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ISSUES AND SYSTEM OF DIGITAL LIBRARIES

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ABSTRACT

The research field of digital libraries needs to be seen as an organization of subfields across different domains with new research issues to realize its full potential. A clear demonstration of the research issues involved is not yet given. Much of the approach to building a digital library system has so far been limited to solving specific digital library problems as the nature of problems in other areas has changed. The results of the problems suggested by the classification appear at several levels of the digital library system architecture for both design and implementation. This is made clear by considering the consequences of a problem at several architectural levels and in the context of the current set of technologies.

KEYWORDS: *Digital Libraries, Physical Libraries, Database.*

INTRODUCTION

The emerging field of digital library brings together participants from many existing areas of research. Currently, the field does not have a separate clear agenda other than these other areas. It is tempting for researchers to think that the area of the digital library is a natural development of an already known area. From the point of view of database or information retrieval, digital libraries can be viewed as the form of organized databases. From the point of view of hypertext, the field of digital library may seem like a specific application of hypertext technology. From a broad-field information service perspective, digital libraries appear to be a use of the World Wide Web. From the point of view of library science, digital libraries seem to be continuing a trend towards library automation. There is some truth in these approaches (as well as others) but no one addresses the whole area and its research agenda. The area of the digital library will be limited if viewed only as a sub-area of previous research interests. To realize its full potential, the field must be seen as an organization of subdivisions in different domains combined with additional objectives and thus new research issues. Digital library research must respect the existing tradition of our physical libraries and go beyond current practice to develop a new, broader research agenda.

Digital and Physical Libraries:

Why a digital library is called a library? This question has been addressed by various members of this research community. The concepts of collection, sources of information and location in the context of physical libraries and how these concepts can be applied in the digital field were discussed. The design of digital libraries considered how

working methods in physical libraries could be used. The physical library can provide a starting point for discussing the components and domains of a digital library. The element of the library is the element of the library. The domain of the library is the world from which the library material is extracted.

ELEMENTS:

It is useful to consider three broad classes of library components: data, metadata, and processing. The data library is the material. Metadata is information about a library and its contents. Processes are active functions performed on library elements. For example, a book in a library can be considered as the data of that library. Indexes to book titles can be thought of as library metadata. The librarian's action in finding a book by suggesting the use of a card catalog can be considered a process. This classification is vague, in the sense that it is difficult or impossible to classify any given library element as belonging to a particular class. It is possible to see a single element as belonging to all three classes. However, this classification is useful because it provides a framework for discussing library elements. Physical library elements often fulfil certain roles at a given moment for a given library user. These roles can often be assigned meaningfully in specific cases. Since this classification relates to the elements in the library, the differences between the roles of people are interacting with the library, the different ways in which these roles are being reassigned to the digital library, and the various high-level tasks performed by the people performing these roles. Of course these are all important points, but they will not be considered here.This classification of physical library elements can also be applied to digital library elements, with the same understanding, a given element can be considered at different times by different users.

DOMAINS:

A physical library deals primarily with physical data, while a digital library deals primarily with digital data. Of course most modern libraries handle both, but considering them as fictional 'allphysical' and 'all-digital' library foils is worth discussing. If physical libraries consist primarily of physical data, and digital libraries consist primarily of digital data, how can digital libraries preserve and disseminate large amounts of existing physical data? Instead of including physical data itself, digital libraries will have digital translations of this data. The term translation is used, because the process of creating this digital representation of physical data is not necessarily a completely semantic process. It cannot be understood in the same way as users perceive the source of the product because the means of their presentation must be different. It would be tempting to think that if there were differences between identical physical and digital objects, they would have no practical effect. However, this means that all such differences are already known. Not only that, but it is also not clear when all such differences can be identified, because one does not know all the important features of an object under any circumstances. Without knowing all the differences between physical and digital objects, how can one claim that these differences are trivial? The magnitude of the difference between physical and digital analog can be related to the accuracy of the physical / digital translation. The spectrum of translation quality certainly exists. Without further research on the consequences of translating material in physical and digital form, it is difficult to know the accuracy of such a translation.

Differences between physical and digital domains also affect the translation of metadata and processes of physical libraries. Some of the metadata and processes in the physical library are physical elements in themselves and thus, the discussion of translations as created above applies. However, even those elements of a physical library that do not have actual physical reality are usually linked to the physicality of the data and the library itself. It is also necessary to translate these abstractions into the digital realm. In summary, although both physical and digital libraries are supposed to share certain objectives and include elements that can be classified equally, the domains of the two types of libraries are different. The digital library will handle translated physical elements, conceptual elements of a digital library adapted to the digital realm, and completely new digital elements without any explicit physical library analogy. The differences between the physical library and the digital library component

have created many open problems about how to adapt the tradition of the physical library to the digital realm.

PHYSICAL LIBRARY DATA TRANSLATION:

It is easy to find examples of physical library data that are regularly translated into digital format. For example, books, journals, and movies are all examples of physical library data that can be scanned, digitized, or otherwise translated electronically. The main problem when translating physical library data is to determine which aspects of the original quality are considered in the translation process. When translating a book digitally, when is the ASCII representation of the text sufficient? When does every page have to be scanned like a photograph? How are such decisions made? These questions involve many trade-offs and in the general case the answers cannot be identified. It is also not clear which features of an object are most meaningful. Many features of physical data, such as the size and shape of a book, can only make sense for a few people or in certain situations. Think about how grease spots alongside auto part manuals help people find the pages they want. It is impossible to include every feature of a physical data object that can ever be considered meaningful to any person, but ignoring the meaningful aspects of the object during translation has significant consequences for the preservation of the function in the digital library.

PHYSICAL LIBRARY METADATA TRANSLATION:

There are plenty of examples of physical library metadata. The three examples are longevity index, classification scheme and spatial arrangement of library materials. One problem when translating such physical library metadata is that often the metadata itself or its application is affected by the physicality of the data. For example, the spatial arrangement of data objects in a physical library expresses meaning and is a form of metadata. The spatial arrangement of objects makes sense because objects have some physical presence. How can this be translated into the digital realm? Is the virtual reality approach, in which digital objects are associated with some virtual physical presence in a virtual physical space, the right way to translate metadata?.

While the spatial arrangement of library content is a physical library metadata component with a physical presence, other metadata that is not directly physical reality must also be translated or, if used in a digital library, converted into its application. For example, the Library of Congress classification scheme may not have any physical reality of its own, but its application is sometimes limited by the materiality of the classified objects. For example, such a classification scheme is used to guide the physical location of data in a library, as placing identical-classified objects in physical proximity can help patrons find data. If the library has a copy of the book, but the book can be classified into more than one category, how to find the book? It can only be effectively co-located with a single classification source. The same limits do not apply to digital objects in virtual space.

PHYSICAL LIBRARY PROCESS TRANSLATION:

Examples of such processes are retrieving data, indicating the usefulness of components, and assisting in the location of components. Choosing new books to add to the library is an example of getting data. Suggesting the usefulness of elements may be the form of a protector identifying potentially useful data and metadata sources to a colleague who may not be aware of or use these sources. An example of helping with the location of elements is that the library worker helps the conservator find incompletely informed objects. One feature shared by many physical library processes is that it is done by humans. The main problem when translating such physical library processes into the digital library field is how to provide humans with the tools to help them carry out these often informal processes, especially when the custodians and librarians of digital libraries cannot rely on the co-location of such people. This problem is especially important considering the many collaborative nature of the work done in the library.

NEW DIGITAL DATA:

Hyper novels, scientific visualization, and active computer programs are all examples of new digital library data that does not have explicit physical library data analogs. It can be claimed that the novels on paper are the obvious predecessors of the hyper novels, but the hyper novels have many features that make them qualitatively different from their study counterparts. Creating a library of active computer objects is certainly imaginable. Also, many physical objects that are not currently included in the physical library may have digital analogues in the digital library due to space or other constraints.One of the problems facing digital library designers and implementers when considering new digital library data is that new types of data are constantly evolving. While it is true that new physical data types are constantly evolving, due to the immaturity of new digital data types, the pace of change in the digital realm is currently high. New capabilities are constantly being identified and used. Creating or implementing a digital library is especially difficult if the type of data to be included in the library is not yet known.

NEW DIGITAL METADATA:

Many new types of metadata are possible in a digital library. The three examples are dynamically generated indexes, individual structures and annotations on library elements. Dynamically generated indexes may have a relatively short lifespan compared to the long-term index of a physical library. An example of an individual structure is a user-specific set of user- or hypertext links on some set of library elements. Annotations are virtual changes of data objects by protectors - these changes exist separately from the data but can always be displayed with data for a specific user or group, causing "virtual" changes. The problem with the new digital library metadata is that much of it is personal and thus can be stored separately from the data being applied, which can lead to potential compatibility errors. If multiple users create a structure based on certain data in a library and it changes the data, what to do with all the metadata that has somehow become invalid because of this change? This is definitely a problem in the physical library. Because most physical libraries reside in the metadata library, however, modifying the metadata can be easy to reflect any changes in the data. Not all such copies of metadata, including personal digital library metadata, are known.

NEW DIGITAL PROCESS:

Finally, the digital library allows new processes not found in the physical library. Specifically, processes such as full-text detection, personalization of presentations, and retrieval by agents are new digital library processes. Full-text search means querying full-text indexes. Personalization of the presentation involves access control issues as well as the built-in screen layout. Recovery by agents includes programs that autonomously search for data and report findings to users. One problematic aspect of these new processes is that they involve calculations that can access large amounts of library data or metadata. A central issue is how to distribute the calculations needed to maintain this process. For example, how much calculation should be included when personalizing the presentation of information and how much should the client do? If such processes are computably expensive, how can this load be properly distributed? What is the optimal combination of client / server communication, serverside computation and client-side calculation to affect these processes?

DIGITAL LIBRARY SYSTEM:

Digital Library System Architecture:

Ideologically, digital library systems can be thought of as mediators in certain types of interactions between people and computer systems. Some relationships and interactions between many parts of the digital library and many people and systems outside the library. To help clarify the interaction between these relationships, the computing resources in this figure are divided into server resources and client resources. It allows to classify computer-supported relationships into human / human, human / client, human / server and client / server categories.Real relationships are more than clichs. For example, publishing in a digital library is not a relationship between a publisher, a librarian,

and a library. Conservatives, budgetary limits, library computer resources, and other factors may be involved. Any strong digital library system should provide support for this relationship. Client and Raider computing systems can each be further subdivided. Women can go to each of the three parts: the back-end, the "middle-end" and the dominance end. The back-end of the system and both the system and some external components interface. The system usually provides out-end services to clients, while back-end outline services provides some intermediate mapping between middle-end droids- and backends.

Solutions of Mapping Issues:

The problems identified in the classification presented in the previous section can affect many areas of the digital library system. Consider the point presented in the discussion of new digital processes - how computer and storage loads can be shared equally between clients and servers for these new processes. In particular, consider the new digital process of personalizing the presentation of content.Publishers of digital library data need to think about how to format the data stored in their server back-end so that it can be presented in a personalized manner on behalf of the client. The server middle-end should address how much pre-processing should be done, including the trade-off between sending as much unprocessed data as possible and spending too much computer time on the server side. Server front-end and client back-end must agree on which protocol to use to send semi-processed data. The client middle-end should address how to distribute the data retrieved from the server in multiple demonstrations on the client front-end process. Finally, the client front-end should address how personalization of the presentation can be used for library protectors. These issues are just a few of the elements presented in the above discussion on the classification of elements or what are the different levels of the digital library system that need to be considered to solve the problem.

Present Technology:

The technology under consideration is a set of WWW clients communicating with httpd servers that use Common Gateway Interface (CGI) scripts and / or binary to access the database. Consider how this technology answers the questions presented in the section above. There are many ways for publishers to answer the question of how to format their data. Many popular formats exist for digital data translated from the physical realm, such as the graphics interchange format (gif) for static video images or ASCII for plain text. Publishers of database data can choose any of these popular formats according to their needs, as many popular formats can be handled on the client front-end. Formats for new digital data types are still being developed, such as the evolving Hypertext Markup Language (HTML) for hypertextual documents. For more exotic digital elements like process-based dynamic hypertext generally do not agree on any format.

Currently, most web clients do not support multiple frontends in any meaningful way. This means that multiple frontends require a back-end to replicate server calls even if they are displaying the same data. Thus, current technology does not address how to distribute client retrieved information on multiple client front-ends.

CONCLUSION:

Physical libraries provide a good starting point for the discussion of digital libraries. The components of both physical and digital libraries can be classified as data, metadata, or processes; these categories are determined in specific cases by the intended use of elements by the librarian, patron, or others. Physical library data, metadata, and processes must be translated into a digital domain if they are to be used in a digital library. In addition, there are no obvious physical library analog types of library elements completely new digital library elements. These observations led to the development of a classification of digital library elements. The field of digital library presents a set of complex problems and solving these problems requires a mix of approaches from different fields. The claim that any one technology has solved all the problems that have arisen in the design and implementation of a digital library fails to solve the whole problem. For example, proponents of the view that federation databases

solve technical problems with digital libraries have considered technology on server back-end to handle already done translations of physical library data and metadata. Enhancing such a database with other current technologies such as web clients, httpd's and CGI scripts also does not provide a fully functional digital library system. Instead, any successful attempt to build a digital library system must address the problems present by considering the different types of digital library elements at different levels of the general digital library system architecture.

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