Effective User Navigability Through Website Structure Reorganizing using Mathematical Programming Model

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Abstract: Website design is easy task but, to navigate user efficiently is big challenge, one of the reason is user behavior is keep changing and web developer or designer not think according to user’s behavior. Designing well structured websites to facilitate effective user navigation patterns has long been a challenge in web usage mining with various applications like navigation prediction and improvement of website management. This paper addresses how to improve a website without introducing substantial changes. Specifically, we propose a mathematical programming model to improve the user navigation on a website while minimizing alterations to its current structure. Results from extensive tests conducted on a publicly available real data set indicate that our model not only significantly improves the user navigation with very few changes, but also can be effectively solved. We have also tested the model on large synthetic data sets to demonstrate that it scales up very well. In addition, we define two evaluation metrics and use them to assess the performance of the improved website using the real data set. Evaluation results confirm that the user navigation on the improved structure is indeed greatly enhanced. More interestingly, we find that heavily disoriented users are more likely to benefit from the improved structure than the less disoriented users.

Keywords: Navigation, Website, MP Model.

I. INTRODUCTION

The advent of the Internet has provided an unprecedented platform for people to acquire knowledge and explore information. There are 1.73 billion Internet users worldwide as of September 2009, an increase of 18 percent since 2008. The fast-growing number of Internet users also presents huge business opportunities to firms. According to Grau, the US retail e-commerce sales (excluding travel) totaled $127.7 billion in 2007 and will reach $218.4 billion by 2012. In order to satisfy the increasing demands from online customers, firms are heavily investing in the development and maintenance of their websites. Internet Retailer reports that the overall website operations spending increased in 2007, with one-third of site operators hiking spending by at least 11 percent, compared to that in 2006. Despite the heavy and increasing investments in website design, it is still revealed, however, that finding desired information in a website is not easy and designing effective websites is not a trivial task. Galletta et al. indicate that online sales lag far behind those of brick-and-mortar stores and at least part of the gap might be explained by a major difficulty users encounter when browsing online stores.

Palmer [8] highlights that poor website design has been a key element in a number of high profile site failures. McKinney et al. also find that users having difficulty in locating the targets are very likely to leave a website even if its information is of high quality. A primary cause of poor website design is that the web developers’ understanding of how a website should be structured can be considerably different from those of the users. Such differences result in cases where users cannot easily locate the desired information in a website. This problem is difficult to avoid because when creating a website, web developers may not have a clear understanding of users’ preferences and can only organize pages based on their own judgments. However, the measure of website effectiveness should be the satisfaction of the users rather than that of the developers. Thus, Web pages should be organized in a way that generally matches the user’s model of how pages should be organized. Previous studies on website has focused on a variety of issues, such as understanding web structures, finding relevant pages of a given page, mining informative structure of a news website, and extracting template from webpages. Our work, on the other hand, is closely related to the literature that examines how to improve website navigability through the use of user navigation data.

Various works have made an effort to address this question and they can be generally classified into two categories: to facilitate a particular user by dynamically reconstituting pages based on his profile and traversal paths, often referred as personalization, and to modify the site structure to ease the navigation for all users, often referred as transformation. In this paper, we are concerned
primarily with transformation approaches. The literature considering transformations approaches mainly focuses on developing methods to completely reorganize the link structure of a website. Although there are advocates for website reorganization approaches, their drawbacks are obvious. First, since a complete reorganization could radically change the location of familiar items, the new website may disorient users. Second, the reorganized website structure is highly unpredictable, and the cost of disorienting users after the changes remains unanalyzed. This is because a website’s structure is typically designed by experts and bears business or organizational logic, but this logic may no longer exist in the new structure when the website is completely reorganized. Besides, no prior studies have assessed the usability of a completely reorganized website, leading to doubts on the applicability of the reorganization approaches. Finally, since website reorganization approaches could dramatically change the current structure, they cannot be frequently performed to improve the navigability.

Recognizing the drawbacks of website reorganization approaches, we address the question of how to improve the structure of a website rather than reorganize it substantially. Specifically, we develop a mathematical programming (MP) model that facilitates user navigation on a website with minimal changes to its current structure. Our model is particularly appropriate for informational websites whose contents are static and relatively stable over time. Examples of organizations that have informational websites are universities, tourist attractions, hospitals, federal agencies, and sports organizations. Our model, however, may not be appropriate for websites that purely use dynamic pages or have volatile contents. This is because a steady state might never be reached in user access patterns in such websites, so it may not be possible to use the weblog data to improve the site structure. In summary, this paper makes the following contributions. First, we explore the problem of improving user navigation on a website with minimal changes to the current structure, an important question that has never been examined in the literature.

We show that our MP model not only successfully accomplishes the task but also generates the optimal solutions surprisingly fast. The experiments on synthetic data indicate that our model also scales up very well. Second, we model the out-degree as a cost term in the objective function instead of as hard constraints. This allows a page to have more links than the out-degree threshold if the cost is reasonable and hence offers a good balance between minimizing changes to a website and reducing information overload to users. Third, we propose two evaluation metrics and use them to assess the improved structure to confirm the validity of our model. The evaluation procedure developed in this paper provides a framework for evaluating website structures in similar studies.

II. EXISTING SYSTEM

A primary cause of poor website design is that the web developers’ understanding of how a website should be structured can be considerably different from those of the users. Such differences result in cases where users cannot easily locate the desired information in a website. This problem is difficult to avoid because when creating a website, web developers may not have a clear understanding of users’ preferences and can only organize pages based on their own judgments. However, the measure of website effectiveness should be the satisfaction of the users rather than that of the developers. Thus, Web pages should be organized in a way that generally matches the user’s model of how pages should be organized.

III. PROPOSED SYSTEM

We propose a mathematical programming model to improve the user navigation on a website while minimizing alterations to its current structure. Results from extensive tests conducted on a publicly available real data set indicate that our model not only significantly improves the user navigation with very few changes, but also can be effectively solved. In addition, we define two evaluation metrics and use them to assess the performance of the improved website using the real data set. Evaluation results confirm that the user navigation on the improved structure is indeed greatly enhanced. More interestingly, we find that heavily disoriented users are more likely to benefit from the improved structure than the less disoriented users.

IV. ARCHITECTURE

Fig 1.

V. ALGORITHM

Mining Candidate Link Algorithm
Input: Pi – Users Profile data
Output: Links that can be use for redesign
Steps-
1: We identify the usage pattern of users λ from Pi = {P1, P2, …., Pm} set for user Ui to get link Pm
2: For every access link set obtain the set of candidate links {C1, C2,…..Cp}
3: For all users and their all access link set obtain the set of candidate links.
4: Obtain the Dice’s similarity coefficient for all candidate link set.
5: Apply KNN classifier.
6: Then the links having problem for maximum number of users are selected for redesign the website.
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In this paper we proposed a MP model to improve navigation effectiveness of a website while minimizing changes to its current structure. Our model is particularly appropriate for informational websites whose contents are relatively stable overtime. It improves website rather than reorganize it hence it is suitable for website maintenance on a progressive basis. Our model has a constraint for out degree threshold which is motivated by cognitive reasons. The model can be further improved by incorporating additional constraints that can be identified by incorporating additional constraints that can be identified using data mining methods.

VI. CONCLUSION

VII. REFERENCES