, capable of providing adaptive e-learning environments and reusable educational resources.

Depending on system domain interest, we can reuse existing ontologies or build new ontology, and merge it with Web mining. In a Web Personalization system [15] ontology is used to semantically enhance web logs. In this system, ontology is built with the concepts extracted from the documents, so that the documents can be clustered based on the similarity measure of the ontology concepts. Then, usage of website is integrated with the ontology in order to produce semantically enhanced navigational patterns. Subsequently, the system can make recommendations, depending on the input patterns semantically matched with the produced navigational patterns.

3. Conclusion

In this survey paper, we took a brief survey of Web-page recommendation system and research work related to it. This paper aims to address the challenges in developing Web-page recommendation such as the “new page” problem and manual domain ontology construction. The study has developed a conceptual framework to facilitate the discovery, representation and integration of the useful knowledge of a website, including the domain and Web usage knowledge, to support effective Webpage recommendations.

The proposed system based on not only the Web usage knowledge, but also the semantics of Web-pages.

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