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May 06, 2019

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Recommended Citation

Carbune, Victor; Keysers, Daniel; and Deselaers, Thomas, "User interface with automatic highlighting of content updates", Technical Disclosure Commons, (May 06, 2019)
https://www.tdcommons.org/dpubs_series/2178



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User interface with automatic highlighting of content updates

ABSTRACT

Users that visit websites or other content at different times often see content with minor updates. For example, a shopping website may display a list of items and corresponding prices, and the prices may change between multiple user visits. While some websites include built-in functionality to notify users of such changes, no general purpose solution is available to alert users. This disclosure describes techniques to detect the context of a user visit to a website or other content, and determine changes to the webpage since a prior visit. With user permission, the UI of the website is modified to highlight the differences or the changes are indicated to the user, e.g., via a notification. Data from user visits is obtained and stored with user permission in order to determine changes.

KEYWORDS

- Web browser
- Site content
- Price update
- Price change
- Content highlighting
- Time-lapse user interface

BACKGROUND

Website content is often updated between multiple user visits that occur at different times. For example, a shopping website may update prices (or other parameters) of various items between consecutive user visits. Such changes are not readily made visible and often go

unnoticed. For example, when a website displays prices for a large number of items, e.g., flight tickets, there is no easy way for a user to determine the change in prices of individual items. For example, if the price of a particular flight goes up or down between two user visits, no indication of this change is provided to the user.

DESCRIPTION

The disclosure describes techniques to determine changes to the contents of a website that take place between user visits and provide a user interface that highlights the changes. The techniques can be implemented, e.g., in a web browser application, an operating system, etc. The techniques are implemented only upon specific user permission to detect context of visit to a website, to store data from site visits, and to modify the display of content. Users are provided with options to turn off or restrict use of the techniques. For example, the user may turn off the techniques for specific websites, on certain user devices, for a particular time period, and so on. Users can also turn off the techniques entirely or choose to not enable it.

When the user provides permission, techniques to highlight changes to website content can be implemented as follows:

Determination of context and identification of content to track for updates

The context of visit to the website is determined and the content that is relevant to track for updates is identified. For example, depending on the type of the user interface, extracting the content of the webpage can be performed by a combination of analysis of the document structure of the web page, visual analysis of a displayed page, e.g., using optical character recognition, etc. The content that is relevant to track for updates can be identified by analyzing the displayed information (e.g., a currency value vs. descriptive text), comparison of changes to the page between visits, machine learned triggering components, etc.

Further, determination of the changes is performed even when user visits take place across different UI views, e.g., a first visit via a desktop browser and subsequent visits via a mobile browser or mobile application. The context of a visit is determined based on the URL and interactions that happen dynamically e.g., the user performing a search for a product. The search parameter may or may not be included in the URL. Hashing of the displayed content can be performed, or interaction processing can be used. Further, learned vector embeddings can also be applied. Still further, the context can also include searches for the same product on different websites. The changed content can be in the form of text, images, etc. that are part of a webpage or mobile app user interface.

Storage of data about user visits, including context and page content

With user permission, the context of the visit and the content (or a subset of the content or a suitable summary, etc.) of the website or application is stored in encrypted form. The data can be stored locally on a user device, or on a server, if permitted by the user. The stored data can be utilized to identify changes at the time of a subsequent visit.

Comparison with past data

When the user visits a website for which past data has been stored, it is determined whether the context is the same, e.g., using machine learning techniques. Determination of the context in this manner allows generating UI highlights in a responsive manner.

Determination of differences

When it is determined that the context to the website is the same or sufficiently similar, pairs of values are determined from past data and from the present visit. The difference between the values is identified and it is determined whether the difference is to be presented to the user.

For example, a machine learning model can be trained using annotated data that includes examples of differences that are suitable for presentation via UI highlights and other examples where the differences need not be presented to the user. Alternatively, the model can be trained by presentation of a user interface with different numbers and determining whether the difference is of interest to the user.

Highlighting updates between visits in the user interface

The differences can be presented to the user based on the user interface and interaction mechanism used by the website or application. For example, differences can be shown in extracted form (e.g., “flight price went up from \$150 from your previous visit to \$170 at present”), via screenshots that show the comparison, by highlighting the page, etc.

Content providers such as website and mobile applications can choose to opt-in for implementation of these techniques, e.g., enable history for their application or website. The techniques are utilized only when user permits matching previous visits to current visits, and therefore, are not applied, e.g., when the user operates a web browser or application in an anonymous mode. Further, users are provided with options to share data with other trusted users. For example, a user may share with a spouse, such that visits by either of the users to the content can trigger the techniques to determine and display changes. For example, a user and their spouse may visit a shopping website at different times, and the user can be provided an indication such as “your spouse saw this apartment listing yesterday when it was \$2000 higher.”

Example of use

An example in which changes to website content between visits are identified and displayed is illustrated in Fig. 1. The user visits a website at a first time and views a page for a smartphone that lists the price as \$500 (102). At a subsequent visit (104), the price of the

smartphone drops to \$400. The drop in price is highlighted, e.g., by the browser application, as shown in Fig. 1. In this example, the user has provided permission to cache information from a prior visit to the website and access information from the current visit, which enables the browser application to determine and highlight the price change. Other types of content updates, e.g., changes to a bonus points or other account, updates to ratings of businesses, etc. can also be highlighted. Non-substantive changes, e.g., updates to date or time are not highlighted. In certain cases, highlighting can be provided for items that did not change between visits, if it is determined from the context that such highlighting can provide benefit to the user.

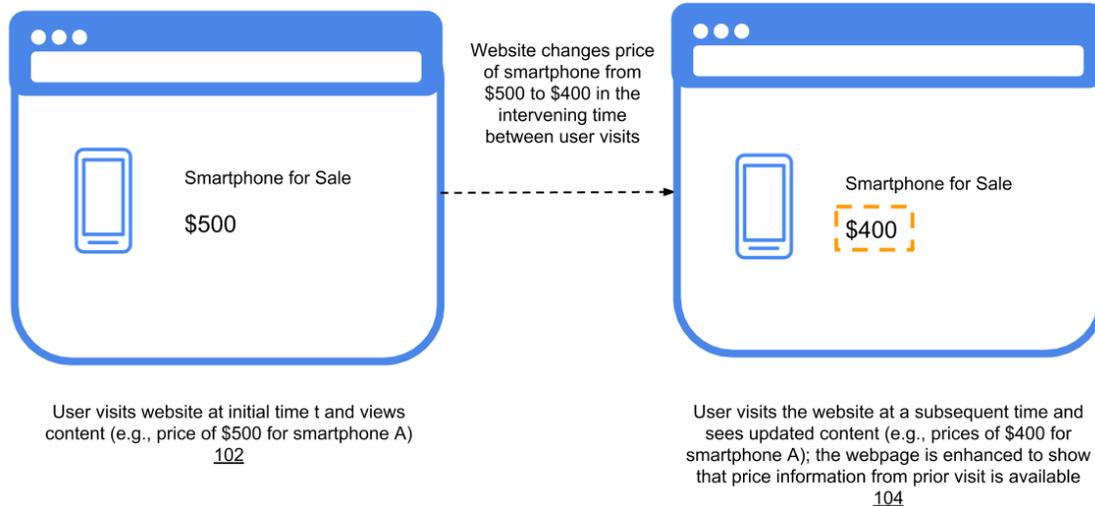


Fig. 1: Automatic detection and highlighting of differences between visits

The described techniques are implemented with specific user permission. If the user denies permission, no analysis of content is performed and no data is stored from content viewed by a user. Users are provided with options to turn off use of the techniques. The techniques can be implemented as part of a browser application, operating system, or other application. The techniques can be implemented without modification to the website or application, and can enrich the functionality of the browser. While certain websites such as flight search websites or e-commerce portals include functionality to indicate prices changes, these require developers to

build such functionality. By implementing the described techniques in a browser application that renders website content, such functionality can be provided without changes to the website.

Further to the descriptions above, a user is provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein enable collection of user information (e.g., information about a user's social network, social actions or activities, profession, a user's preferences, or a user's current location), and if the user is sent content or communications from a server. In addition, certain data is treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity is treated so that no personally identifiable information can be determined for the user, or a user's geographic location is generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. Thus, the user has control over what information is collected about the user, how that information is used, and what information is provided to the user.

CONCLUSION

Users that visit websites or other content at different times often see content with minor updates. For example, a shopping website may display a list of items and corresponding prices, and the prices may change between multiple user visits. While some websites include built-in functionality to notify users of such changes, no general purpose solution is available to alert users. This disclosure describes techniques to detect the context of a user visit to a website or other content, and determine changes to the webpage since a prior visit. With user permission, the UI of the website is modified to highlight the differences or the changes are indicated to the user, e.g., via a notification. Data from user visits is obtained and stored with user permission in order to determine changes.