

MyLibrary, A Personalization Service for Digital Library Environments

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Abstract

Several initiatives have offered personalized electronic services for digital library users. However, most of these services do not provide users with personalized shared Web environment, recommender system integration, Web link checking mechanism and tools that extend the functionality of Web browsers. MyLibrary at Los Alamos National Laboratory (LANL) provides digital library users (as individuals or groups) with a personalized Web environment while offering all these features. MyLibrary @LANL is the result of a project sponsored by LANL Research Library, which provides electronic services to LANL users (scientists, students, staff, external users, etc). This article explains the motivations for the design and development of the system, presents an overview of the MyLibrary @LANL initiative, summarizes MyLibrary's features, briefly discusses the technical solutions adopted, describes how the system is perceived by its users and addresses some of the directions for future developments of the product.

Keywords: Personalization, Recommender Systems, Digital Libraries, Recommendation Systems, Spreading Activation, Bookmarklets, Shared Libraries.

1 Motivations that Drove the MyLibrary @LANL Project

At LANL Research Library, which focuses on digital information services, has provided new products and has offered significant commercially available digital data, our users have become overwhelmed and found it difficult not to get lost in too much information. It is problematic to organize Web links into categories, areas and groups that are natural and instinctive for a wide variety of users. A personalized model for our digital library was desirable for several reasons: the ever growing amount of information provided to the users, a multidisciplinary clientele, the desire for a simple Web data organization and the aim for a personal environment for patrons with some value-added features.

Winter (1999) explains how Web based personalization services can be used to improve digital library services. Indeed, due to their specialized interest, scientists and students who use the LANL library's resources, typically use the same resources over and over and would benefit from customization, interactivity and recommender systems. Our main reason for the design and development of a new online service, even though the market has provided personalized digital services in other formats, is the inability of those formats to meet the research needs of our customers. Most of the available services do not provide users with personalized shared Web environment, recommender system integration, Web link checking mechanism and tools that extend the functionality of Web browsers, all available in one place. On one hand, our system is specific to the digital library environment, especially LANL's. On the other hand, the system could fit the needs of a large variety of customers, providing functionalities such as shared Web environments, Web links checking mechanism and tools that extend the Web browser features. Imagine library users or standard customers who can also use the MyLibrary interface for personalizing online resources available at their library or at their company's Web site. The users could select to see local weather, local movie theater show times or share business information; the options are endless, and the best part is that the site could automatically be updated each time they log into their accounts.

2 Overview of MyLibrary @LANL

The MyLibrary @LANL service allows users to set up, to collect and to organize general Web resources or other selected information contained on the Research Library's Web site. This service allows for individualized spaces, enhanced content and ensures that the users are using increasingly more reliable and pertinent Web data. MyLibrary gives the users the opportunity to create and populate personalized Web environments called libraries. A personal library holds categories or divisions called folders; the folders hold a collection of links. The MyLibrary @LANL organization is similar to the directory structure of systems, with libraries being called directories, folders being sub-directories and Web links being files. A shared library in MyLibrary follows the same structure and has the same characteristics of a personal library. Moreover, a user sharing a library with a group of people defines the people who can participate and what their rights should be. MyLibrary's Web link characteristics could be compared to Web browser bookmarks. Bookmarks, also known as favorites, are shortcuts to Web links and assist users in remembering where to locate Web information. Bookmarks are not dynamic; when links stop functioning or are updated, bookmarks do not change to aid the user. There is an esoteric feature in the Netscape browser that will check your bookmark file to see if a Web link has changed since it was last visited. This feature is called *update links*. Many people never learn enough to utilize the update features. Bookmarks can be useful tools, but if your data exponentially increases, it is beneficial to have a mechanism to organize, check and rearrange bookmarks. MyLibrary @LANL links have the characteristic of bookmarks with the added features of quality, update and flexibility.

2.1 MyLibrary @LANL Interface

Upon the initial login, a user is presented with a personal library, whose content and *messages* are based on the subject discipline he/she chose at the subscription time.

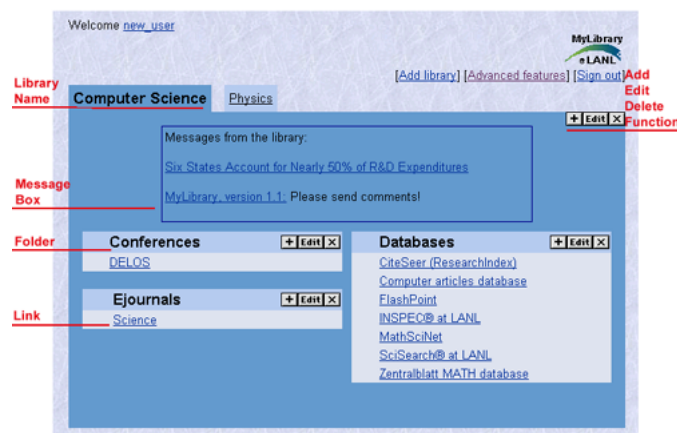


Figure 1. MyLibrary interface

In order to get the user started, we provide a *library* (Figure 1) with default links in the selected subject matter divided into folders according to media types that could be selected (e.g. *Databases* and *Electronic Journals* (Ejournals), *General Reference*, *Web Resources* or *Personal Web Links* (Personal)). At the moment, defaults are selected only for the first three listed media types. Currently the message section is a space where users can read library-related and discipline-related messages (e.g. a patron could receive conference/workshop announcements or instructional programs). The user at this point is free to add or delete links from his default sets of links, add folders for the different media types, add other (private or shared) libraries pertaining to other subject disciplines, and customize his Web browser profile and settings. In order to populate the media types (Databases, Ejournals and Web Resources), the user has two options, browsing the media type titles by subject discipline or searching them by keyword. The media types that are formed produce Web links with checkbox options allowing them to be selected and added. When adding links for the Personal and General Reference folders, the user has

the opportunity of choosing among different protocols (http, https, ftp, mailto, news, telnet, file). The Ejournal media type helps users to stay informed of new electronic journals available at LANL Research Library, from publishers. The Databases and Web Resources media type helps users to use the possible electronic databases and Web information available at LANL Research Library Web site. All the Ejournal and Databases links are exported from the local Online Catalog. All the Web links in MyLibrary are checked and if not functioning they are updated with user notification.

3 Main Features of MyLibrary @LANL

The MyLibrary system is designed so that library users at any type of library can search the LANL Research Library databases and the World Wide Web with more functionality, without expending their time and effort learning the intricacies of the various Web browsers. MyLibrary also offers users the ability to create personal Web bookmarks (be they from the internal or external Web), interact with the Research Library, use a protection mechanism to access their data, use bookmarklets, have the Web links checked and updated if they are not functioning and be notified if any bookmark changes. Groups of users who desire to share information have this option too. The following are relevant MyLibrary @LANL features and the first three are unique to MyLibrary @LANL:

1. **Bookmarklets:** Bookmarklets are simple tools that extend the surf and search capabilities of Web browsers. Bookmarklets are interactive small pieces of Javascript code that are contained in a hyperlink; they can be bookmarked and run in the context of the Web browser. A bookmarklet could be seen as a bookmark, but instead of storing a static Web link it stores a command, a tiny program. Bookmarklets can be utilized in several areas and with different purposes, such as direct access to search engines, improved browser navigation, extract data from a Web page, control cookies and many other handy tools.

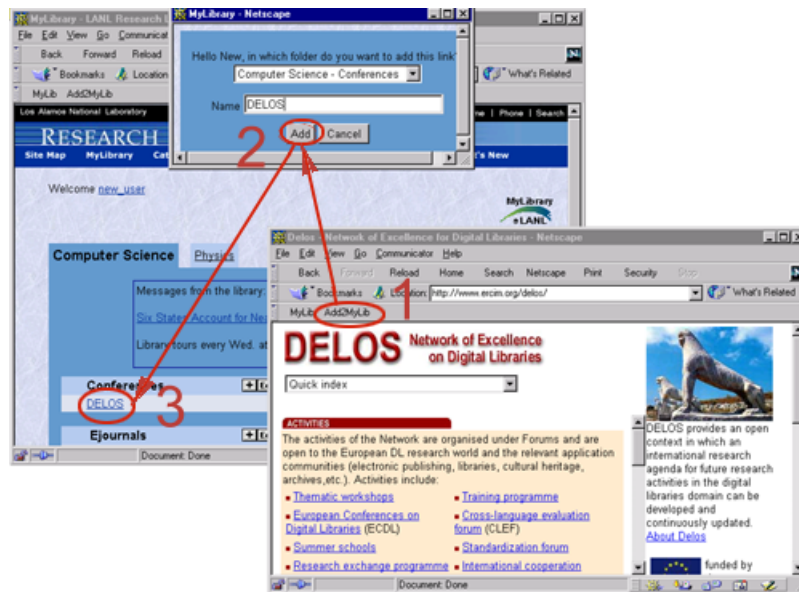


Figure 2. Adding a Web link to MyLibrary collection via Bookmarklets

The easiest way to launch bookmarklets is have them stored in the personal toolbar of a Web browser. The personal toolbar in a Web browser provides simplified access to links, commands, and page location information. It is located below the menu bar in the browser window. Besides adding links to web pages, you can add JavaScript methods that are activated when you click on their corresponding button in the toolbar. For example, you can add a method that opens a new window. To add a JavaScript method to the personal toolbar, you need to create a bookmark and define a command for that bookmark (instead of a link). If a link is dragged to the personal toolbar of a Web browser, the functionality of this link is readily obtainable since the link resides on the user's browser toolbar.

Example:

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<a href="javascript:void(window.open('http://www.lanl.gov'))">WWW</a>
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MyLibrary @LANL uses a bookmarklet (Figure 2) to easily add an external url to a folder within libraries. The bookmarklet passes the currently viewed url to the MyLibrary server and then adds this link to the media type folder the user has chosen.

2. Shared libraries: Groups of users interested in sharing Web data can do this by creating shared libraries, defining the users participating in it and the participants rights (read only or all).
3. Web link checking: Unfortunately Web links frequently stop functioning. An irritation for most users is that they are unaware of a link failing until they try to use it. MyLibrary @LANL has added a link checking mechanism to its design. The links are checked on a weekly basis and the user is notified of a link change.
4. User profile customization: A user has the choice to customize MyLibrary interface by having the ability to choose among several color themes, to order and rearrange libraries, folders and links.
5. Automatic download and updates for library selected (Databases, Ejournals and Web Resources) resources: This feature records links as well as it has the capability to update World Wide Web data (Personal). The Research Library has approximately 4,000 electronic journal titles, 200 electronic databases and 500 subject based Web links. All the Web links are updated automatically and periodically.
6. Library or subject discipline related messages: MyLibrary's design includes a message window for users. These messages are library and subject related. If a new physics journal is acquired and if the user has selected a physics discipline, the message is displayed on the user's library.
7. Protection mechanism: MyLibrary @LANL has a protection mechanism based on user name and encrypted password through which any user can log in. The server stores only encrypted passwords and if a user forgets his password the server can initiate a new one.

4 MyLibrary @LANL Architecture

This section presents the architecture and the technical solution adopted for MyLibrary @LANL. This system uses a client-server architecture and is based on an object-oriented design. The software architecture has been implemented using object-oriented Perl and Javascript (Web browser's cross-platform, object-based scripting language for client and server applications). The database MySQL is an Open Source SQL Database and the Operating System is Linux. MyLibrary @LANL service at the moment can be accessed through Netscape and Internet Explorer browsers. The server supports a user concurrency control mechanism and atomic transactions. The server consists of several modules, such as: library manager (takes care of all the features of a library), folder manager (whose purpose is the organization and manipulation of folders associated to media types), link manager (the manager for Web links), database manager (it is in charge of the database), style sheet manager (it handles user customized profiles) and bookmarklet manager (it manages bookmarklets).

5 User Perceptions

This section describes an interesting aspect of MyLibrary system, how the personalization system is used and perceived by its users, how they use it, how the system has improved their research and work time. Most of MyLibrary @LANL users make MyLibrary site their starting home page in their Web browsers. Mainly the reason for that is the majority of the Web links the Research Library offers are spread over different machines and domains; even though the Web links could be bookmarked, it is difficult for most of the users to organize all of them. The categories or folders arrangement offered by MyLibrary system provides users with some default links and a tabular organization that gives a dimensional perspective which is preferred to the vertical hierarchical ordering of bookmarks. The easy mechanism for editing libraries, folders and Web links makes MyLibrary more attractive and simpler than the equivalent features provided by Web browser for bookmarks. Users are very excited about the personalization service, because they can make their choices and they can access them extremely easily, from anywhere, and all of them are in only one location. Other uses of MyLibrary that have proved extremely beneficial are its use for outreach activities and remote access. Using MyLibrary, librarians and customers can populate a *demo* library with products that would be of interest to the specific audience.

It is a great way to pull together and share all the products with interested customers and also illustrate the power of MyLibrary at the same time. Moreover, users have found this service very useful while working from home or while accessing it remotely, because they can easily access any electronic journal article and all their Web links they need without carrying anything. In addition to the easy accessing, users are enthusiastic about the bookmarklet feature, because most of the internal and external Web links can be added from anywhere to their MyLibrary collection quickly, effortlessly, smoothly. To sum up all the users comments, we could say that MyLibrary makes user's research and work time more efficient. In the words of one user, *What a fabulous idea!*

6 Directions for Future Development of the Product

Future enhancements will expand the interactive characteristics of MyLibrary @LANL in several directions: enrichment of message area, user profile customization, Web link checking and visualization of not functioning links, and interaction with the *Journal Recommender System (JRS)*.

1. MyLibrary @LANL can become an interactive enhancement of the library's standard services by displaying automated messages announcing special events, reminding the library user of book due dates, allowing holds and recalls to be placed, books to be renewed and interlibrary loan forms to be filled out.
2. The MyLibrary @LANL interface could also allow patrons further user profile customization by giving them the ability to choose background, foreground, text, link color and many other possible options for their browser style sheet.
3. Web link checking and visualization of dead links: As stated earlier, links change and occasionally die. At the moment MyLibrary @LANL has a mechanism that checks for deceased links and notifies users through email; the enhancement would be to display the link with a visual symbol that shows the state of a link.
4. Interaction with the JRS: Currently MyLibrary users have two options to populate the Ejournal folders browsing the media type titles by subject discipline or searching them by keyword. This search function could be problematic for users who are not expert in the domain they are interested in. A general query may return an impractically large number of Ejournal results, while more specific queries require domain specific knowledge of classifications and terminology. The goal is therefore not only to help users to find relevant Ejournals, but also to recommend a standardized classification of their interests for future retrieval sessions, using JRS. The JRS is based on the use of Spreading Activation (SA) (Anderson, 1983) as an Information Retrieval (IR) methodology (Pirolli, Pitkow, & Rao, 1996). SA in IR relies on networks of associative document relations, rather than text matches against an individual document's content or meta-data. As such, it can return relevant results to associative queries that would otherwise generate large numbers of irrelevant text matches. JRS lets users enter general key terms associatively describing their interests rather than an actual query to match against journal titles or abstracts. For example, a *water energy* query could indicate the user's interest in *hydrology*. One other advantage of SA's reliance on network structure is that, given the appropriate interface, it can be queried by lists of sample documents implementing a *more like these* functionality. An associative network of 472 journals was generated from temporal patterns of usage derived from the Research Library Web logs using a methodology outlined in (Bollen, 2000). Each of the journals was labeled with its titles and a Library of Congress Classification (LCC) as a classification of its content. Users can query the system using highly general description of their interest and the JRS recommends a list of relevant Ejournals.

This system will shortly be improved to respond to LCC as general descriptions of journal content. The JRS interface will consist of two lists. Users may select a number of LCC categorical descriptions in the first list. These will be input to the JRS that will consequently return a list of SA Ejournal recommendations. This list will appear in the second window where users can indicate which of the recommended Ejournals they find interesting. This list can then again be fed into the JRS to return a list of LCC recommendations corresponding to these Ejournals. At any time in this process, a user can add a recommended journal to one of his/her MyLibrary folders. The journal or LCC recommendation will not rely on fixed classification-journal relations, but on the SA process generating relevant recommendations for both Ejournals and LCC. We expect this interactive process to allow users to discover not only possibly relevant journals according to an explicit categorical indication of their interests, but also to discover new classifications of their interests.

Figure 3 shows an example of query through the existing JRS system.

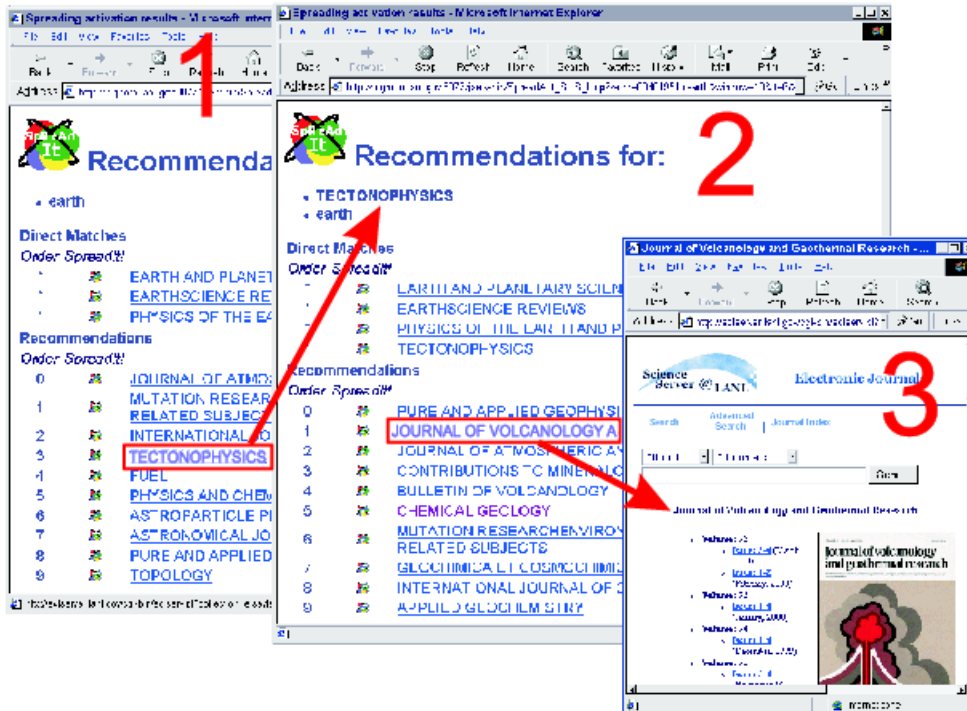


Figure 3. Querying by example via JRS service.

A user enters the query *earth*. The JRS returns the list of recommendations displayed in screenshot 1. The results include journal titles such as *Fuel*, *Journal of Atmospheric and Solar-terrestrial Physics* and *Topology*. The user wants to fine-tune these recommendations according to his/her interest in *Tectonophysics* and selected the *add-query* item preceding the journal *Tectonophysics*.

The original *earth* query is expanded with the *Tectonophysics* journal, and a new set of recommendations is generated for the new query (shown in screenshot 2). These recommendations have changed according to the addition of the *Tectonophysics* journal. The list contains journal recommendations for *Pure and Applied Geophysics*, *Contributions to mineralogy and petrology*, etc.

The user decides the *Journal of Volcanology* is most relevant to his/her information needs, and selects the retrieval hyperlink associated with the journal recommendation. The user is then taken to the journal's main page on the LANL Research Library web site (screenshot 3) and he/she can add the journal to MyLibrary using the Bookmarklet feature.

7 Conclusion

The LANL Research Library strives to improve services to its users by working with its digital products to enhance functionality. MyLibrary @LANL will continue to evolve and improve, based on customer use, comments, needs and testing.

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