A social recommender mechanism for improving knowledge sharing in online forums

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ABSTRACT

Nowadays, online forums have become a useful tool for knowledge management in Web-based technology. This study proposes a social recommender system which generates discussion thread and expert recommendations based on semantic similarity, profession and reliability, social intimacy and popularity, and social network-based Markov Chain (SNMC) models for knowledge sharing in online forum communities. The advantage of the proposed mechanism is its relatively comprehensive consideration of the aspects of knowledge sharing. Accordingly, results of our experiments show that with the support of the proposed recommendation mechanism, requesters in forums can easily find similar discussion threads to avoid spamming the same discussion. In addition, if the requesters cannot find qualified discussion threads, this mechanism provides a relatively efficient and active way to find the appropriate experts.

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1. Introduction

People exchange information and goods with one another in their daily life. Useful information becomes knowledge through face-to-face discussion. Document-recommendation based on locally stored files is proposed to aid users in efficiently discovering relevant information (Liu & Lai, 2009; Liu, Lai, & Huang, 2008). With the vigorous development in Web-based technology, however, a large amount of information and knowledge has been transferred to online platforms, and the Internet provides an environment for people to contribute their knowledge and acquire the knowledge of others. One of the Internet's intended purposes is to encourage knowledge sharing so that valuable knowledge embedded in the network can be effectively explored. Some previous studies on knowledge management show that the success of knowledge transfer lies in neither communication systems nor documents, but in social relationships (Argote, McEvily, & Reagans, 2003; Ashok, 2005; Tobias & Finke, 2006; Yang & Chen, 2008). Knowledge sharing in some virtual communities, however, has not lived up to the expectation of Internet users in terms of acquiring and sharing valuable knowledge to meet their needs.

In knowledge-intensive online virtual communities such as technical discussion forums, knowledge sharing usually starts with knowledge inquiry in an online platform, which can take three forms: post-and-wait, know-what, and know-who (Wang, Chiang, Ho, Hsieh, & Huang, 2007). The "post-and-wait" approach describes anonymous queries where requesters, or searchers, post questions in a forum and wait for answers from volunteers. The "know-what" approach describes most situations in which huge volumes of documents or knowledge repositories are stored in a database ready to be retrieved by keyword matching or other more sophisticated yet similar techniques. The requester can only obtain what is stored in the database, and may have difficulty in evaluating the quality of the information acquired. The third approach, "know-who," is to construct the connections between searchers and knowledge providers. The main requirement of this model

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is to possess knowledge as to who knows about the answer, and make it available to the searchers. The communities based on the "know-who" model will be more effective than the "post-and-wait" and "know-what" models, as they will facilitate knowledge transfer, and also enhance experiences and value exchange (Wang et al., 2007). Thus, the "know-who" model is a kind of expert find-and-discover model which can help accomplish knowledge sharing through social interaction.

Nowadays, online forums have become a useful tool for problem-solving (Stein & Maier, 1995), learning discussion (Jeng, Huang, Kuo, Chen, & Chu, 2005), and knowledge-building. They are established in several developed countries. In terms of countable posts, Japan is in the lead with over 2 million posts per day on their largest forum, 2channel.[1] China also has many millions of posts on forums such as Tianya Club.[2] The United States does not have any one large forum, but instead several hundred thousand smaller forums, the largest of which are Gaia Online,[3] IGN,[4] and GameFAQs[5] (Wikipedia, 2009). Moreover, online forums prevail among various organizations. On the IBM website,[6] there are seventeen online forums, over 30,000 threads and 200,000 replies. There are 28 online forums in the newly-established Microsoft research[7] communities. This reveals the importance of the online forum for knowledge sharing. The most important benefit of online forums is that individual users can receive tailored answers from peers after formulating problems in their own words, without using specific keywords to search online (Steehouder, 2002). Inevitably, online forums face the same problematic questions with regard to knowledge sharing: "Who is the right expert to ask? When can I get the answer? How do I reduce the request time?" Without a practical means to ameliorate drawbacks and advance efficiency, the consequence is information-overload and time-wasting. A recommendation mechanism based on the "know-who" model is therefore proposed in this study.

There is great potential in online forums in the area of knowledge sharing, but Steehouder (2002) also argued that there are disadvantages in traditional forums, and we summarize these disadvantages as follows. First, if there is no participant interested in discussing it, a question will remain unanswered. Second, questions may remain in the discussion group for a long time before being answered. Third, the ways to reduce the waiting time for a question to be answered are limited. Considering these three disadvantages, this research proposes a social recommender system for more efficient knowledge sharing in online forum communities. In this study, we propose an innovative recommendation mechanism which identifies social relations and offers semantic analysis to construct a more comprehensive and personalized framework for each user in the online forum space, both for discussion threads and experts in the human-expert knowledge forum. Moreover, we utilize the concept of the Markov Chain model for social networks to find the most accessible and helpful experts if the user does not find satisfactory threads.

This proposed social recommender system provides the following advantages: First, the system can prevent the same question spamming the online forum. Second, the system can recommend potential experts to the requester if he/she cannot find the relevant answers. Third, the system can suggest the most willing experts to the requester. In certain knowledge forums, the help-seeker, called a requester, asks about a specific problem using natural language. The proposed model combines the aforementioned methods to find the relevant discussion threads. Nevertheless, if the search results do not meet the user's needs, then the model recommends the most helpful experts and provides the shortest social path (including intermediate collaborators) for the requester. This model deals with the disadvantages of traditional online forum systems. The mechanism actively recommends the most helpful experts with willingness to solve the given problem. Accordingly, questions cannot be ignored and they are resolved in a short time via the shortest social path.

The remaining part of this paper is organized as follows. Section 2 introduces related works, followed by the whole framework in Section 3. Section 4 describes the experiments, data source, data statistics, and the results and evaluations of the experiments. Section 5 concludes and offers suggestions for further research.

2. Literature review

2.1. Online forum

An online forum is a Web application for holding discussions and posting user-generated content in a specific domain, such as sports, recreation, techniques, and travel. People participating in an online forum may cultivate social bonds, and interest groups for a particular topic may form from the discussions. Forums contain a huge amount of valuable user-generated content on a variety of topics. It is highly desirable if the human knowledge contained in user-generated content in forums can be extracted and reused (Chen, Zeng, & Liu, 2006). Forums have been used for knowledge management in organizations, such as course forums in schools, employees' work diaries and discussion boards in enterprises, online news editor forums, etc. (Lichtner, Kounkou, Dotan, Kooken, & Maiden, 2009; Pendergast, 2006; Updegrove, Smith, & Bollentin, 1988). To take advantage of the abundant knowledge available, researchers have started to construct expert networks and Question Answering (QA) search systems in online forums (Chen et al., 2006; Hu & Elamy, 2007; Zhang, Wu, Wang, & Huang,

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[1] http://2ch.net/.
[2] http://www.tianya.cn/.
[3] http://www.gaiaonline.com/.
[4] http://www.ign.com/.
[5] http://www.gamefaqs.com/.
[6] http://www.ibm.com/ibm/ibmforum/.
[7] http://research.microsoft.com/.