Multi-modal Presentation of Changes in Web Repositories

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Abstract: Information in Web repositories changes dynamically and unpredictably. At the same time, the scale of Web repositories is increasing every second. In most cases, users of the World Wide Web have to deal with the huge information sources without any idea whether when the information they have perceived will be changed. This results from the form of information system. Most of the information sources in Web repositories are stock type where information access is in pull mode. We are developing a system that keeps monitoring the Web pages, analyzing the changes, notifying user of the change, and providing an easy to understand. In order to produce an easy to access presentation, we choose to provide multi-modal presentation for the changes detected by our agent. In this work, we present the transformation of change information to an intermediate form of multi-modal presentation, which is accessible to currently available applications.

Introduction

The Web repositories are exposed to us in form of a huge amount of heterogeneous information sources. Therefore, the information is overwhelming the users. Besides the target information itself, the changes upon the previously released information are significant and worth being notified to those who perceived the out of date information as soon as possible. This also includes the lessons provided on the Web in remote learning system. The updated information or addition should be made freely and regardless of updating announcement. Unfortunately, most of information sources in the Web repositories have no mechanism for delivering changes to those who would like to know. We have been developing a system that keep monitoring and creating comprehensive presentation of the changes. As a result for the above example, the lesson developers can focus only on the contents.

In our system, we provide the summary of changes by multi-modal presentation. The detected changes are compiled into an intermediate HTML document with presentation script, which can be interpreted by Microsoft Agent. With this script the user can learn the changes easily by asking the presentation agent by voice as well as reviewing the hypertext presentation with highlighted changes.

Architecture

The service is provided openly on the Web. Each user accesses the service via the Internet using any browser with Java Virtual Machine. Requests can be made directly to the Service Agent which is the front end of the service. The functions of main modules can be listed as follows:

- Resource Manager: This module handles All resources for the service. It keeps the results from the HTML Difference Engine in the archives.
- Service Threads: Each Web page monitoring request will be handled by a service thread. The thread keep monitoring and comparing revisions of the Web page.
- Service Agent: This is the heart of the service that interacts with users and other modules in order to retrieve and compare Web pages.
- HTML Difference Engine: The service threads implement the Difference Engine in order to compare the content of updated pages and see whether there are significant changes in them. At the same time, it will summarize the updated information into another HTML document, which contains a multi-modal presentation script for Microsoft Agent.

Change Monitoring

Each user starts the service by telling the URLs of target pages, frequency of monitoring, and a notification threshold to the Service Agent. A new service thread will be created in order to serve the request. The thread retrieves the pages according to the specified frequency and compares the revisions by the HTML Difference Engine. The results of HTML can be divided into 2 types. The first type is the decision whether the changes are significant enough to be notified to the user. The Difference Engine evaluates the change according the change categories defined in [1]. All of the changes are given scores. If the sum of these scores exceeds the notification threshold, the user will be notified of the changes via Email. The second one is the summarize page in HTML format which contains multi-modal presentation script. Once a user is notified of the changes via email. He can access the summary page by using any browser that supports Microsoft Agent. At this point, the script will be interpreted and the presentation agent appears on the screen.

Multi-modal Presentation of Changes

We attempt to compile both new and old versions of the revisions together with the change actions into one page. In order to create comprehensive presentation we consider providing the following information in every summary page:

- Existence of contents: The icon that shows the addition will be placed next to the added images or links found in the new revision. At the same time, we try to display the deleted images and links respectively. In the same manner, the icon that shows the deletion will be placed next to the deleted images or links.
- Context changes: We implement the method called "Longest Common Tag Sequence" introduced in [1] to locate the exact start points for comparing context in structured text like HTML document. With the information of start points for context comparing, we can apply the LCS (Longest Common Subsequence) to find the context changes. We can highlight the added words by underline typeface and the deleted words by stroke typeface.
- Microsoft Agent script: The information mentioned above is compiled into conversation model for Microsoft Agent. The user can ask the presentation agent about the number of image, link, and Java applet changes and how the changes occur on the new page.

With this presentation, the user can easily jump from one change to another. The multi-modal presentation enhances the readability of summary of change and makes the change reviewing easier.

Summary

We presented the mechanism of the system that provides Web repository change monitoring and displaying service. The system automatically creates comprehensive multi-modal presentation scripts when it found changes. Such script contains necessary information for a presentation tool like Microsoft Agent. As a result, the users spend less time to learn what have been changed in the page revisions by the conversation with the presentation agent, as well as looking to the hypertext presentation in the summary pages.

References

[1] Santi Saeyor and Mitsuru Ishizuka: WebBeholder: A Revolution in Tracking and Viewing Changes on The Web by Agent Community, in proceedings of WebNet98, 3rd World Conference on WWW and Internet, Orlando, Florida, USA, Nov. 1998.

[2] Fred Douglis, Thomas Ball, Yih-Farn Chen and Eleftherios Koutsofios: The AT&T Internet Difference Engine: Tracking and viewing changes on the web, World Wide Web Volume 1 Issue 1, 1998. pp. 27-44

[3] Fred Douglis: Experiences with the AT&T Internet Difference Engine 22nd International Conference for the Resource Management & Performance Evaluation of Enterprise Computing System (CMG96), Dec. 1996.