B. Chang et al. (Eds.) (2010). Joint Proceedings of the Work-in-Progress Poster and Invited Young Researcher Symposium
at the 18th International Conference on Computers in Education. Putrajaya, Malaysia: Asia-Pacific Society for Computers in Education.

Applying a Proposed Recommendation System to Facilitate Web Search in Professional Community

Chia-Jung Chang, Kuo-Ping Liu & Chen-Chung Liu
Graduate Institute of Network Learning Technology, National Central University, Taiwan
baileysrong@gmail.com

Abstract: Web search has become an essential pathway to getting information which assists learners to acquire new knowledge and solve problems. However, web search is rather complex and challenging and learners may not acquire valuable information they really need. Recommendation systems are designed to facilitate learner's web search and proved to be efficient. Nevertheless, few recommendation systems have so far been developed to facilitate learners to use precise keywords in specific field. In this paper, an empirical study is developed to evaluate whether a proposed recommendation system can facilitate learners in professional community to use keywords precisely.

Keywords: Web Search, Recommendation Systems, Association Rules

Introduction

With the rapid development of information technology in recent years, web-based learning has been increasingly promoted in education settings. Due to the abundant web content, learners consider web search an essential pathway to getting information which assist them to acquire new knowledge and solve problems [13]. Studies also indicate that web search can facilitate learners to view things in different perspectives and cultivate the problem-solving ability[2][7].

Since the World Wide Web (WWW) is an open-ended environment, web search is rather complex and challenging [5]. For example, since anyone can post any information on the WWW, information is unreliable and incomplete [10]. Learners have to evaluate the reliability of the source and this may lead to learner's heavier cognitive load [13]. In addition, learners may have disorientation problems [6], which means learner have no idea what and how to search useful information [12][13]. Moreover, learners may find it more challenging to use precise keywords for searching in specific fields due to insufficient prior knowledge. As a result, learner's searching will be interrupted and learner's motivation will be decreased. Hence, it is critical to develop mechanism to facilitate learners to web search and extract information in the web-based learning context.

Several studies indicated that recommendation system is one of the most successful techniques to help learners find valuable contents [5][3]. A recommender system is a technique that recommends useful information or strategies that learners may adopt for web search. Many researchers have developed recommendation mechanisms like content-based filtering [3][10] and collaborative filtering [4][8]. Content-based filtering provides suggestions to a learner according to her past search record. Unlike content-based filtering,

collaborative filtering provides recommendations on the basis of a community of learners who have similar search record. With the benefit of the mechanisms above, learner's problems of information overload, disorientation and keywords using can be alleviated to some extent by receiving more precise suggestions [1]. However, few studies have so far been done to use recommend system to facilitate learners to use precise keywords in specific field. Hence, the purpose of this study to evaluate whether a designed recommend system can help learners acquire desired information in the professional community.

Method

1. Participants

Participants are 28 graduate students with e-learning background of a university in Taiwan. Their ages ranged from 22 to 27 years old, and 12 are males while 16 females. All participants are categorized first year students (17) and second year students (11).

2. Procedure

This study adopts quasi-experimental method which includes the pretest and the posttest, and each participant was asked to conduct two activities. All participants implements ISI Web of Knowledge as the platform in the first activity and recommendation system [9] in the second activity. Participants have to complete assigned task and fill in the proposed questions. The time span of each activity is 90 minutes.

3. System design

The proposed system used data mining technology which extracted the relationship and tacit pattern from stacks of data. Association rule approach, one of the data mining technologies, was used in the system to analyze the relations among keywords. A relationship model among keywords, which were filtered from fifty thousand papers of 118 journals, could be further constructed.

As to information retrieval, TF-IDF (Term Frequency-Inverse Document Frequency) was used to evaluate how important a word is to a paper. The importance of keyword increased proportionally to the number of times the keyword appeared in the paper. To recommend learners more suggestive keywords, association rule mining, based on the Apriori algorithm, was used to construct a relationship model. The system could calculate association values among the keywords filtered from the abstract and the keywords provided by authors. Thus, the system would decide the most relevant keywords for recommendation. Values of Support and Confidence technique were further adopted to provide learners most relevant keywords. For instance, when leaners input a keyword 'community', the system would present all associative keywords with four categorizations evaluated by the result of Support and Confidence, as illustrated in Figure 1.

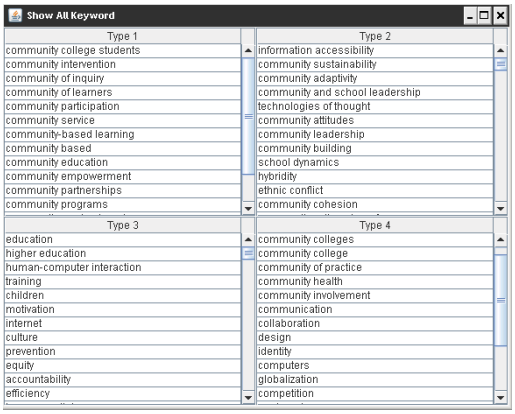

Figure 1. Result of recommendation system

4. Instruments

The questionnaire was adapted from Tsai's Online Information Searching Strategy [11] and revised in order to evaluate whether recommendation system affect learner's online searching strategies. Participant's information-searching processes were recorded by Camtasia Recorder, an on-screen capture software. After the activity, participants were asked to fill out the questionnaires for further analysis.

Acknowledgements

This research was partially funded by the National Science Foundation under 99-2631-S-008 -003 -.

References

[1] Arasu, A., Cho, J., Garcia-Molina, H., Paepcke, A., & Raghavan, S. (2001). Searching the Web. *ACM Transactions on Internet Technology*, 1(1), 2-43.

[2] Brand-Gruwel, S., Wopereis, I., & Walraven, A. (2009). A descriptive model of information problem solving while using internet. *Computers and Education*, 53(4), 1207-1217.

[3] Burke, R. (2002). Hybrid recommender systems: survey and experiments. *User Modeling and User-Adapted Interaction*, 12, 331-370.

[4] Chen Y. L., Cheng, L. C., Chuang, C. N. (2008). A group recommendation system with consideration of interactions among group members. *Expert Systems with Applications*, 34(3), 2082-2090.

[5] Cho, Y. H., & Kim, J. K. (2002). Application of Web usage mining and product taxonomy to collaborative recommendations in e-commerce. *Expert Systems with Application*, 26, 233-246.

[6] Dias, P., Gomes, M. J., & Correia, A. P. (1999). Disorientation in hypermedia environments: Mechanisms to support navigation. *Journal of Educational Computing Research*, 20(2), 93-117.

[7] Jonassen, D. H., Howland, J., Moore, J., & Marra, R. M. (2003). *Learning to solve problems with technology: A constructivist perspective*, 2nd. Ed. Columbus, OH: Merrill/Prentice-Hall.

[8] Kim, J. K., Kim, H. K., & Cho, Y. H. (2008). A user-oriented contents recommendation system in peer-to-peer architecture. *Expert Systems with Applications*, 34(1), 300-312.

[9] Liu, C. C., Fan-Chiang, S. H., Chou, C. Y., & Chen, S. Y. (2009). Knowledge exploration with concept association techniques, *Online Information Review*.(Accepted)

[10] Mooney, R. J., & Roy, L. (2000). Content-based book recommending using learning for text categorization. In Proceedings of the Fifth ACM Conference on Digital Libraries, San Antonio, Texas, ACM Press, 195-204.

[11] Tsai, C. C. (2009). Conceptions of learning versus conceptions of web-based learning: The differences revealed by college students. *Computer and Education*, 53(4), 1092-1103.

[12] Tsai, M. J. (2009) ,Online Information Searching Strategy Inventory (OISSI): A quick version and a complete version. *Computers and Education*, 53(2), 473-483.

[13] Walraven, A., Brand-Gruwel, S., & Boshuizen, H. P.A. (2009). How students evaluate information and sources when searching the World Wide Web for information. *Computers and Education*, 52(1), January 2009, 234-246.