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Organizing Slovene Medical Bibliography on the World Wide Web

ABSTRACT

The Institute of Biomedical Informatics (IBMI) has built and maintained the Slovene biomedical bibliographic database Biomedicina Slovenica (BS) for more than twenty years. BS is built according to the standards of the American National Library of Medicine adjusted to local needs. BS is used for the following tasks: information retrieval particularly for endemic topics, preparing individual and institutional bibliographies and recently serving as a base for a decision support system for biomedical research evaluation. Because the BS database is very important for the Slovene medical community, IBMI decided to enable wider access to it by putting it on the Internet. World Wide Web (WWW), one of the most popular Internet tools was chosen for the implementation.

INTRODUCTION AND BACKGROUND

Although the Internet has evolved over more than twenty years, resources useful to health information professionals have became available on the Internet only recently. Medical research, diagnosis and therapy require urgent access and integration of information from waste databases. [1,2,3]

World Wide Web (WWW) has become one of the most popular search tools in the last decade. It offers hypertext documents that pull together information from sources around the world. Instead of merely citing supporting references, WWW authors can include active links directing the reader to the WWW server holding the supporting information.[4]

We can follow many valuable biomedical bibliographic resources on the WWW. The bibliographic database MEDLINE produced by the National Library of Medicine (NLM), is a computerised index to the world's biomedical literature. It is one of the most important biomedical reference source. The various means of access are available. Trends include increased access to the WWW using different solutions and links from MEDLINE records to full-text databases or online journals.[1,2,3,5]

The Institute of Biomedical Informatics (IBMI) started to create the Slovene medical bibliography (BS) twenty years ago using MEDLINE standards. BS

is important for information retrieval, particularly for specific topics e.g. considering national epidemiology or health planning and personal and institutional bibliographies .

In the last two years BS has served as the basis of a decision support system for biomedical research evaluation. For that purpose it was augmented with various scientific indicators, generally falling into the categories of bibliometric and non-bibliometric indicators. The evaluation is usually needed either for individual scientist or for a research group and for different purposes e.g. for research project approval, for academic career, for different awards etc.[6]

BS has many functions of national importance so we decided to enable our users easier and more user friendly access. Because of its complex structure it was quite a difficult task. Transferring BS into a relational database environment made possible to offer it on WWW.

PRINCIPLES OF BS CONSTRUCTION

IBMI has built BS using MEDLARS standards and MESH thesaurus as an indexing tool. In addition two special fields have been included: Non-Mesh terms useful for describing geographic areas in Slovenia or personal names and institution numerical code denoting Slovene institutions useful for preparing institutional bibliographies. For the purpose of the research activities evaluation the structure of BS has been expanded with bibliometric indicator code and researcher identification code (ID). Recently the BS structure was augmented by an URL field, in which the Universal Resource Locator (URL) is stored. If present, the data in this field enables access to the full text version of the document on the Internet.

Today BS is organised in two segments: the older one indexed by MESH headings translated in Slovene and newer one with English MESH headings. The entire database contains about 48000 records with an annual increase of about 3500 records.

BS indexes Slovene authors' articles published home and abroad. It also includes journals, monographs and proceedings published in Slovenia. BS covers biomedicine, dentistry, veterinary medicine and adequate life sciences.

BS IMPLEMENTATION

Biomedicina Slovenica (BS) is basically a bibliographic database and for a long time it was stored and managed by a bibliographic database system called CDS/ISIS. It was suitable for managing textual data, but unsuitable for numerical data.

Because we wanted to use BS as a foundation for a decision support system for research evaluation and because a lot of numerical measures have to be calculated and stored in such a system, two years ago we decided to transferred the data from CDS/ISIS to a relational database management system (RDBMS). We selected the Oracle 7 RDBMS, which is currently running on a UNIX server.

The programs needed for data entry and searching, as well as the necessary reports were developed in a client-server manner using Oracle Developer/2000 set of tools. These programs run on personal computers in the MS-Windows environment and communicate with the Oracle server using the TCP/IP communications protocol. The programs are quite complex and offer a rich set of search capabilities. They are used by the staff of the Institute of Biomedical Informatics to maintain the Biomedicina Slovenica database.

However we found some drawbacks when we considered making these programs accessible to the general medical community: each client computer needs a runtime licence, the Oracle tools must be installed on it and they require relatively high communication bandwidth.

In order to make the Biomedicina Slovenica database accessible to a large number of users in an inexpensive and easy to use way, we decided to make it available on the WWW.

WWW is the most popular and frequently used tool for accessing and browsing through information on Internet. Any user having a WWW browser and a connection to the Internet can reach any WWW server. Typically the WWW pages are static and are created by hand. Static pages were not suitable for our purpose because we wanted to allow the user to formulate a search request and get a dynamic WWW page as a result.

There are several possibilities for creating dynamic pages. The easiest way is probably to use some of the specialised web indexing and search tools like Harvest[7] or Excite[8]. However these tools require periodic uploads and reindexing of the data. As a consequence, the user does not get the current state of the database, but that of the last upload.

After carefully considering the strengths and drawbacks of the various methods we decided to develop our own programs to allow the user to search the Biomedicina Slovenica database directly from his/her WWW browser. Our programs create the web pages programmatically and always display the state of the data as stored in the Oracle database at the time the web page is accessed. To achieve this functionality, we used the Oracle's WOW (WWW-Oracle-WWW) gateway interface. The WOW gateway allows the web pages to be dynamically created by writing high level programs which are stored in the Oracle database as stored procedures.

USING BS ON WWW

Biomedicina Slovenica on WWW can be accessed either indirectly from the Medical Faculty home page *http://www.mf.uni-lj.si* or directly from the Biomedicina Slovenica on WWW home page *http://www.mf.uni-lj.si/bs/bs_start.html*. In either case, the first thing to do is to select the Slovene or English versions of the programs by following the appropriate hyper-link.

Searching Biomedicina Slovenica on WWW is very easy if the user has a browser, which is capable of working with frames. In that case the browser window is divided into three parts (frames): In the upper frame we can enter the search request, in the lower left frame we get brief search results or help for searching BS and in the lower right part we get a full bibliographic record (Figure 1). Using frames makes it possible to make visible all the important information at the same time. Browsing backward and forward between the web pages when searching for information is confusing for many users. By using frames it becomes unnecessary. We can resize the frames by simply dragging their boundaries if we want to increase or decrease a particular frame.
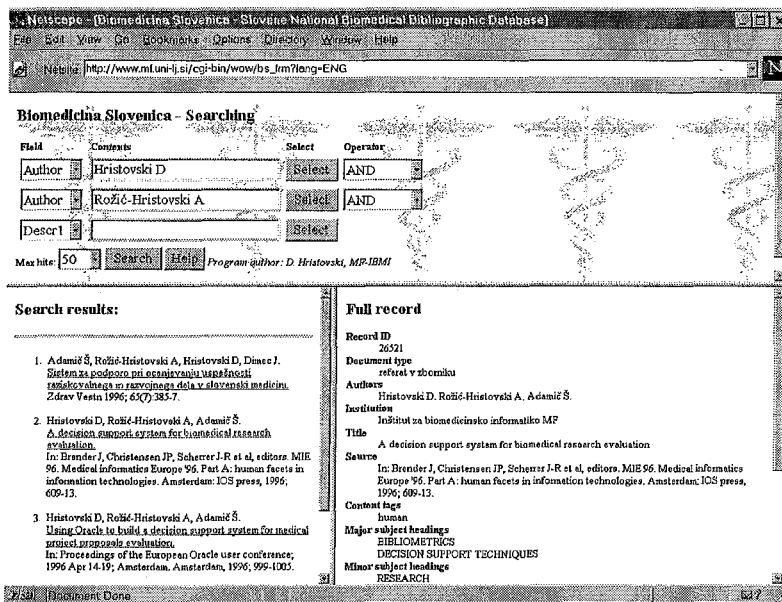
Figure 1. Searching BS for documents written by two known authors.

The upper frame contains three rows, which allow us to enter three search terms at most. In the column **Field** we can select the name of the field we want to search. Currently it is possible to search for publication's author, title, source, publication year, major and minor subject headings (Figure 2).
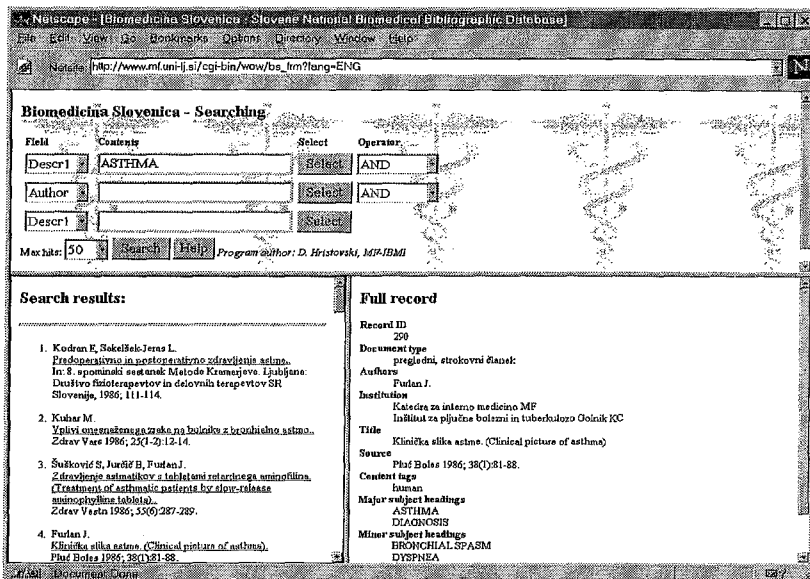
Figure 2. Searching the BS database for the ASTHMA major subject heading (Descr1).

Then in the column **Contents** we can enter the search term. The symbol '%' (percent) can be used as a wild-card character and can replace any string of characters. If one search term is not enough to specify the search request, it is possible to enter additional search terms in the second and third row (Figure 1). The search terms are connected by an operator, which is selected in the **Operator** column. Three operators are available at the moment: *AND, OR* and *AND NOT.* They follow the traditional Boolean logic semantics. When developing the user search interface our foremost goal was to make searching as easy as possible for the inexperienced user. Thus, the set of search requests that can be expressed with our interface is a subset of the set of all possible Boolean search expressions.

If we do not know the exact form of the search term, we can type a part of it in the column **Contents** and click the appropriate **Select** button. As a consequence, we get a list of corresponding search terms and a database

occurrence count for each term. From this list we can select the desired search term. The selected term is written back in the main search frame.

We can run the search request by clicking the **Search** button. The field *Max hits* determines the maximum number of hits displayed, regardless of the actual number of hits. The search results are displayed in the lower left frame as a list of brief bibliographic records. The document title is underlined and represents a hypertext link to the full bibliographic record. By following this link we get the full bibliographic record in the lower right frame. Here all the fields of the record are displayed, one record at a time. An increasing number of records contain an *URL* field which represents a link to the full text version of the document.

The **Help** button displays some help about searching the database.

BS ON WWW USE EVALUATION AND CONCLUSIONS

Six months after BS is accessible on WWW we noticed a great interest among the Slovene biomedical community. During that time the users accessed BS home page 1509 times and they performed 2746 searches (Figure 3). Most of the users were from Slovenia, but we found out a few from abroad as well.
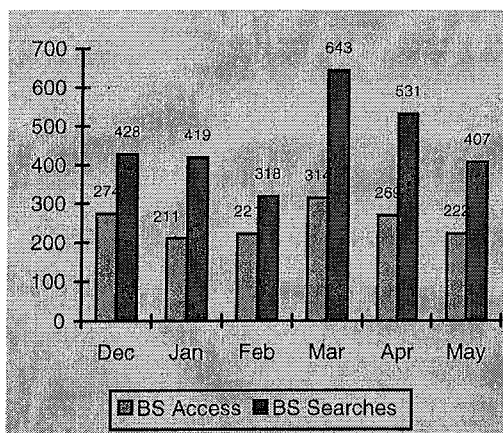

Figure 3: BS on WWW access and searching statistics

Because BS serves as the base for a decision support system for research activities evaluation and sometimes for tenure and promotion, the users are interested in completing their bibliographies in BS. Now they check their references regularly themselves on WWW and inform IBMI about mistakes and missing publications.

As BS gains popularity, the Slovene journals publishers and congress organisers are more interested to index Slovene biomedical literature in BS than before.

Including URL in documents enables presentation of full-text on WWW. At the moment three Slovene journals have started to go completely online. IBMI endeavours to include the more URLs and make possible links form BS to complete documents.

In the future, we plan to improve the capabilities for searching BS on WWW by including the MeSH thesaurus and by offering subheading searching.

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