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Bridging Versioning and Adaptive Hypermedia in the Dynamic Web

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Abstract. Web Dynamics has been recently considered in the context of the analysis of how people search and re-search information on the web. There are lots of challenges and opportunities when considering user behaviour. In this paper we propose the way to tackle some of them by applying versioning methodologies (as a backend solution) in the context of content changes, user re-visitations and re-searches on the web, as well as Adaptive Hypermedia (AH) techniques to overcome visualisation issues (as a frontend solution). Essentially we bridge versioning and AH in the field of Web Dynamics showing how versioning helps to make the adaptation scrutable.

Keywords: adaptive hypermedia, versioning, web dynamics, user modelling.

1 Introduction

In a dynamic information environment such as the Web the understanding of the constantly evolving content is becoming an issue [1]. The main problem is that user behaviour is influenced by the fact that changes to the content are observed. These changes may cause re-visitation and re-searches for the “same” information.

In order to cope with the information overload issues, changes and evolving structures on the web we may think of using versioning approaches and technologies. Besides this, the rates of web re-visitations and re-searches (which are estimated to be very high [1, 3], e.g. re-visitation rates are about 50-80%) incite us to investigate versioning in the area of user visitation and search behaviour.

We essentially consider a number of scenarios of bridging versioning methodologies with AH. The first one is the backend solution, which employs conventional source control approaches. Secondly, we consider the front-end solution that uses AH methods and techniques, presenting versioned information to the user. And as a result we think that these two can be merged moving towards an intelligent versioning cache system or a proxy that would serve as an Adaptive Hypermedia System (AHS) and would function as a proxy between a conventional web information system and a user (user profile) retrieving, dispatching and presenting adapted information (web content, user queries, sites visited).

2 Versioning to Support AH in a Dynamic Web Environment

Considering the basic concepts of versioning we can come up with the following classes of operations which will reflect typological and structural types of changes and capture changes in the dynamic web environment. The following taxonomy of changes was extended in the field of AH [4]. Here we extend and elaborate it in terms of Web Dynamics, describing properties and potentials of versioning operations which could be used mostly as a backend solution to store, keep track of changes and retrieve them for further analysis: **Transformation** – is a set of actual changes; **Conceptual changes** – refer to changes of the structure, relationships or presentation aspects; **Descriptive changes** – dealing with metadata describing the intentions, user or author credentials, and reasoning behind the changes; **Context changes** – describe the environment in which the current update occurs and the environment where it is valid.

Much stress has been placed on the visualization part of re-searches and re-visitation cases, presenting mostly ‘historical’ snippets in the search result list or browser extensions which highlighted the difference in the newer versions of the document [3]. We take a look at the visualization issues throughout AH research and use content and presentation adaptation techniques introduced there [5] in order to support versioning visualisation. At the same time one may consider different versions of some content and apply the same techniques from the AH field taking into account the fact that different versions just represent the different variants of the same fragment as it is done in AHS.

3 Use-Case: User Web Activity in a Versioned Environment

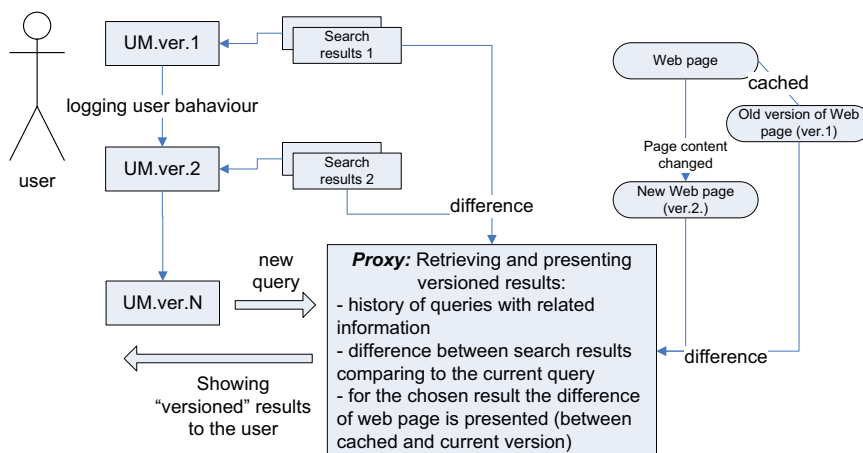


Fig. 1 User web activities in versioned environment

In Fig. 1 we present a use-case bridging versioning approaches used to track user activities in the dynamic web environment with the AH presentation of the versioned content (e.g. user search results history, changes in web pages, etc.).

We have a user, who searches and browses through the web. The initial state of UM (UM.ver.1) starts accumulating search and visitation history. As the user continues the interaction he posts a new query. An Adaptive Proxy retrieves the previous state of UM and search queries and result lists with changes to UM. These changes are processed and compared to be presented, providing an opportunity to see what other related queries and results he has already done. As a result actual changes of a particular page can be retrieved and presented using AH techniques. Search results could also be presented using AH techniques and re-arranged according to a new global or personalized ranking that may change over time for various reasons.

4 Innovative Aspects and Prospective Solutions

Here we would like to conclude and outline the advantageous, innovative aspects and prospective versioning solutions in web dynamics. These are the following:

System Design and Authoring – versioning helps to create, maintain, re-use, reconcile concurrent versions of an application, model or a particular property or value, saving authoring and design effort.

Storing – versioning provides an efficient way to store changes, label and annotate them. It facilitates convenient, hierarchical structure presentations and offers a number of operations to handle it.

System Maintenance and Support – structured changes and a number of operations (e.g. merge, resolve, etc.) are sufficient to maintain and reconcile application conflicts, inherit functionality between system versions.

Logging – logging changes provides flexible playback possibilities and can serve as a basis for system analysis. Logging user updates will provide a ground for user behaviour comparison.

Analysis – step-by-step system and user behaviour analysis is facilitated. Versioning which provides hierarchical incremental logs exploits the transparency of the system functionality and evolution of the user web environment.

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