

XLink and Open Hypermedia Systems: A Preliminary Investigation

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ABSTRACT

XLink is an emerging Internet standard designed to support the linking of XML documents. We present preliminary work on using XLink as an export format for the links of an open hypermedia system. Our work provides insights into XLink's suitability as a vehicle for extending the benefits of open hypermedia to the rapidly evolving world of XML.

KEYWORDS: XLink, open hypermedia export, XML, World Wide Web, Chimera

INTRODUCTION

Since the mid 1990's, researchers have been exploring the integration of open hypermedia and the World Wide Web [1, 3, 7, 10]. The World Wide Web offers limited but scalable hypermedia services through the use of standardized formats and protocols. Open hypermedia, on the other hand, provides advanced hypermedia services across an open set of applications and data types but cannot scale as well as the Web, nor is it as widely deployed. Integrating the two is an attempt to address the shortcomings of each with the strengths of the other. The limited hypermedia services of the Web are the result of the simplistic support for hypermedia concepts in the HTML format [12]. Links and anchors are unified into a single element, resulting in links that are little more than one-way pointers.

The Web's limited support for hypermedia is being addressed by a new generation of Internet standards centered on the Extensible Markup Language (XML) [4]. In particular, two standards XLink [9] and XPointer [8] promise to provide advanced linking and anchoring capabilities respectively to XML-enabled Web browsers [14]. As such, research is needed to explore the integration opportunities that these new standards provide to open hypermedia and, indeed, some work has occurred [5, 6].

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This paper presents preliminary work on using XLink as an export format for open hypermedia links.

EXPERIMENTAL DESIGN

We were motivated to explore XLink's ability to serve as an export format for open hypermedia links by the existence of Simon St. Laurent's LinkMap applet, which is part of his XLinkFilter project [13]. This applet has the ability to display images that have associated links and anchors defined by XLink specifications. The applet provides its functionality by processing an XML file (see below). These files contain one element that specifies the location of an image, and an arbitrary number of elements that define anchors (known as areas) on the image. Each area definition can have one or more links associated with it. These links, known as locators, specify the location of additional LinkMap XML files. LinkMap, therefore, supports the browsing of an interlinked set of images.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE map SYSTEM "map.dtd">
<map>
  <image src="boulder.gif" />
  <area id="mtns" content-title="mtns"
    shape="rect" coords="143,127,188,196">
    <extlocator href="bearpeak.xml"
      title="mtns - bearpeak" />
  </area>
  <area id="iris" content-title="iris"
    shape="rect" coords="45,74,132,152">
    <extlocator href="wildflowers.xml"
      title="iris - wildflowers" />
    <extlocator href="cutflowers.xml"
      title="iris - cutflowers" />
  </area>
</map>
```

We decided to test the linking capabilities of XLink by creating an interlinked set of images using an open hypermedia system and then exporting the images and links into XML files that can be processed by the LinkMap applet. We made use of the jimage client of the Chimera open hypermedia system [2] to create the test set of interlinked images. The experiment was performed by opening a set of images within jimage and creating a variety of n -ary links between them. Chimera's session manager was modified to provide an export operation that produced LinkMap XML files using the following

algorithm:

```
foreach jimage link
  foreach endpoint
    fetch name from endpoint's
    associated image object

foreach image
  create LinkMap XML file
  write image element
  foreach jimage link
    if current image is in this link
      write area element
      write locators for all other
      images in link
```

Note: the LinkMap applet requires all images and XML files to be in the same directory. This restriction currently requires a user to move the output created by the above algorithm and all associated image files into a single directory. Then, the path of one of the XML files must be supplied to the LinkMap applet for it to function correctly.

RESULTS

In our tests, we were able to create a wide range of interlinked image configurations within Chimera that all could be reproduced in the LinkMap applet. There are a number of presentation differences between the two applications (for instance jimage can display multiple images at once and can traverse to a particular anchor within an image, whereas LinkMap can display only one image at a time and the destination of its traversal is a whole image) but in each case the structure of the image web was preserved. As such, XLink has the potential to serve as a vehicle for exporting open hypermedia webs to the WWW when enough XML/XLink-enabled applications become available.

FUTURE WORK

Currently, the restriction of copying files to a single directory for use by the LinkMap applet is cumbersome. However, LinkMap allows use of URIs and HTTP to retrieve XML files located anywhere on the Internet. As such, our integration can be strengthened by allowing Chimera to respond to document URI requests. Chimera's servers currently support the HTTP protocol but not for document retrieval [1]. We intend to expand Chimera's support for HTTP to address this situation.

An issue raised by Carr and Hall is that link services may need tight integration with applications to share data semantics [6]. This is true of our work since the above export pseudo-code is jimage-specific. Furthermore, the generated XML file is specific to the LinkMap applet. As such, research is needed to produce general mechanisms that can be parameterized for specific XLink applications. Carr has performed some initial work in this area [5].

Finally, although the LinkMap applet does not support XLink's extended link groups, it would be interesting to see how well these groups correspond to Chimera's notion of hyperwebs, which is a collection of anchors and links.

CONCLUSIONS

Our preliminary work shows that XLink can be used to capture the link structures of an existing open hypermedia system, and demonstrates that extending open hypermedia systems to export XLink information is straightforward. We believe this work also demonstrates the potential of using open hypermedia systems as authoring environments of future XML-based hyperwebs delivered over the WWW as additional XML-aware applications become available. In particular, we believe the problems described by Hall [11] when using open hypermedia systems to author HTML-based hyperwebs can be avoided or mitigated.

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