

Visiome Platform

Izumi Ohzawa

Graduate School of Frontier Biosciences, Osaka University,
1-3 Machikaneyama, Toyonaka, Osaka 560-8531 Japan

ohzawa@fbs.osaka-u.ac.jp

1. Introduction

There is much more to ingredients for successful research than availability of published papers in research journals. Despite rapid development of modern information technology, the way we share our fruit of research is still largely limited to papers published in scientific journals. Although these published papers will continue to play an important role in scientific exchange and record-keeping of ideas, we need to share much more than traditional published papers in the future. Just as genome and protein databases have been playing a key role in the modern molecular and cellular biology in enabling sharing key data, we must begin to share non-traditional form of research results, by products, and tools in neurosciences.

One obvious candidate for sharing is experimental data, and the data sharing is beginning to be required as a standard part of publicly funded research. However, models of neural systems are increasingly gaining importance not only in computational neuroscience, but also in experimental areas of neuroscience. Many of recent exciting progresses are being made where mathematical models are combined with more traditional experimental neuroscience research. It is in recognition of need that Neuroinformatics Research in Vision (NRV) Project was initiated in 1999 with funding support from the Japanese government. And as a key part of this research project, Visiome Platform and its personal version, Personal Visiome have been developed.

Visiome Platform is a Web-based database system with a variety of content items that are relevant for research activities in the area of vision and neuroscience. The choice of the specific research area, vision and neuroscience, is coincidental and is not an inherent limitation of the database system. It was initially designed by users who are active scientists in these particular areas for use in their own research activities. It is now a reference platform, which may be duplicated for other fields of research by replacing the key word index tree. In what follows, unique features of the Visiome Platform system are described in detail.

2. Design Goals of Visiome Platform

Visiome Platform is not a portal site, and has been designed to be a site with real content with the following goals.

1. Database with real content with mathematical models, experimental data, references in addition to pointers to resources at other sites.
2. Browsing via hierarchical index key word tree (Visiome Index) combined with key word search for finding items.
3. Ability to define relationship between content items in a hierarchical manner by a follow-up tree.
4. Ability to collect related items into a binder (Visiome Binder).
5. Simple procedures for adding new content.
6. Ability to open a PDF reprint file for a given reference (MyPDF)
7. Data export via a shopping cart mechanism for importing into Personal Visiome.
8. Open source components for system infrastructure (Apache, MySQL, etc.)
9. Site, user, and content management functions.

3. Overview



Figure 1. Visiome Platform Home Page

Visiome Platform is accessible at the URL, <http://platform.visiome.org/> with the top page as illustrated in Fig. 1. At the top is a header section with commonly used functions represented as

icons. At the left is Visiome Index section which allows navigation for browsing the content via hierarchically organized keyword index (see below). In the main display area, some of the representative key content such as collection of models, data, tools, visual stimuli and others are accessible via the top page. This area will display the search results, entry forms for contributing new items. Many of the content items may be viewed and downloaded as a guest user. However, other items may require a registered user status for downloading. Adding new content items also requires a user account.

4. Basic Features

4.1 Visiome Index

Visiome Index is a key navigation feature of Visiome Platform. It is a hierarchically organized tree of index keyword that NRV members spent a great deal of time and effort to construct. These key words are of course specific to visual neuroscience, but is replaceable when building a platform for other disciplines. Clicking a keyword performs a search in the database, and the results are displayed in the lower-right area of the main window (see Fig. 1). The same index area is used for selecting multiple keywords for performing more complex searches by ANDing or ORing key words at different branch positions in the index tree. Using this index tree, one can browse the Platform content.

Of course, if you know a specific key word by which you wish to perform a search, a search field at top-left of the main window (see Fig. 1) may be used. For advanced search, there is also a form (not shown) which allows selection of item type such as model, data, tool, simulator, etc., selection of range of dates for publication, contribution, and more complex combination of ANDing and ORing key words.

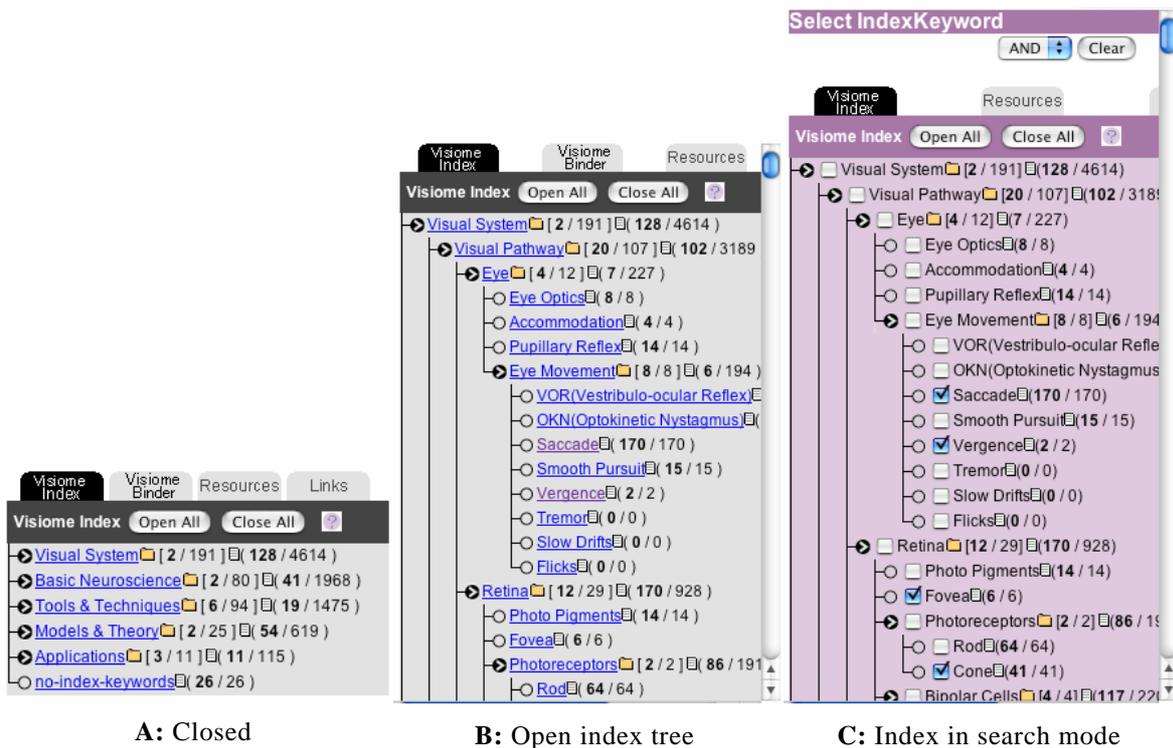


Figure 2. Visiome Index in various conditions. **A.** Index in closed condition revealing the top index items. **B.** Index items marked with the right arrow symbol may be opened further to reveal a more detailed tree structure. Clicking a keyword will list selected items that match the key word in the main display area (see Fig. 1). **C.** During search mode, the index tree key words become "checkable" for specifying key words. Note that multiple key words are selected for performing AND search (may be changed to do OR as well). An index tree similar to this is also used for specifying key words when contributing new content to Visiome Platform.

4.2 Contributing Content

Visiome Platform has 10 basic items that registered users are able to contribute. These include Binder, Model, Data, Tool, Stimulus, Simulator, Presentation, Reference, Book, and URL. Clicking the "Contribute" icon at the top of the main window will display the list of item types as shown in Fig.3.

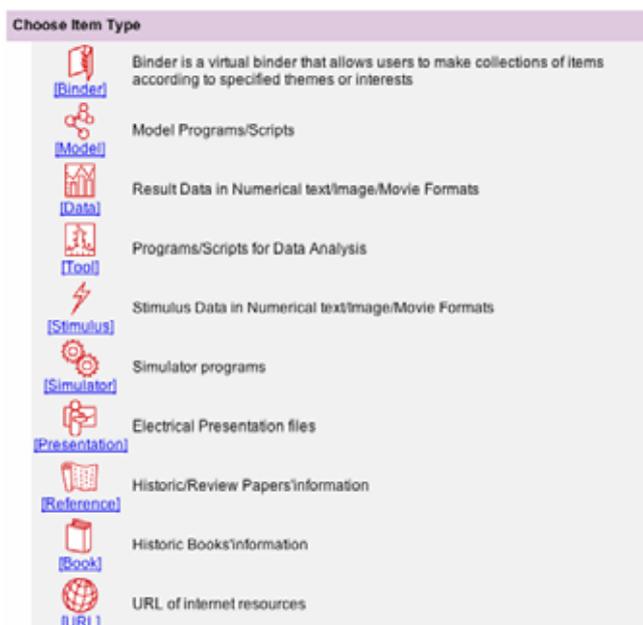


Figure 3. List of item types that may be contributed.

Because information that should be recorded differ depending on the item type, a separate entry form is displayed for each item type. Many of the original content items such as Models, Data, Tool, etc. will allow uploading of multiple attachment files, multiple explanatory figures, a README file, and allows specifying license terms under which the content is made available to users. At the time of registering contributed content, the contributor is able to select various options as well. For example, the system has an ability to send an email each time the contributed item is downloaded. One can elect to receive such notifications. The contributor is also able to select whether a guest user is allowed to download the item or only a registered user is allowed to download it.

When contributing a content, one can specify a relationship of the item contributed to other items already registered on the system. This is called a "follow-up." For example, if one wishes to contribute a model source code described in a certain paper, the model may be contributed as a follow-up to the reference item (a paper) that is already registered. The follow-up tree is also hierarchical. Therefore, a new updated version of the model or a paper that utilize that model may be added as a yet another follow-up to the original model. In this manner, a flexible binding between registered items may be created between items of different types. Internally, each item maintains a list of its "parent" as illustrated in Fig. 4.

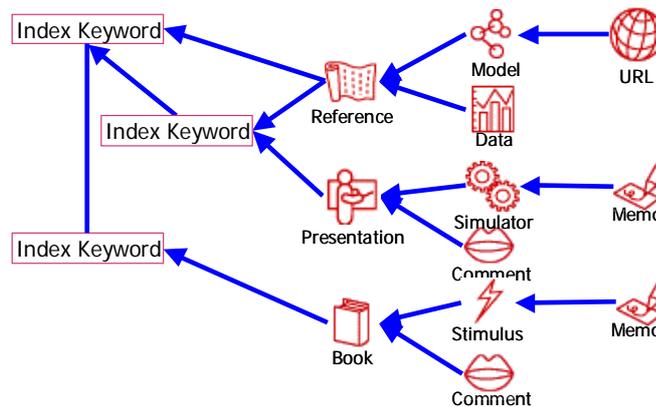


Figure 4. Follow-up tree may be created between items of different types.

Although the main focus of Visiome Platform is to serve as a database of models, data, tools etc. that are useful for researchers, the "glue" that binds all these items are published papers. Therefore, handling of the item type "reference" is critically important for the ease of use of the entire platform. We have made the registration process for references as painless as possible by leveraging on the PubMed database operated by the National Library of Medicine at the NIH.

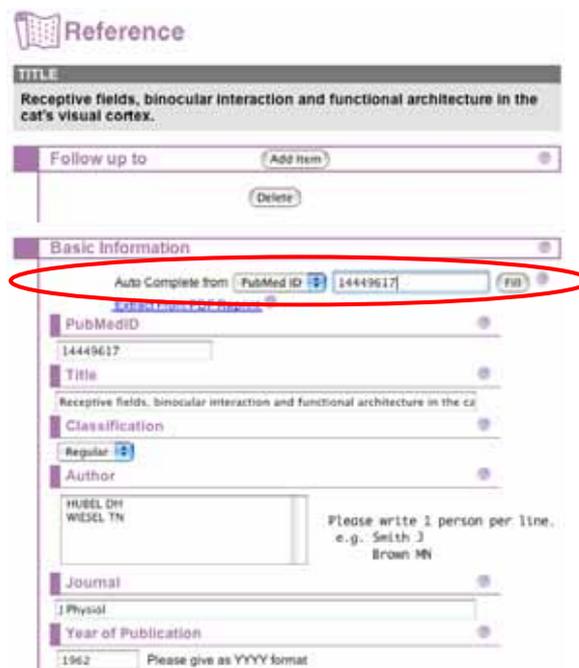


Figure 5. Auto-completion of reference data fields via PubMed.

By entering just one number, PubMed ID, for the paper, and pressing a button "Fill" as shown in Fig. 5, the remaining textual fields such as the title of the paper, author list, journal name, year of publication, volume number, and page ranges are automatically completed in this form. The

contributor has to select the index key words using the Visiome Index tree similar to that shown in Fig. 2C.

4.3 MyPDF: one-click opening of your PDF reprint

Additional key feature of Visiome Platform regarding handling of references is that the platform is able to open a PDF reprint in your own collection. Based on the "base URL" that one can register as a part of user information, each user is able to specify the location of the PDF archive site. Then, whenever a search results contain a reference, the platform creates a complete URL to the PDF reprint on your own server. This process is illustrated in Fig. 6. The PubMed ID is a key field of the Visiome Platform database, and if your PDF archive is constructed with reprint files named by PubMed ID, the URL for automatically opening the reprint may be constructed easily.

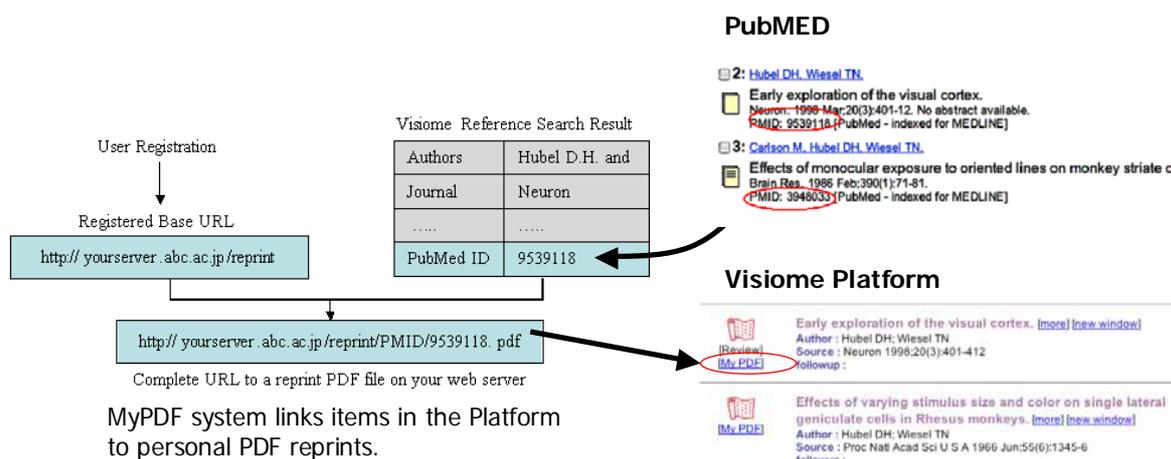


Figure 6. MyPDF feature allows direct opening of PDF reprint of from Visiome search results.

Tools that are leveraging on the PubMed ID-based reprint collection are appearing in the form of scripts (PubMedPDF Tools) and GUI-based applications (iPapers for MacOS X). Management of thousands of PDF reprints has been a headache, but the appearance of these tools and support provided by the Visiome Platform is able to solve most of the problems associated with reprint management.

4.4 Visiome Binder

Binder is a collection of any registered items organized and packaged as a single item, as illustrated in Fig. 7. It is ideal, for example, for presenting a reading list that is not limited to just published papers. It may include published papers, models implementing some of the results

described in these papers, comments made by other contributors, experimental data that support or are inconsistent with the models, and URLs for other sites that offer related information. All these diverse range of contents can be packaged into a single binder. Compare the ease of gathering all the necessary items relevant for your research as implemented by Visiome Platform to the current state of reference list at the end of published papers. Reference section of most journals only lists other published papers, exception being the related additional materials from the authors available at the journal site or notes indicating the authors' own web site for such materials. Visiome Binders themselves may be contained in another binder.

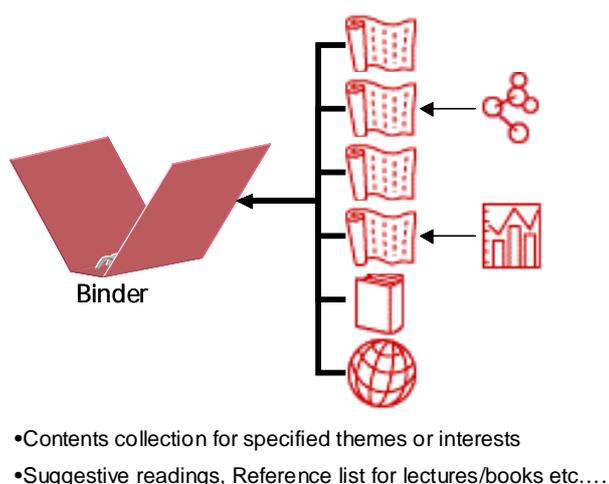


Figure 7. Visiome Binder - a collection of any registered items

5. Personal Visiome

Personal Visiome is a version of Visiome Platform specifically designed for use by an individual or small laboratory. Although initially started as separate projects, much of the code base for the two systems have been consolidated to use mostly open source components such as Apache web server, and MySQL database. The reason for the Personal Visiome is obvious. It is for managing contents that a researcher or a laboratory is not yet ready to make public, such as the data that are being analyzed, collection of materials that are incorporated into a manuscript during preparation, notes and candid opinions about papers that may be awkward to make public. Although Personal Visiome is primarily for private use, with time the contents in the Personal Visiome may become ready for public consumption. With the data export/import feature under development, it should not be difficult to devise a mechanism for exchanging data between Personal Visiome and Visiome Platform. Keeping the content of Visiome Platform including references up-to-date requires cooperation of many users, the ability to update it from Personal Visiome of many users would be a great way of enhancing scientific communication among researchers.

6. Concluding Remarks

After 5 years of intensive development, Visiome Platform publicly opened its doors in April, 2004. It is designed to serve as a reference implementation for many other similar platform systems for other research areas. For example, a similar system may be opened as a central repository of research results from specific research grants distributed through cooperative groups, perhaps a grant distribution system unique to Japan. It would be far more beneficial for members of such research groups and taxpayers as well to end up with a database system that contains key research achievements, including models, data, and tools resulting from such group efforts at the conclusion of each project. It is a collective hope of all the members of NRV project that numerous platform sites will spring up for many other disciplines, based on systems we have developed. We intend to make it a reality in the near future.

Acknowledgements

Visiome Platform has been developed by 20+ members of the NRV (Neuroinformatics Research in Vision) project and their laboratory members with full funding support from the Special Coordination Funds for Promoting Science and Technology of Ministry of Education, Culture, Sports, Science and Technology (MEXT) of the Japanese Government.