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Exploring Annotations in Digital Libraries and Collaboratories

Mrs. P. Selvamariammal **Dr. S. Surianarayanan**

***Librarian,Scad college of Engineering&Technology,Cheranmahadevi-627 414**

****Librarian (Selection Grade), Sri. Paramakalyani college Alwarkurichi- 627 412**

Abstract:

This paper presents the results of our study regarding the different facets and ways of using annotations in both digital libraries and colaboratories.Digital libraries must fundamentally recast users not just as content consumers, but as content creators. This article analyzes the integration of social annotations – uncontrolled user-generated content – into digital collection items. The literature review briefly summarizes the value of annotations and finds that there is conceptual room to include user-generated content in digital libraries that they have been imagined as forums for social interaction since their inception, and that encouraging a collaborative approach to knowledge discovery and creation might make digital libraries serve as boundary objects that increase participation and engagement.

Keywords- Annotation, collaboration, education, reading, study, on-line annotation system design, digital library use

INTRODUCTION

Existing annotations tools, however, are often limited to context and tags, which provide poor semantics, and, when they offer more expressive annotations, use proprietary or non-interoperable formats to represent semantics. In other words, the knowledge created by advanced users carefully annotating contents with valuable information is often lost, since it is not directly reusable by applications.

An annotation is a marked-up comment made to information in a book, document, online record, video, software code or other information. Commonly this is used, for example, in draft documents, where another reader has written notes about the quality of a document at a certain point, "in the margin", or perhaps just underlined or highlighted passages. Annotated bibliographies, give descriptions about how each source is useful to an author in constructing a paper or argument. Creating these comments, usually a few sentences long, establishes a summary for and expresses the relevance of each source prior to writing.

Annotating may be defined as making or furnishing critical or explanatory notes or comment. Whether positive or negative, implicit in the meaning of an annotation is the original text, image or other medium to which the annotation refers; and upon which that annotation is dependent for its full meaning. A note, added by way of comment, or explanation; -- usually in the plural; as, annotations on ancient authors, or on a word or a passage. The act or process of furnishing critical commentary or explanatory notes.

One form of a distributed digital environment would be a subject gateway. The gateway is designed to provide (usually registered) users with resources of agreed quality, grouped by subject, through a common browser-based interface. Access may be subject to authentication process. An annotation may apply to many different kinds of resources, text, image as well as other forms of Multimedia and can be applied at differing levels of granularity. For example, in the instance of a text document, an annotation could apply to the item description of the document, a sub-division of the document, a paragraph, passage or span of text right down to a single word as might appear in a glossary. Annotations support different facets of Digital Libraries (like creation, management, access and retrieval, and effective use) in several ways. Annotations can manifest themselves in different forms and dimensions, ranging from simple text highlighting and personal notes through (typed) links between documents up to nested and shared annotations with which collaborative discussions about a specific topic are realized.

Literature Review

This paper presents a literature review of empirical research related to the use and effect of online social annotation (SA) tools in higher education settings. SA technology is an emerging educational technology that has not yet been extensively used and examined in education. As such, the research focusing on this technology is still very limited. The SA empirical research has provided some evidence regarding the potential effectiveness of integrating social annotation tools into learning activities. Annotation is a handwritten comment or mark written directly onto the page of the students' script. There was a recognition that annotation can convey a tone and the student survey indicated that the tone of some annotation undermines confidence. Findings show annotation is considered important by students but is different from other forms of feedback. Because annotation is written on the page it requires greater sensitivity towards students' work. Recommendations disseminate findings to develop health professional education. Annotation defies any stable definition precisely because it can be practiced in so many ways. It is vital that annotation is used and received appropriately so that negative effects of annotation are minimised and the positive effects emphasised. There are a number of ways of improving annotation, and good practice guidelines are offered in the conclusion to this paper.

The educational use of social annotation tools in higher education: A literature review

by Elena Novak, Rim Razzouk, Tristan E Johnson , Volume: 15, Issue: 1, Publisher: Elsevier Inc., Pages: 39-49

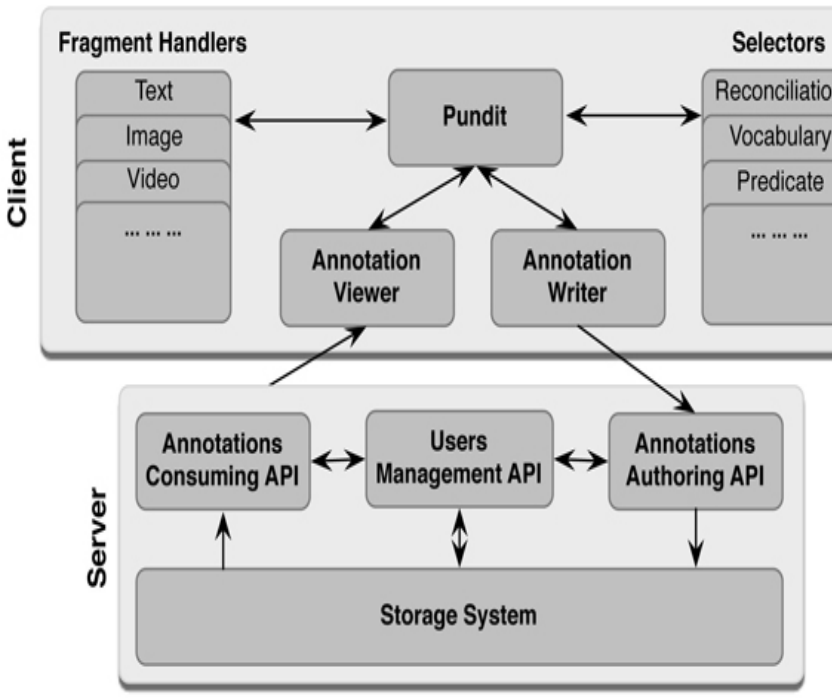
Annotation is a valuable tool to enhance learning and assessment in student essays.

by Elaine Ball, Helen Franks, Jane Jenkins, Maureen McGrath, Jackie Leigh , Volume: 29, Issue: 3, Publisher: Elsevier Ltd, Pages: 284-291

- Naturally placed annotations, distinguishable from the source item
- Non-interpretative markings
- Fluidity of form
- Informal coding
- Smooth transitions between public and private annotations
- Integration with reading

A variety of software tools commonly used in research and industry allow a user to select (usually contiguous) segments of content to be annotated, referenced, or otherwise distinguished from a containing document. However, digital libraries (DLs) often curate only full documents, not these

selected *sub-documents*. Thus, sub-documents in a DL may not have the full complement of metadata, and they may not be visible using DL browse and search facilities. We are interested in explicit representation of sub-documents in a DL environment. In this paper, we show how sub-documents may be represented and curated. We focus on the explicit representation of what we call a *mark* - an encapsulated address of a sub-document along with associated context. Our contributions are: a software architecture for representing marks as first-class objects together with regular documents in a DL; and an implementation of our architecture using existing software packages with modest enhancements. This approach provides new capabilities for the DL with minimal modification to tools and interfaces familiar to the DL user.



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However, the most recent DELOS Digital Reference Model (DELOS 2007) adopts a much broader view of digital libraries, one with room for users as both content creators and interactors:"The DELOS Network of Excellence on Digital Libraries now envisions a Digital Library as a tool at the centre of intellectual activity having no logical, conceptual, physical, temporal, or personal borders or barriers on information. It has moved from a content-centric system that simply organizes and provides access to particular collections of data and information, to a person-centric system that aims to provide interesting, novel, personalized experiences to users. Its main role has moved from static storage and retrieval of information to facilitation of communication, collaboration, and other forms of interaction among scientists, researchers, or the general public on themes that are pertinent to the information stored in the Digital Library." (DELOS 2007, p. 14)

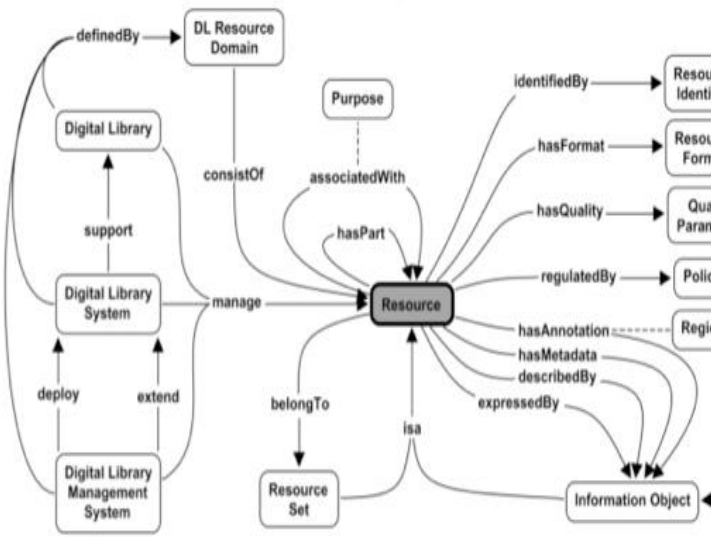


Figure 1: DELOS Digital Library Resource Domain Concept Map (DELOS 2007)

Annotations within Digital Libraries

Annotations can be exploited in order to realise the distinguishing features of digital libraries highlighted above. The creation of new information resources is supported by annotations in two ways. First, when users add annotations to existing information resources, these are new information resources themselves. Second, annotations can also assist in the creation of new information resources. Through annotations, new ideas and concepts can be discussed and Fig. 1. Digital Libraries, Collaboratories and Annotations the results of such a discussion can then be integrated into the newly created object. Annotations might increase and expand the information resources managed by the digital library. In this way, they may provide interpretations of information resources. User communities benefit from such interpretations in that they help understanding the annotated resource and contain additional information about it. In the Humanities, for instance, interpretation is one of the basic tasks scholars perform.

19]. Different layers of annotations can coexist in the same document: a private layer of annotations accessible only by the annotations author himself, a collective layer of annotations, shared by a team of people, and finally a public layer of annotations, accessible to all the users of the digital library; in this way user communities can benefit from different views of the information resources managed by the digital library [15,17]. Annotations can contain interpretations, reviews and additional information about the resources they belong to. They reflect what others say about a resource, which establishes an interesting context exploitable for information retrieval [7]. Furthermore the access and retrieval of information resources can be aided by means of automatic annotations. Employing topic detection techniques,

a document can be segmented into topics of desired granularity and automatic annotations represent a summary of these topics. Then, exploiting automatic hypertext construction techniques [4], automatic annotations can be linked to the original document. Finally, the content of annotations can support

the effective use of the digital resources. Automatic annotations, interpretations, alternative paths, and all other information contained in annotations help the user in approaching a document.

Digital Libraries and Collaboratories

Digital libraries are not only the digital versions of traditional libraries, but offer means going beyond mere presentation of the content stored in a digital repository. Two definitions of digital libraries, coming from two different directionsand thus focusing on different aspects, point to this fact. Collaboratories focus on facilitating scientific interaction within a team. Besides this, they should support the sharing of data and resources. Figure 1 summaries the aspects of digital libraries and collaboratories. As we will discuss in the following, all these aspects are particularly relevant for annotations and they can greatly benefit from having annotations available as an additional tool.

Collaboration and Metadata

In addition to shared annotations and virtual books there are at least three other methods for USD to enhance the metadata of the DEBORA collection.

Error Correction. Most database users have no way to record the presence of errors they detect in item descriptions. The client currently supports one-click Boolean 'error-present' actions and allows users to suggest alternative descriptions. With a population of active users any data quality effort could priorities those items with the most reported errors or *error-wear* by analogy with *edit-wear*.

User-Supplied Metadata. In addition to correcting existing metadata, the client can accept new keywords from users. At present these terms are not easily integrated with
Metadata on the main DEBORA server but this is a small technical problem. A simple interface is required to allow human authorization of additional metadata.

Re-purposing Annotations. The annotations are stored separately and so can be easily searched independently of the collection metadata. Annotation databases are potentially valuable sources of text particularly for image databases. Conversely, we can mine user annotations for indexing terms; as 'multimedia annotations…are simply meta-data associated with multimedia content' .A major difference between conventional image annotation and this approach is the purpose of the annotation: collaborative annotations are not *intended* to describe the images. Although re-purposed annotations will generate index terms of lower quality than an expert cataloguer, it may well be better than their complete absence.

Semantic Annotations

Semantically structured data is expected to provide the ability to mash-up heterogeneous information and establish connections among digital objects independently provided by different institutions.

Data interoperability and flexibility of aggregation foster reuse and enable serendipity: unexpected reuse of data by different persons and in different contexts from the one data was produced in. Users annotations, when properly represented as semantic data, can play an important role in this context, as they link documents to data.

On the one hand, semantic annotations represent precise relations and metadata and they are reusable with relatively low effort to augment the DL's data.

Characterlstlcs and Marklng Strategles

Annotations on documents in the digital format, called digital annotations, are similar to paper-based annotation but they provide additional benefits that paper-based annotation cannot provide. Digital annotations are not physically limited, may be made concurrently, and are separable from the base document. They are also disposable.Some people use annotation as a reminder of an interesting or important part in a document. The anotation can help summarize the document .Annotation can be used for commentary, suggestion, or discussion The annotation can be used to support collaborative work and collaborative discussion Annotations can be viewed as meta-data by adding more information to the whole document or selected parts for some purpose such as classification and linguistic dissection. However, there were few published research papers proposed a framework for a development of digital annotation system on WWW. This paper proposed a conceptual framework for a development of digital annotation system on WWW. We also used the proposed framework to develop a digital annotation system, called "Vtag". This system allows users to create annotations on any web pages. Users can add notes and tag and create highlight on web pages.

Characteristics	Within-text	Marginal or blank sp
Telegraphic	Underlining; Highlighting Circles and boxes around words and phrases	Brackets, angle brackets, and brace Asterisks, and stars; Circles and boxes around whole pa Arrows and other deictic devices to text markings to other marginal mar
Explicit	Brief notes written between lines, especially translations of words in foreign language texts	Short phrases in margin; Extended notes in margin; Extended notes on blank pages in t book; Problems worked in margins

Table 2: Characteristics of annotations written on the books

The texts were markings that indicated a specific group of words (an extent), through highlighting, through underlining, or through some other scheme for intermingling one's own notes with the text itself.

Telegraphic annotations are markings that arise from personal systems of annotation; for example, some of the texts had asterisks in the margins. Explicit annotations are usually textual.

Removable annotations include devices like bookmarks (scraps of paper, candy wrappers), dog ears (page comers turned down), and Post-its, as well as notes taken on separate pieces of paper tucked into the pages of a book. I will not dwell on this sort of annotation at any length, primarily because the focus in this study is on markings on the book page, not on removable media.

ANNOTATION IN A DIGITAL (PAPER) WORLD

Informational Component of Annotation

The components of annotating the digital content depend on the purpose of a digital annotation system. It should be at least composed of the following components;

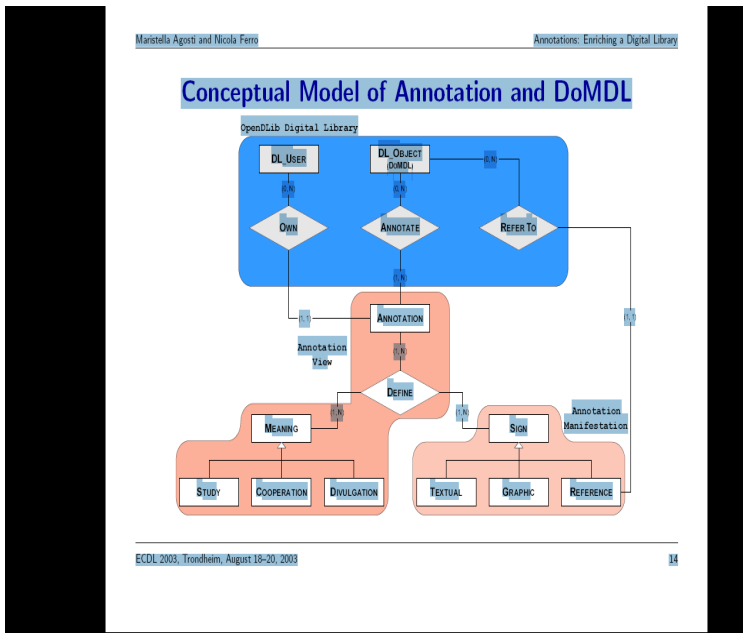
- **Annotator**: a person who create annotation
- **Annotation type**: explanation of what annotation is for
- **Annotation content**: a message in annotation
- **Annotated artifact**: an information artifact that annotation associated with
- **Annotated anchor**: the position, area or time range of annotation in the annotated artifact
- **Annotation Audience**: a person or a group of persons who is a target audience

Signs of Annotation

The Signs of Annotation is a way represending a meaning of annotation that is a way in which a particular meaning of another can materialize itself.

We can identify the following signs of annotations

✓ Textual sign
✓ Graghic sign
✓ Reference sign. These signs can be compounded together in order to express complex meaning of annotation



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Maristella Agosti and Nicola Ferro Annotations: Enriching a Digital Library

Conceptual Model of Annotation

Note the threefold relationship Define, which connects the three entities

Annotation, Meaning and Sign in order to de¯ne the semantics and

the materialization of an annotation.

Annotation form into function.

- Annotations as procedural signals.
- Annotations as place markings and aids to memory.
- Annotations as in situ locations for problem-working.
- Annotations as a visible trace of the reader's attention.
- Annotations as incidental reflections of the material circumstances.
- Annotations as a record of interpretive activity.

Form	Function
Underlining or highlighting higher level structure (like section headings); telegraphic marginal symbols like asterisks; crossouts.	Procedural signaling for future attention.
Short highlightings; circled words or phrases; other within-text markings; marginal markings like asterisks.	Placemarking and aiding memory.
Appropriate notation in margins or near figures or equations.	Problem-working.
Short notes in the margins; longer notes in other textual interstices; words or phrases between lines of text.	Interpretation.
Extended highlighting or underlining.	Tracing progress through difficult narrativ
Notes, doodlings, drawings, and other such markings unrelated to the materials themselves.	Incidental reflection of the material circun reading.

Table 3: Mapping annotation form into function.

Purpose of Annotation

1) ***Annotation for Memory****:* When people annotate a document, their primary purpose is to communicate with themselves. Marshall found that the dirtiest copy of a book contained underlined or highlighted content, notes summarizing the main idea and marks emphasizing important paragraphs. Wolfe found that annotations helped students recall emphasized items and decreased unnecessary summarizing. O'Hara and Sellen suggested that annotating while reading allowed readers to understand the text deeply and extract structure of the document creating a plan for writing. This kind of annotation helped locate interesting sections of documents

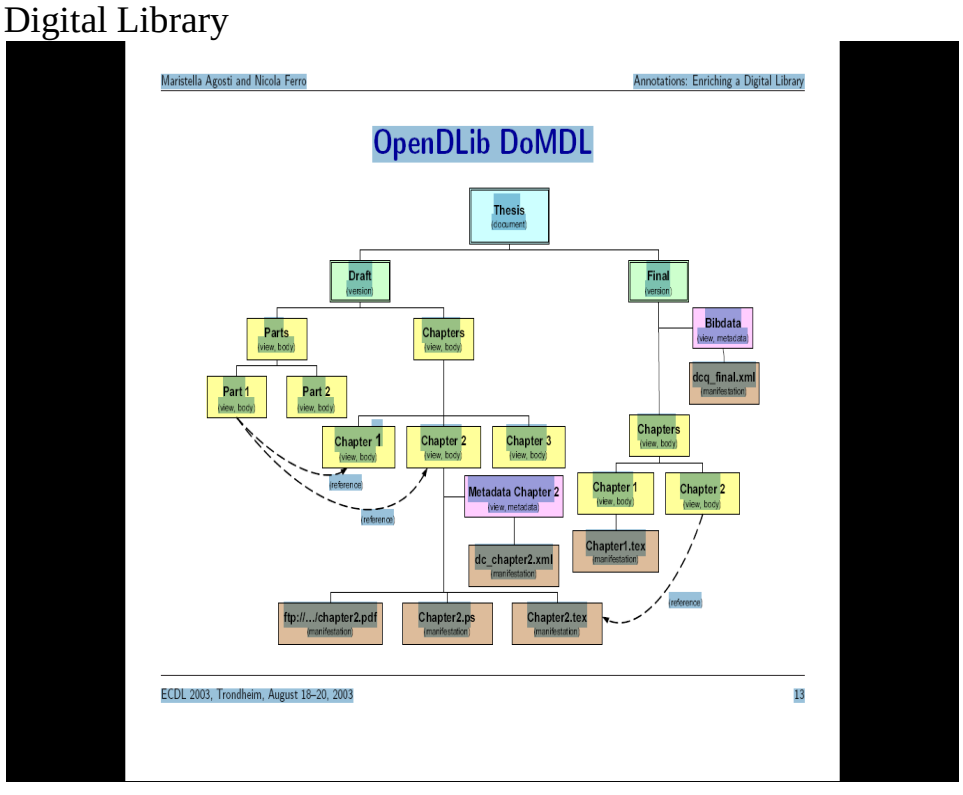
and improve recall of the important concepts in a document.

2) ***Annotation for Communication****:* While many people annotate to remember, others use annotations to communicate. Davis and Hutten ocher observed that shared annotations, especially in the educational context, provided benefits to both students and instructors. The shared annotations provided opportunities for communication outside of the classroom or computer laboratory. Both students and instructors could communicate via the shared annotations.

3) ***Annotation for Collaboration****:* Annotations play an important role in collaboration. When people work together, communications between them are very important. In collaborative writing, writer, consultant, editor, and reviewer use the annotation as a tool to provide feedback Other than collaborative writing, the annotation can be used for discussion purposes Perry] described scenarios where annotation helped in scientific collaboration in real time environment Scientists in different locations could collaboratively work and discuss the working document in the real time fashion. Designers annotated their design objects to provide more information or provide feedback and comment to other people in their team.

4) ***Annotation for Description****:* Annotations can also be used for describing an object. Many researchers use annotations for classification. Shneiderman and Kang used annotations to label human photos for easier retrieval. This kind of annotation adds more information describing an object, an image in this case. In addition, Wilhelm and his colleagues developed a framework, called Mobile Media Metadata, which enabled image annotation at the point of capture using Nokia 3650 camera phone. Handschuh and Staab proposed a framework, called CREAM (CREAting Metadata). They used the annotation as marked content to describe objects on a web page. Denoue and Vignollet found that annotations could improve automatic clustering of web pages and, at the same time, improve information access and retrieval. Linguistic researchers used annotations to dissect parts of a sentence. Bird and Liberman suggested that linguistic annotation covered any descriptive or analytic notation applied to raw language data. The annotation might include transcriptions of phonetics, phonology, morphology, syntax, semantics pragmatics, and discourse structure.

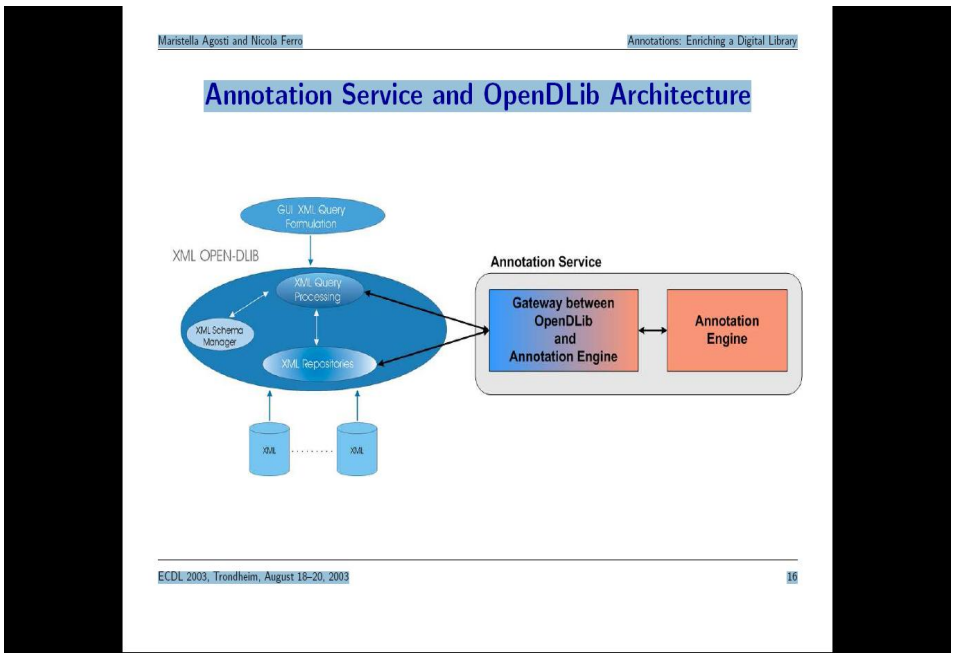
Maristella Agosti and Nicola Ferro Annotations: Enriching a Digital Library



Proposed Research

When showing how to exploit the annotation context for information retrieval, three main tasks have to be done:

1. Find a suitable formalization for annotations and annotatable objects.
2. Define and implement suitable context-based retrieval approaches for document and discussion search.



Evaluate these approaches with regard to their retrieval effectiveness.

Conclusions

The paper considers how collaborative features can be added to a digital library. One pertinent problem is that the intended users do not perceive themselves as working collaboratively (even when they do), and so are unlikely to see the benefits of collaborative features. We are exploring the provision of annotation features as a mechanism to support a graceful transition from solitary use to collaborative work.

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