

Interface for the Personalization of the Digital Library

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Abstract

As the use of digital libraries increases, users expect more than being able to filter, retrieve and refer to library materials. Digital library users prefer to utilize the library materials as their own personal materials. Our approach is to let users create personal versions of a digital library to support collecting information and organizing, modifying and, integrating collected information. However, the current interfaces for digital libraries are not adequate for such requirements. This paper proposes an interface mechanism to address the requirements for the personalization of a digital library. The interface is based upon a model called the personal document model. The personal documents, which are instances of the model, are the user specific views in the personal library.

Keywords: Digital Library, Personalization, Personal Library, Document Model, User Interfaces, Notebook, Shallow Copy

1. Introduction

Advances in technology and infrastructure in Internet have resulted in the digital library service becoming a practical and also very enthusiastic one for general public. The personalization is one of the important issues for digital libraries. A personalized service is expected to serve the users according to both their personal interests and personal requirements. Information filtering in the Digital Library is an example for personalized service according to the user's interest profile. However, when a user has acquired some materials from the library, he/she may want to interact with them as his/her own personal materials. Since the personalization should be done on the user basis, it is regarded as an interface function on the client side.

Currently, in the most research related to digital libraries, interfaces are based on providing the facilities for the efficient retrieval/browsing [1,2,3]. These interfaces have not been developed to provide interaction with respect to both user's personal interests and requirements. In this paper, we describe an interface mechanism based on a model called the personal document model. This model defines document classes according to real-world user interactions in a library environment. Personal

documents, instances of those classes, are the user specific views about the library materials in the personal library.

In section 2, we describe the personalization of the digital library. Section 3 presents the interaction model that describes how the user interacts in a personalized environment. Then we illustrate the Personal Document Model in section 4. In section 5, we present the prototype system developed to investigate issues related to the personalization of a digital library. The conclusion is given in section 6.

2. Personalization of the Digital Library

Personalization is a service provided by the digital library to serve up individual users of the digital library according to their **personal interests** and **personal requirements**. It is a highly discussed issue with respect to providing a better human-computer interaction.

We consider two stages in the process of personalization of the digital library. Namely, **collection personalization** and **material personalization**. The collection personalization, also known as information filtering, supports to list the digital library materials with respect to the user's interest profile. It simplifies the problem of information overload by providing what the user wants. The material personalization allows users to use the digital library materials according to the user's personal requirements such as collecting information and organizing, modifying, annotating and integrating the collected information. Hence it provides a better utilization of the material benefiting the user.

In most of researches [11,12] related to the personalization of the digital library, more attention has been paid about the collection personalization. However, in a personalized information environment, users expect not only to collect the information but also to utilize them for different personal needs. To achieve this goal, we are studying specifically the material personalization for the digital library. As a result of material personalization, the user's change of interests can be filtered to update his/her interest profile. Hence, it improves the collection personalization too.

2.1 User's Personal Information Requirements

It is necessary to determine user's information needs and purposes of using the library service for the successful design of material personalization. This contains the context of the user's work, the individual user's specific work tasks, his/her information acts (including information acquiring, using, storing and so on), and finally his/her library use (searching, browsing, and retrieving information) [5].

Although the way users interact with digital libraries differ from one with conventional libraries, their primary requirements and ultimate objectives of the data gathering process remain as they are. In a conventional library, since the materials collected from the library are public items that should be returned and should use with some care without making any marks on the book. In such a situation, the user uses a notebook to keep a record of things, take down important parts from several materials. If something is very useful for his studies, the user may keep a copy of it for the later reference in his personal library. The personal library is considered as a private one which contains personal documents such as notebooks, textbooks, articles belonging to the user including dictionaries and glossaries. Reading frequently involves not just looking at words on a page, but also underlining, highlighting and commenting either on the text or in a separate notebook. This combination of reading with the critical thinking and learning is a common behavior of academic users. It is called *active reading* [4]. Therefore, when the academic users access the digital library, they prefer to interact in line with the active reading style.

According to our investigation about the user interaction in a library environment, at least following facilities must be supported in a personalized digital library. Works done in [5,7,8] were also useful in determining following facilities.

- To re-organize the arrangement of the library materials
- To customize contents of library materials by annotating, formatting and modifying
- To integrate different types of library materials

Hence, in a personalized digital library, the user is able to develop his/her own versions of library materials and new materials using above facilities.

3. Interaction Model

Our interface has been designed specially to support the material personalization of the digital library. To achieve this objective, a single interface is provided

to both the digital library and the user's personal library.

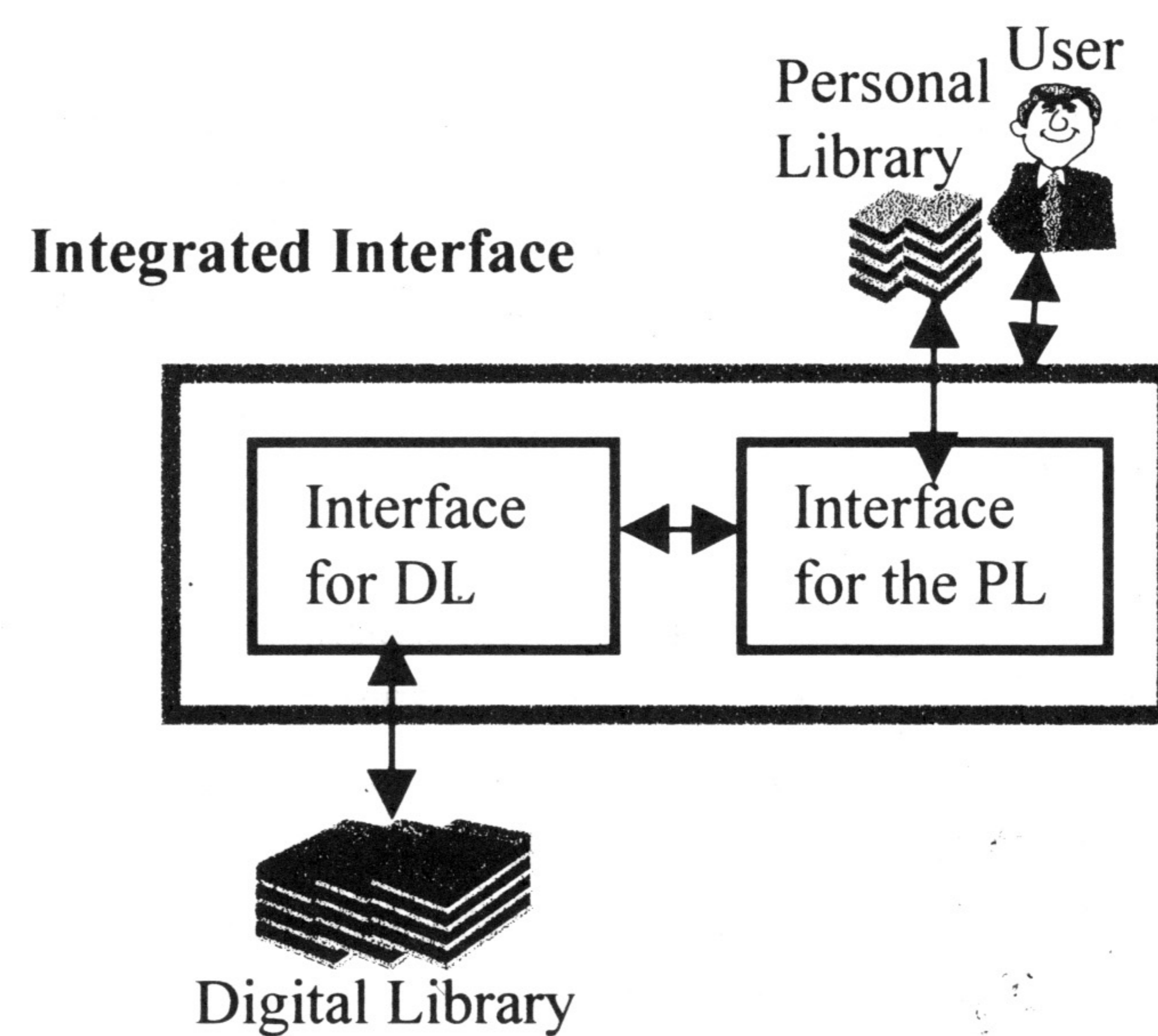


Figure 1: Integrated Interface Architecture

The proposed interface architecture is illustrated in Figure 1. The personal library exists at the user's side as a client component. It generally contains private materials acquired from other sources. The user can create views called Personal Documents, whenever he/she wants to create a new version of library materials. These personal documents are regarded as the basic components in the personal library.

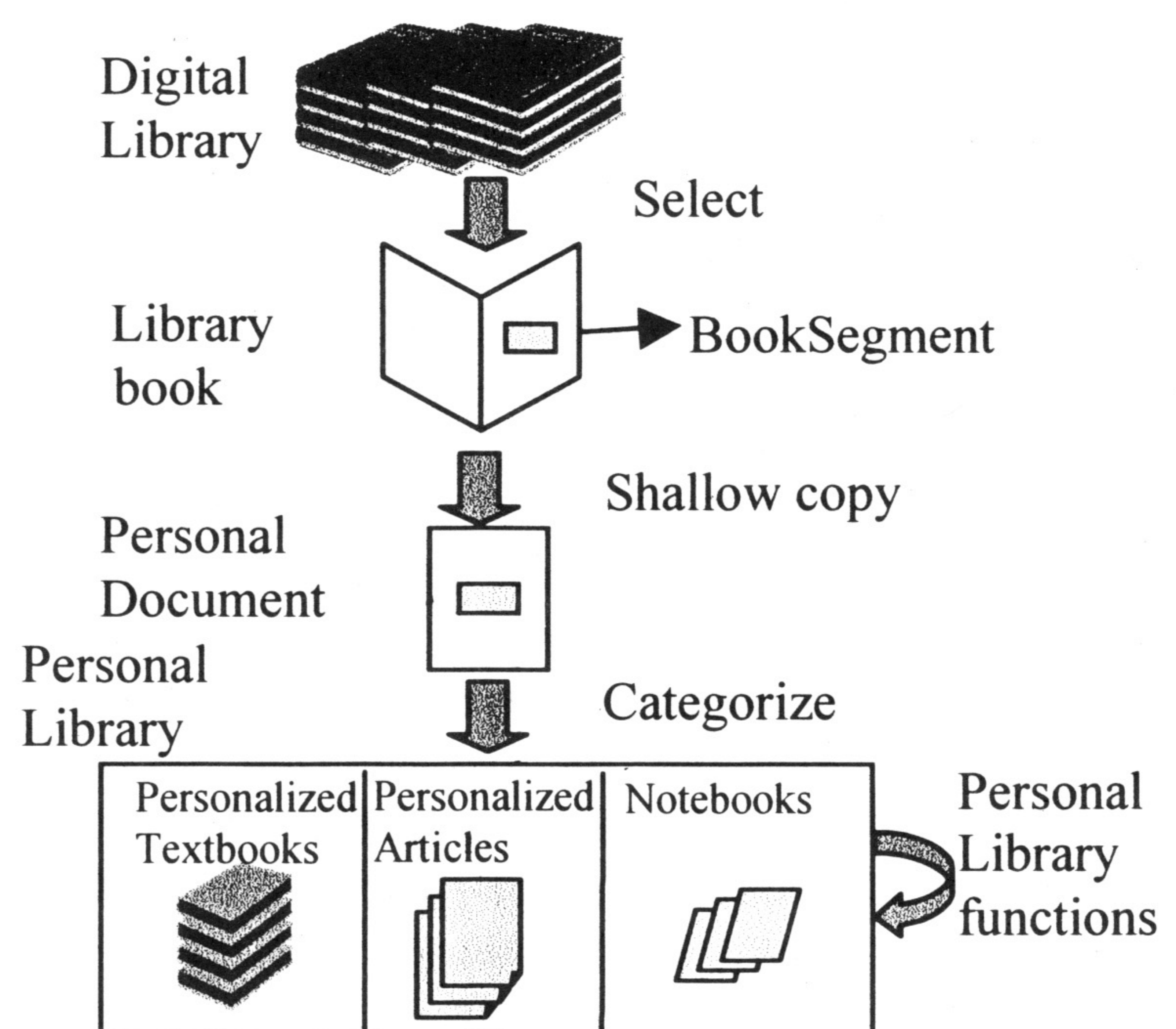


Figure 2: Library Material Personalization

Figure 2 illustrates the material personalization process in the integrated interface. To achieve this process, it is necessary to integrate the digital library with the personal library. When the user refers the library material, if he/she finds some important parts, they can be copied into a **personal document**. Such important parts are called **Booksegments**. This copy is defined as **Shallow copy**, which is the technique used to copy parts from the library books in the digital library. This technique is based on the

concept of transclusion advocated by Ted Nelson [6]. The mechanism of transclusion creates a pointer indicating the whereabouts of information when it is stored, and provides access to the source of the information when a user wants to display that information. So, the shallow copy can handle the copyright management and allows the user to refer the original locations. Then these personal documents are categorized according to the contents. Therefore, a personal document may be a **Notebook**, a **Personalized Textbook** and a **Personalized Article**.

personal document exists as a personalized view of library materials. In the document architecture, classes are defined according to the real world entities in a library environment. **DocObject** class is the based class for the whole class hierarchy and it provides the most primitive functions like printing to all sub document classes. **LibDoc** class represents all library materials in the library. **PersonalDoc** class consists of personal documents, which are the documents belongs to the user. This PersonalDoc class contains the three sub classes such as

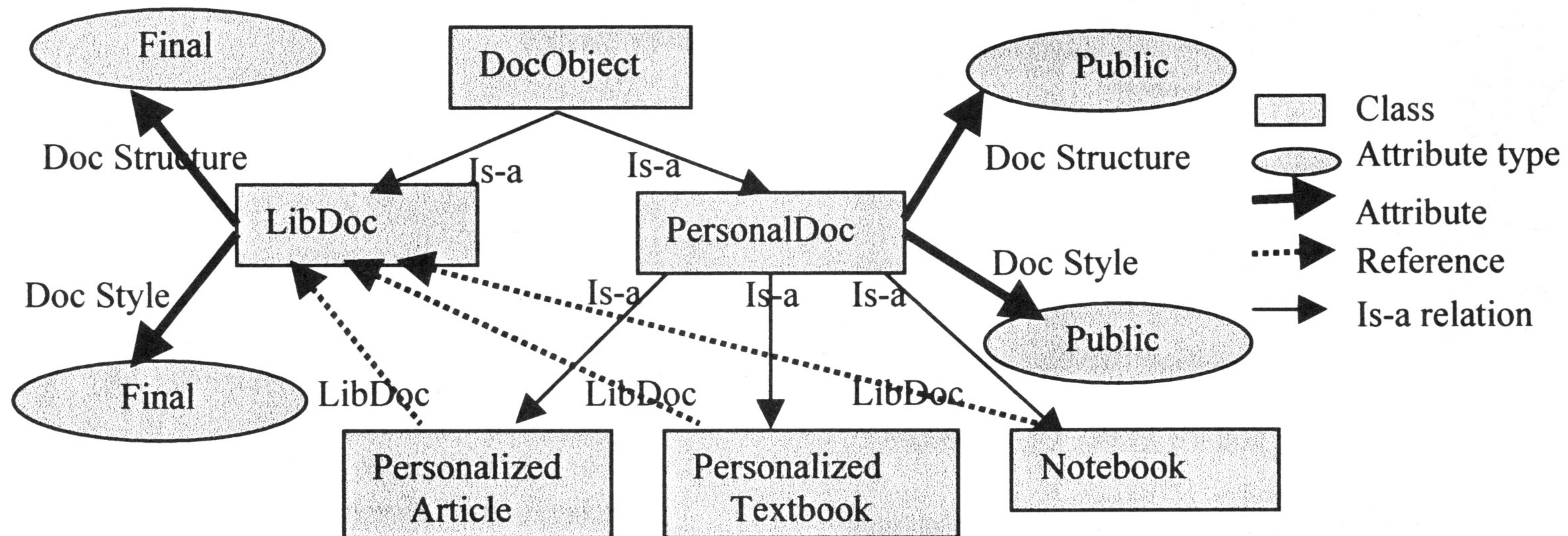


Figure 3: Document architecture of the personal document model

4. Personal Document Model

The personal document model (PDM) is designed to develop the interface for the personalization of a digital library. The PDM is the extended version of the notebook model [9,10].

Instances of PDM are known as personal documents. A personal document is a personalized view of one or more library materials. Depending on their contents and personal documents are categorized into different groups. A Notebook is the simplest form of a personal document and it allows the user to integrate different segments of library materials and also to add new contents. Other personal documents are used to directly personalized library materials by considering the whole document or a logical parts of library materials.

When the segments are copied to a personal document, actual contents are not persistent in a personal library. Instead of that, the addresses of the data are saved. The original data is fetched from the digital library when a personal document is opened but its appearance (defined in the doc.style sheet) can be modified by the user.

4.1 Document Architecture

Figure 3 illustrates the document architecture of the personal document model and it describes how a

Notebook class, **Personalized Textbook** class and **Personalized Article** class. A Notebook consists of the parts of library books (segments) and the users annotations. A Personalied Textbook contains a whole copy of a library document modified in the way user wants with his annotations. A Personalized Article corresponds to an article or a logical section like a chapter in library documents.

4.2 Functions

The functions in the PDM define ways in which the user can interact with the contents in personal documents. In our vision, the editor is the visual interface for the document and it allows user to access the attributes and invoke the functions of the document. Functions like editing and formatting may be primitive but others like shallow copying, annotating, linking, summerizing, collecting and term-describing are important to construct personal documents.

5. Implementation

We developed a browser called DL Browser to investigate our ideas/proposals to provide personalized library service. In the current system, MS Access DBMS is used to maintain the personal library, while whole system is developed using Java and VC++ programming languages. DL Browser has two toggling interfaces named as Public Bookshelf

and Personal Bookshelf and an editor for personal documents. Public Bookshelf (Figure 4) provides the interface for the public digital library. This interface provides facilities for searching, browsing materials and copying the segments from the materials. Personal Bookshelf provides the interface for the personal library. The editor of DL browser (Figure 5) provides facilities for modifying, formatting, linking, annotating and organizing personal documents.

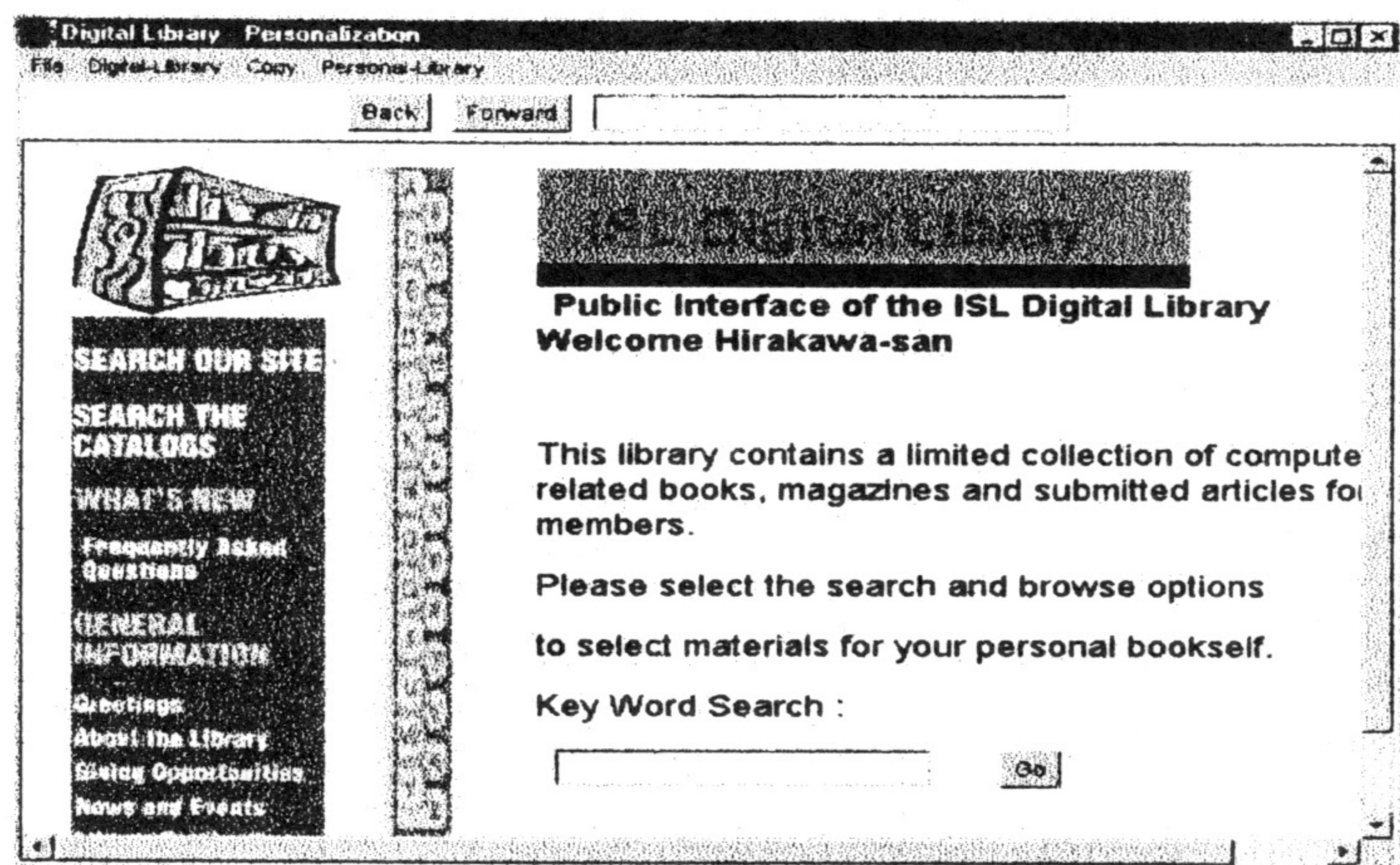


Figure 4: Public Bookshelf in the DL browser

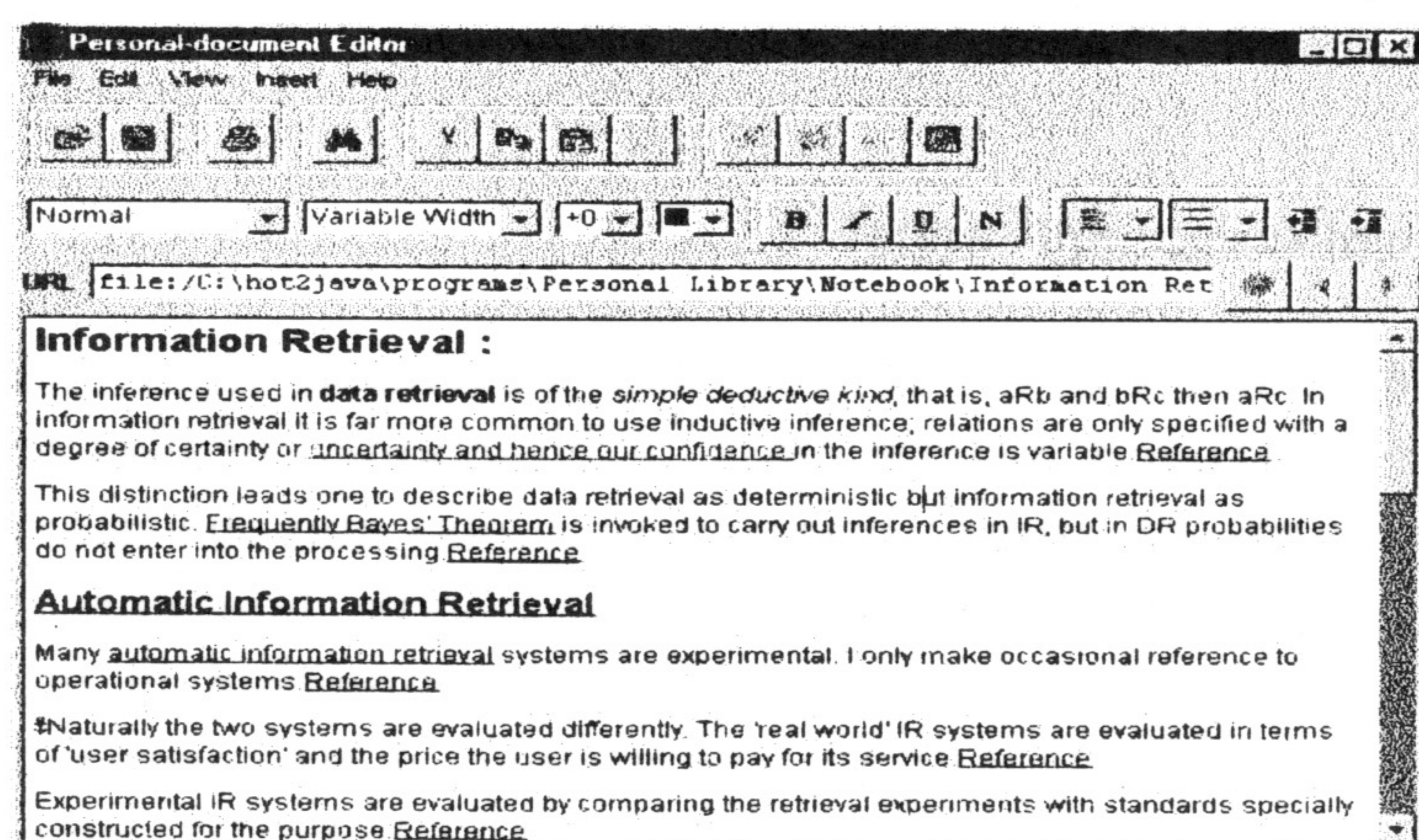


Figure 5: Personal Document Editor

6. Conclusion

In this paper, we presented a new interface mechanism, for structuring the materials in a digital library to provide personalized access to them by integrating the contents with the local personal library. We consider two types of personalization in the digital library environment: collection personalization and material personalization. The work described here is related to the latter one.

When we investigate the personalization of digital libraries, it is important to consider material personalization, as it improves the usability of library materials. Our personal document model is a successful approach for the material personalization of digital libraries. The PDM is based on the user's real world interaction metaphor in a library environment. The personal documents which are instances of the model are the personalized views of the materials in a digital library.

In the future, our research target includes automated filtering of personal documents to establish the user's interest profile and how the current framework can be extended to collaborative activities among the digital library users.

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