SHASS: A New Electronic Annotation Support System, Towards an Effective Knowledge Sharing in Digital Library

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ABSTRACT

Digital libraries have become an increasingly valuable tool for knowledge dissemination. Most of the research in the digital library domain has addressed indexing and recovering digital resources. However, more work is still needed to find effective ways to support users when they actually use (read) digital libraries' documents and to enhance reading experience by sharing digital annotations. In this paper, we present a new system, named SHASS (for SHarable Annotation Support System), providing advanced assistance for making and exploiting annotations in digital libraries.

KEY WORDS

Knowledge representation, Electronic annotation, Digital library, E-Learning.

Introduction

Research in the digital library domain has mainly addressed possibilities and efficiencies for indexing and recovering digital resources from these repositories (Shum and Selvin 2000). Although this research is important, there remains a strong need for more research on how digital library systems can provide an effective support to their readers while they actually use the documents (i.e. during the reading phase). This issue becomes more important when considering the use of digital library in an educational context, such as in E-Learning.

In this paper, we present a new system named SHASS (for SHarable Annotation Support System) aimed to provide advanced assistance for annotating in digital libraries, and make those annotations more useful. More than merely a marking or highlighting tool, it provides the reader with means for knowledge representation, organization, and sharing.

Declarative Knowledge and Digital Libraries

A significant part of human knowledge, and especially in digital libraries, is declarative knowledge and relies more on the understanding ability than on performance as in problem solving (Ohlsson 1995). Consequently, in the annotation support system SHASS, we use a special knowledge representation model that takes into account several knowledge dimensions associated with declarative knowledge and is relevant to annotation activities. It has been derived from our previous work on the LEKC knowledge model (Learning by Explicit Knowledge Construction) (Rouane, Frasson and Kaltenbach 2003a, 2003b). The LEKC model was designed to support learning based on reading activities and has shown to be a good knowledge model for didactic purposes.

The SHASS System

The user interface of the SHASS system is composed of two tools (Figure 1): The SHASS Browser, a special web browser to display documents, and The SHASS K-Editor, a special graph structure editor to manage extracted text and represent ideas graphically.
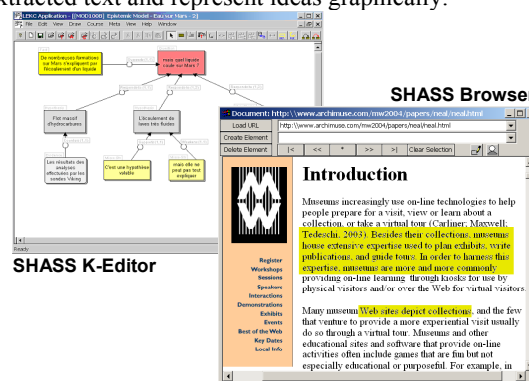

Figure 1 – The CHASS User Interface

The SHASS Browser

The SHASS Browser is a Web browser we created to help readers browse through electronic documents and easily create highlights (of selected text).

Users can organize their highlights in two kinds of structures (or micropropositions, noted Mi): atomic and composed. An atomic Mi is a selected string of contiguous characters representing anything from a single character to a set of adjacent sentences. A composed Mi is a combination of (Mi)s that are not necessarily adjacent on the document text. Composed Mi helps the reader mark and highlight non-adjacent sentences that are related to a same idea and which can be referred to as one unit.

The SHASS K-Editor

The cognitive process of understanding while reading a text of average complexity is very often supported by drawing some kind of graphical representations, named "External representations" (Cox and Brna 1995). Knowledge modeling in the SHASS system is based on the notion of 'External representations'.

External representations are ways to guide the reader's attention and organize his memorization process by making the relationships among different ideas in the text, clear and explicit (Rouane 2004).

The SHASS K-Editor is a special graph editor that allows the reader to create and manage external representations (or ERs). An ER is defined as a free graph structure with an arbitrary number of nodes and links. A node is a proposition (from the text or created by the reader) with an associated node type selected from a predefined set (e.g. Fact, Concept, Microproposition, etc). A link is a relationship between two nodes in an ER with an associated link type (e.g. Is-a, Support, Condition, etc).

The set of predefined node types and link types is not complete, nor is it exhaustive. The system is open ended. The reader can find this predefined set more than sufficient, or he may easily extend it. But, if the sharing is deemed important, it is advised to stick to the set of predefined types.

The Figure 2 shows a simple ER created with the SHASS system as an annotation for the following simple document:
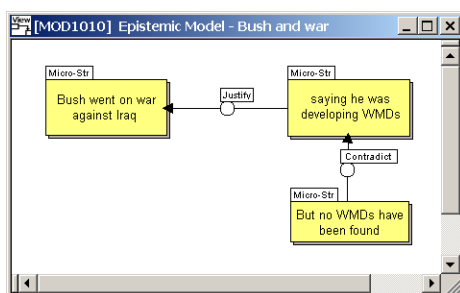

Figure 2 – Example of a Simple ER

The Knowledge Sharing Utility

One important aspect of the SHASS system is the annotation sharing ability. This feature is based on a publishing mechanism with a central annotation repository (which is actually a database with a server interface) where reader can publish (export) their annotations or download (import) other readers' annotations. A visualization mechanism allows the reader to visualize the imported annotations in many different ways: single projection, merged projection, intersection projection and difference projection.

Conclusion and Future Work

In this paper, we have presented the SHASS system, a simple and practical way to implement shared annotations in a digital library. A first working prototype using C++ and .Net has been developed and is currently being tested. So far we received comments from users (about 10 students) of the current prototype stating that they found the system useful and would like to use it on a permanent basis.

For this version of the prototype, only HTML documents are used as source document. The reason is technical: many software components are available to control the display of an HTML document at a very fine grain level. The next step is to extend the system to accept document in PDF format as almost all current digital library content is in this format. The next step will concern documents in XML format.

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