

# Partial Bookmarking: A Structure-independent Mechanism of Transclusion for a Portion of any Web Page

Takehiro Nagatomo      Takahiro Tachibana      Keizo Sato      Makoto Nakashima

Dept. of Computer Science and Intelligent Systems, Oita University

700 Dannoharu, Oita-shi, 870-1192, Japan

{v16e3013, v1353041, k-sato, nakasima}@oita-u.ac.jp

## ABSTRACT

A novel mechanism of transclusion for collecting and producing information on the Web, named *partial bookmarking*, is proposed. Partial bookmarking allows a user to collect portions of any web page by making it able to use for a spatial hypertext, like a web document element, without the need to duplicate its contents. Whereas the previous studies involving transclusion required pre-designed linkable objects, such as XML elements or HTML objects, partial bookmarking does not rely on any document structure. To accomplish partial bookmarking, we enhanced a conventional web browser with multiple tabs by introducing the technology of *mirroring* to display only a portion of a web page appropriately while factoring in potential copyright issues.

## Author Keywords

Partial bookmarking; Transclusion; Spatial hypertext

## ACM Classification Keywords

H.5.4 [Information Interface and Presentation]:  
Hypertext/Hypermedia – *Architectures, Navigation, User issues*

## INTRODUCTION

The World Wide Web (WWW) provides the indispensable environment for collecting and producing information on a daily basis. Transclusion [4] is a technique enabling authors to include portions of existing contents into their own documents without duplicating any content. We here propose the mechanism of transclusion, named *partial bookmarking*, and introduce an enhanced web browser to utilize it for authoring a spatial hypertext. Partial bookmarking makes transclusion available regardless of the document structure which is presupposed in many previous studies [2,3] involving modularized documents written in languages for hypertext such as XML, XLink, or HTML. Our approach takes a way of *mirroring* a portion of a web page from the user's web browser to a spatial hypertext.

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the Owner/Author.

Copyright is held by the owner/author(s).

UIST'16 Adjunct, October 16-19, 2016, Tokyo, Japan

ACM 978-1-4503-4531-6/16/10.

<http://dx.doi.org/10.1145/2984751.2984761>

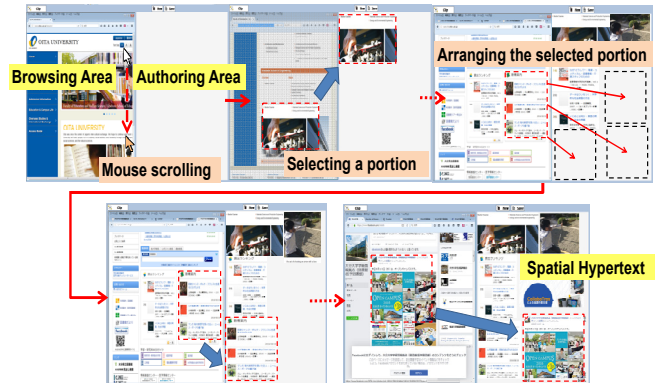


Figure 1. An example situation of partial bookmarking

This approach provides a great advantage in that the user can collect any portion of a web page, even if it is a part of an image or a scene within a movie. There is also no infringement of copyright in producing the spatial hypertext on the WWW.

## PARTIAL BOOKMARKING

Figure 1, in brief, shows an example situation of partial bookmarking via our early version of the enhanced web browser. There are two areas: browsing area and authoring area. The former includes a web browser with multiple tabs, where the user visits the web page and browses its content on a web browser, and then selects a single portion of the web page, e.g. a part of an image and text, which the user is interested in and wants to access again later. The selected portion is able to be arranged to create the spatial hypertext and when the user needs on the latter area. As shown in the figure, partial bookmarking is proceeded by selecting the portion and recording it as an element of a spatial hypertext just as it is.

## Partial Bookmark

To identify the portion of the web page, the shortcut, called *partial bookmark*, is composed of two types of information: *location* and *action* information. The former includes the URL of the web page and the coordinates of the region of the portion on a web browser. The latter includes the information about the sequence of events that occurred on the web browser, e.g., button down or scroll down, which were performed when the user found the portion including the required information. Figure 2 shows the version of DTD defining the syntax and structure to represent the

```

<!ELEMENT PB (Location_information, Action_information)>
<!ELEMENT Location_information (url, portion)>
<!ATTLIST Location_information id NMTOKEN #REQUIRED>
<!ELEMENT url (#PCDATA)>
<!ELEMENT portion EMPTY>
<!ATTLIST portion upper_left_x CDATA #REQUIRED
  upper_left_y CDATA #REQUIRED lower_right_x CDATA #REQUIRED
  lower_right_y CDATA #REQUIRED>
<!ELEMENT Action_information (event+)>
<!ATTLIST Action_information id NMTOKEN #REQUIRED>
<!ELEMENT event (type, position?)>
<!ATTLIST event id NMTOKEN #REQUIRED>
<!ELEMENT type (mouse_event | key_event)?>
<!ELEMENT mouse_event (button_event|wheel_event)?>
<!ELEMENT button_event (#PCDATA)>
<!ELEMENT wheel_event (#PCDATA)>
<!ELEMENT key_event (#PCDATA)>
<!ELEMENT position EMPTY>
<!ATTLIST position x CDATA #REQUIRED y CDATA #REQUIRED>

```

**Figure 2. DTD of partial bookmark**

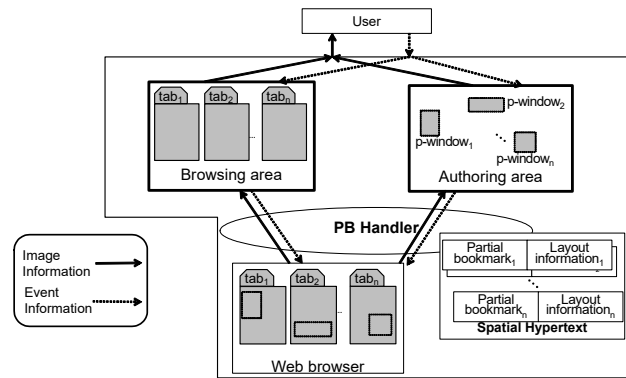
partial bookmark in XML. The element PB is the top element of partial bookmark. It contains two sub elements, i.e. Location\_information and Action\_information, for recording the pieces of the information explained above.

From the aspect of browsing the web pages, the user has to perform a considerable number of actions on the web browser in order to find useful information. If the portion is found after performing these actions, the URL of the web page is mandatory but insufficient to identify the portion. Our idea is to reproduce the actions on the web browser, which were performed by the user when s/he visited the web page, and to display only the portion on the web browser. Note that there is no necessity to analyze the web page structure and to record any source document of the reference web page for the partial bookmark. The portion to be bookmarked is shown in the spatial hypertext as it is displayed on the web browser.

### The Enhanced Web Browser

Figure 3 shows the architecture of the enhanced web browser. The browsing area allows the user to select the portions of any web page for creating partial bookmarks. The latter plays the role of an authoring place of a spatial hypertext, where a window, named *p-window*, for the portion identified by the partial bookmark can be arranged.

In the figure, each *p-window* is a window mirroring the portion of a web page, which is referred by a partial bookmark. For mirroring the portion, *PB handler* uses the techniques [1,5] of intervening image/event-information between the user and the web browser. Its primary role is to collect the location and action information when the user selects the portion on the web browser for partial bookmarking. Another role is to reproduce the events in the partial bookmark for mirroring only the portion identified by this bookmark to the *p-window* from the reference web page on the tabbed window. Thus the dynamic changes on the web page are always updated on the *p-window*. When the user is aware of the layout changes of the reference web page, s/he can revisit the page through the tabbed window to revise the partial bookmark.



**Figure 3. The architecture of the enhanced web browser.**

The spatial hypertext consists of some partial bookmarks and their layout information on the authoring area. The reference web pages for the spatial hypertext are always loaded on the tabbed windows of the web browser. Premising the use of the enhanced web browser to see the spatial hypertext, the user can broadcast it publicly without copyright infringement.

### CONCLUSION

We proposed a partial bookmarking which is different from the previous mechanisms of transclusion premising the document structure of the web page. In the preliminary case study using our early version of the enhanced web browser, the subjects tended to prefer to use the partial bookmark usage similar to the ordinary bookmark usage. Even when the same web pages were given as the reference web pages, the subjects could create unique spatial hypertexts.

### ACKNOWLEDGMENT

This work was partially supported by JSPS KAKENHI Grant Number JP25330236.

### REFERENCES

1. Abe, Y., Matsusako, K., Kirimura, K., Tamura, M., Nakashima, M. and Ito, T. Tolerant sharing of a single-user application among multiple users in collaborative work. In *Companion Proc. CSCW2010*, ACM Press (2010), 555-556.
2. Choi, J.-R., An, S., Lim, S.-B. Spatial hypertext modeling for dynamic contents authoring system based on transclusion. In *Proc. HT'14*, ACM Press (2014), 303-304.
3. Iorio, A.D. and Lumley, J. From XML inclusions to XML transclusions, In *Proc. HT'09*, ACM Press (2009), 147-156.
4. Nelson, T.H. *Literary Machines*. Mindful Press, Sausalito, CA, USA, 1990.
5. Sato, K., Adachi, Y., Nakashima, M. and Ito, T. A mechanism of trailing the footprint for the previously visited web pages to ease a meta-knowledge-based search. In *Proc. NBS2012*, IEEE (2012), 298-305.