Structural Computing and Metadata Management

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Abstract: A short and pregnant description of the content and intent of the article. Please try to avoid mathematical symbols and special characters as much as possible.
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1 Introduction

In this paper, we begin by introducing ...

2 Structural computing

2.1 History

Hypermedia has become a concept familiar to many people ... The term structural computing was coined to describe this unification of various hypermedia variants within a common framework [Nürnberg et al. 1997].

2.2 Comparing data- and structure-based approaches

Structural computing environments are distinguished by their focus on the construction and management of structural abstractions ...

This realization significantly complicates certain otherwise well-understood problems....

Similar examples of structural complications in version control and access control have been discussed at length within the hypermedia and structural computing communities (e.g., [Hicks et al. 1998, Nürnberg et al. 1996]).

2.3 Current status

There is much ongoing work within the structural computing field (see, for example, the proceedings of the last three workshops on structural computing [Anderson and Reich 2000, Nürnberg 1999, Reich et al. 2001]). Two modern structural computing systems are Callimachus [Christodoulakis et al. 1999] and Construct [Wiil and Nürnberg 1999].... It is a codebase successor to three lines of hypermedia research systems – specifically, DHM [Grønbæk and Trigg 1994], HOSS [Nürnberg et al. 1996], and HyperDisco [Wiil and Leggett 1996]. Both the Callimachus and Construct systems implement a wide variety of structural services. Recently, a metadata service, allowing the tagging of WWW pages with arbitrary metadata records, has been added to Construct [Neveu et al. 2001].

3 Metadata as first-class structure

Metadata is not simply data ...

Secondly, a given metadatum may be related to more than one datum. For example, two data that share identical authors may both be related to an identical author metadatum. This "transclusion" [Nelson 1993] model of building metadata references is atypical – generally, two metadata records for data that share identical authors simple both share, for example, identical text in an author key field. At one level of abstraction (e.g., the user interface), this model of metadata may be useful – a metadata browser may want that matadata presented as keyword/value pairs. However, from an implementation perspective, the keyword/value pair model is a poor choice. It makes several types of operations, such as updating information (e.g., "change all instances of Joe Public to Joe Q. Public"), querying for related information (e.g., "find all articles authored by Joe Q. Public"), or differentiating information (e.g., "which of the three authors named Joe Q. Public authored this article?") unnecessarily difficult...

4 Generalized first-class metadata management

In this section, we present some brief examples of how implementing metadata management... The implementation and implications of such examples are described at greater length elsewhere (e.g., [Hicks et al. 1998, Nürnberg et al. 1996]).

4.1 Data mining

If metadata are treated as structure ...

4.2 Adaptive systems

When structures (both metadata itself, and the structure that binds it to data) are treated as first-class, they may then be manipulated as any data object, including being tagged ith attriubute/value pairs and being versioned. Both of these characteristics are very useful in adaptive systems [Schraefel 2000]...

5 Conclusions and Future Work

Until recently, focus in metadata research has focused on what metadata is and how it should be represented to the user. However, there has been a lack of focus on how it should be managed at a system level. We have shown that treating metadata as simple data out of the context of the relationships to which it belongs, and which it defines, although the current default model, is insufficient. We advocate borrowing structure management techniques from fields such as structural computing to manage metadata more effectively.

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