

## Providing Access to Locally Generated Databases over the Web

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### Abstract

The Grainger Engineering Library at the University of Illinois at Urbana-Champaign has implemented Web-based access to locally developed information resources using the Microsoft (MS) Active Server Pages (ASP) technologies. These local databases, in both MS Access and MS Structured Query Language (SQL) Server format, complement traditional engineering information resources. The databases provide enhanced access to difficult to locate materials and resources that are outside the scope of an online catalog and article databases. The local databases are accessible for any Web user from the top-level menu at Grainger public terminals, from a custom reference desk menu, and from the Grainger Home Page (<http://www.library.uiuc.edu/granger/>). These databases have greatly improved the training of reference staff, particularly new graduate assistants, librarians and paraprofessionals. From December 1997 through February 1, 2000, the Grainger local databases have been selected 26,067 times, which makes up approximately 24% of the over 107,000 selections from public terminal main menus. This paper describes how these resources are developed and the improvements that Web technologies have offered.

### I. Introduction

The World Wide Web has become the vehicle of choice for online databases and other collections of online information.<sup>1</sup> Web-based resources offer several advantages over telnet, CD-ROM, and locally programmed resource access. The Web offers a consistent search, retrieval, and display mechanism independent of the hardware or operating system being used.<sup>2</sup> There is evidence that web-based interfaces are used more effectively than telnet-based interfaces by end-user searchers.<sup>3</sup>

Libraries have begun to offer or are experimenting with Web-based access to locally produced information resources formerly available in vertical files, word processing documents, or within

client-server database systems accessible through custom client software, telnet environments, or as part of the local OPAC configuration.<sup>4-7</sup> Other libraries have converted their paper vertical files to a Web format by creating Web pages that contain hypertext links to the Web sites of the organizations or entities formerly represented in the vertical file.<sup>8,9</sup>

The customized local databases, in both MS Access and MS SQL Server format, complement traditional engineering information resources. Currently, there are over 20 local databases available on the Grainger Web sites and are commonly referred to by Grainger staff as “Reference Assistant”. Each of the different databases has a specific name and description listed below:

- a Reference Collection database with over 2,600 records. Includes added subject access points taken from each work’s table of contents; annotations and comments entered by Grainger staff to indicate the most appropriate reference tool to meet a patron specific information need; and the ability to limit to a specific type of reference tool;
- Difficult Citations and Frequently Asked Questions databases of both commonly asked questions and difficult to find information and holdings/locations totally nearly 600 records;
- a Currently Received Journals database of 1,600 serial titles. Includes check-in and binding information and links to tables of contents of specific issues via a custom component which connects to the Current Contents database running under Ovid<sup>10</sup>;
- a database of All Journals Ever Received in the Engineering Library – over 4,500 records of both currently received and canceled/ceased – including previous titles and succeeding titles since 1916;
- a Reserve Collection database of approximately 1,000 reserve items and which includes links to instructor supporting materials on the Web;
- a UIUC College of Engineering Documents Center collection of over 14,000 uncatalogued technical reports authored by UIUC faculty;
- engineering publications databases providing searching of over 5,000 society publications from IEEE, MRS, ACM, AIAA, NASA/NACA, ASME, and SPIE. Each society can be searched independently or combined in the Engineering Societies Publications interface;
- a New Books database with links to 6,300 online catalog records and order records;
- a Multimedia database with 360 video, CD-ROM, and audio tape records;
- a Faculty Research Interests database with information on 1,076 individual faculty members - including research accomplishments, awards, honors, etc;
- governmental Bureau of Standards, Bureau of Mines, and US Patents assigned to UIUC databases; and
- a Multiple Resources database that allows simultaneous, discrete searching of a number of the local files listed above.

These databases have been converted into a Web-based retrieval environment using the Microsoft (MS) Active Server Pages (ASP) technologies. These Web-based databases are designed to provide patrons and reference staff with enhanced access to important information resources and also to assist in the training of reference staff, particularly graduate assistants and paraprofessional staff. This paper will describe the local databases and the Web-based technologies employed by Grainger staff in implementing access to local information resources.

It includes a discussion of ASP technologies and the associated local database structure and format.

## II. Development of the Local Databases

From 1978 to 1998, UIUC was using the WLN software for a statewide online catalog. In 1998, the online catalog was converted to DRA Classic, with primary access being supplied by a telnet client. The Web based DRA client has, until recently, been in test phase. Due to various difficulties in the OPAC systems, Grainger librarians started to develop printed finding aides from word processor or text files and kept in a Ready Reference file. The updated lists needed constant reprinting. In early 1995, in order to maintain complete and accurate information, the author and another Grainger librarian began to convert these files into MS Access databases using custom Visual Basic programs. Library staff to search specific fields that the online catalogs could not provide could tailor the Visual Basic programs. These early programs were added to the Reference desk and public terminal interfaces to assist library staff and patrons. Librarians using custom Visual Basic data entry and verification programs or program-based data extraction from other resources generated eventually additional databases.

Each of the databases has a unique history. Some databases were originally created to simplify library operations such as the Serials Control System and Reserves. In order to verify receipt of society publications, the engineering society databases utilize publication lists taken from the Web sites of the various societies and the IEEE database allows library staff to enter information from shipping lists and publication notices. As these databases developed with added information that could help patrons — such as assigned call numbers, series titles, or special holding locations — the databases naturally evolved to provide public functions. Other databases were developed to assist library users and provide access to materials lacking adequate bibliographic control, such as Engineering Documents collection, Faculty Research Interests, and UIUC patents. These local resources complement or supplement the online catalog and other available information resources.

All databases are maintained and updated as needed, depending on the particular database. For example, some are changed daily such as the Currently Received Journals. Others are updated weekly or monthly as new publications arrive such as the Engineering Society Publications, New Books, and Multimedia databases. The Faculty Research Interest and Reserves databases are typically updated at the start of new academic semesters. As the databases grew in size, many databases have been moved to MS SQL Server to insure better transaction throughput, particularly in multi-user situations. Maintenance and updating of the databases is primarily the responsibility of 1.5 FTE graduate assistants. This is done in two ways: via data entry forms using Web-based or Visual Basic clients or through program-based extraction from other resources such as the online catalog or article databases.

When the databases were accessed through a Visual Basic program, each public terminal required a custom Visual Basic client to retrieve information from the databases. This did not allow patrons to access the databases from non-library terminals. In the last three years, the Reference Assistant databases have been moved to a Web environment using ASP technologies for Web-based retrieval. Upgrading the Visual Basic programs to ASP was relatively easy given

that ASP uses the Visual Basic Scripting Language (VBScript) to connect to MS Access databases and other Open Database Connectivity (ODBC). In order to accomplish this quickly and easily, librarians first converted the Visual Basic programs to VBScript programs for a few of the programs. Library graduate assistants could then copy the files needed, changing the connecting database name and field names as needed, and load the programs onto the Web server. The Web-based programs and changes took less than 16 months to complete.

Local database access in Grainger has followed a natural evolution from stand-alone microcomputer-based systems to local-area networked architectures to a Web-based environment. These local resources are available to any Web user from the Grainger Library Home Page, the Web top-level menu on Grainger public terminals, and a custom reference desk Web page at <http://www.library.uiuc.edu/granger/>. Figure 1 shows the public terminal top-level menu. Placing the mouse over any link brings up a short description of the resource. Figure 2 shows the database selection page that is one link below the Grainger Home Page.

As the number of available local, remote, and consortia information resources continues to grow, Grainger staff have developed a 'Help Getting Started' module, the first page of which is shown in Figure 3, to assist users in identifying the most appropriate resources to meet their information needs.

### III. Database structures and retrieval features

Within the Web-based local databases, we have employed a common database structure and data element format. These conventions have been applied, as much as possible, across all of the local resources. This standard database structure includes a set of common table and field (column) tags and rules for the format of the associated data contained in the fields. Both the planning and the implementation are crucial to the success of any database project.<sup>11</sup>

We have assigned 20 standard field names displayed in Figure 4. Each file uses the appropriate fields as they apply. This provides a number of advantages for search and retrieval. It allows for simultaneous searching of multiple databases. These databases can be in the form of a large merged database or can be separate databases that are searched consecutively. The common table and field names and consistent format of the data allows the creation of general purpose ASP routines that construct the appropriate SQL commands needed to search the selected database(s). For example, the 'Authors' field is used in a consistent fashion in each database. That is, in all the databases the author name is entered in the form last name followed by a comma followed by first name, e.g. Smith, John. This allows us to construct consistent SQL search statements for retrieval across different databases, see Figure 5.

Presently we are able to search multiple MS Access or MS SQL server databases consecutively and can return results within a single Web session. We expect to expand this capability in the future. We have developed a Z39.50 dynamic link library (.dll) that will allow sequential searching of the library online catalog, selected periodical index databases, and local databases.

On the Web side, the Grainger local databases employ the same common interface for search and display operations, whenever possible. See Figure 6 for the search argument(s) entry form from

the Reference Collection database. The initial ASP (.asp) Web page for each resource displays a 'query-by-example' entry form, with the particular search entry fields differing between resources depending on the fields within the particular database. The databases all feature:

- the ability to search multiple fields and utilize either Boolean OR or AND operators;
- a choice of displaying search matches one full record at a time or fifteen abbreviated records at a time with links to the full record;
- default keyword 'AND' searching for multi-word search arguments;
- default left and right hand truncation of search arguments;
- exact phrase searching using quotation marks;
- separate prompts for author last name and first name;
- 'NEXT', 'PREVIOUS', 'FIRST', and 'LAST' record navigation buttons (Figure 7); and
- return to the original top-level menu.

#### IV. Web technologies

The Grainger local databases that have been made available over the Web have been developed under the Active Server Platform (ASP) technology on Microsoft (MS) Internet Information Server (IIS) running under Windows NT. These Web pages, which have an .asp file extension, provide browser-neutral database connectivity over the Web. ASP files contain a mix of Hypertext Markup Language (HTML) and server-side scripting code written in VBScript, JavaScript, or PerlScript. Within an ASP file the scripting code is executed on the server with the resulting code converted to HTML, which is sent directly to the Web browser.

Web developers are able to create dynamic Web pages using ASP' server-side scripting tools. ASP uses predefined objects to connect to Open Database Connectivity (ODBC) databases, such as MS Access or MS Structured Query Language (SQL) Server databases. ASP executes in process and does not incur the processing overhead of Common Gateway Interface (CGI) which spawns separate processes for every new request that goes through the server. The ASP technologies utilized in these databases are discussed at length elsewhere.<sup>12</sup>

#### V. Usage

Both library users and staff have made heavy use of the local databases. Grainger staff has written transaction log software that records what users have linked to/chosen from the public terminal menu. This includes links to the above databases, the online catalog, article databases, and other resources from the Grainger Engineering Library Web pages. The logs currently record activity from 20 public terminal Web top-level menus and date from December 1997 to the present. From December 1997 through February 1, 2000, the Grainger local databases have been selected 26,067 times, which makes up approximately 24% of the over 107,000 selections from public terminal main menus.

In addition, the local databases are accessed an average of 1,420 times per week from the reference desk terminals, staff terminals, and Grainger main Web pages.

These Web-based local databases provide greatly improved services from both inside and outside the library and also when the Library is closed. Patrons are now able to find difficult to locate materials or locate information not in standard bibliographic resources. The local databases also provide expedited navigation through the myriad of library information resources. In addition, the training of reference staff has been facilitated by the use of the Reference Collection database with its comments and notes, by the Difficult Citations and Frequently Asked Questions databases, and by the ability to simultaneously search multiple local resources. Reference Assistant is designed to make available the knowledge store of Grainger reference librarians.

## Bibliography

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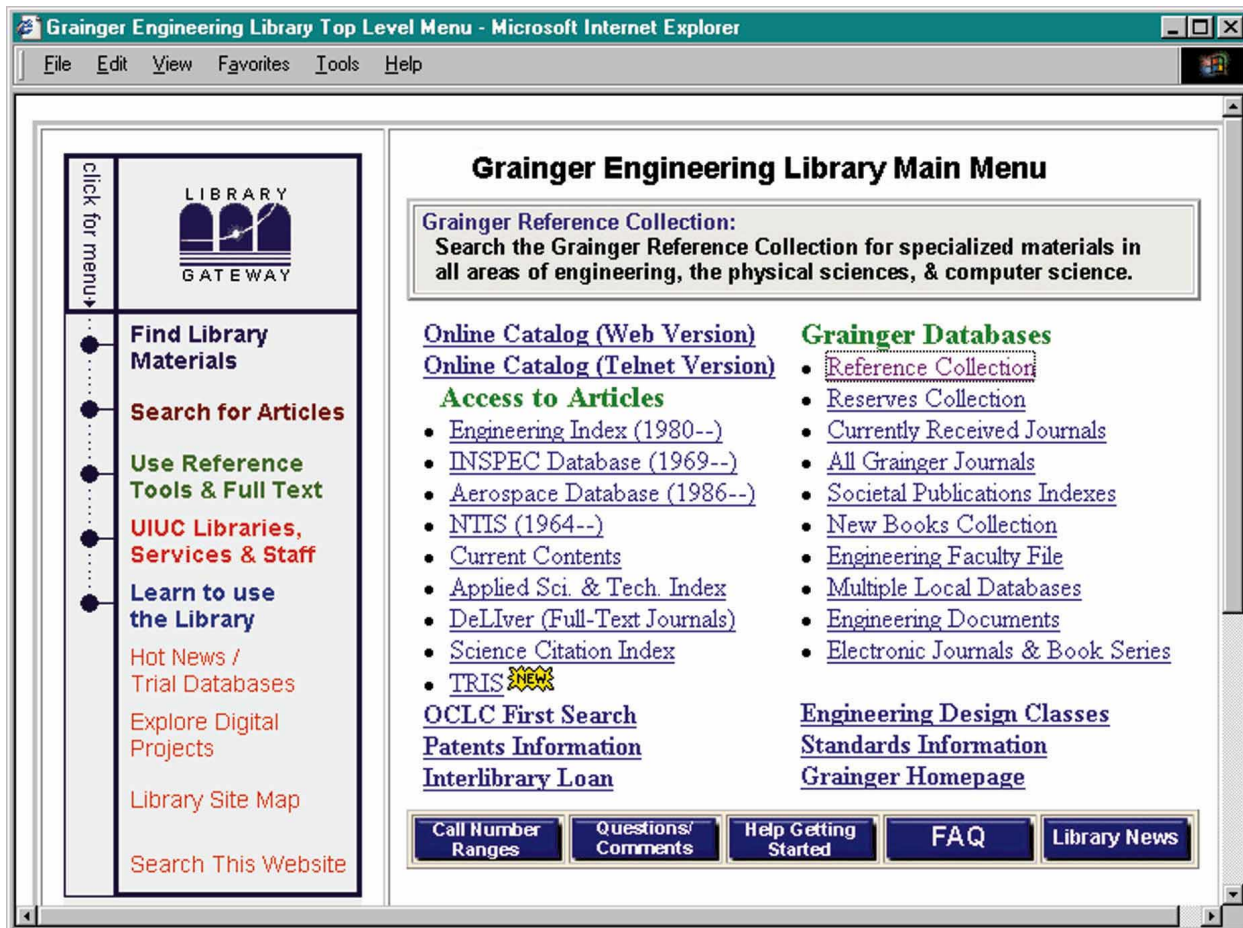


Figure 1 Grainger Public Terminal top-level menu

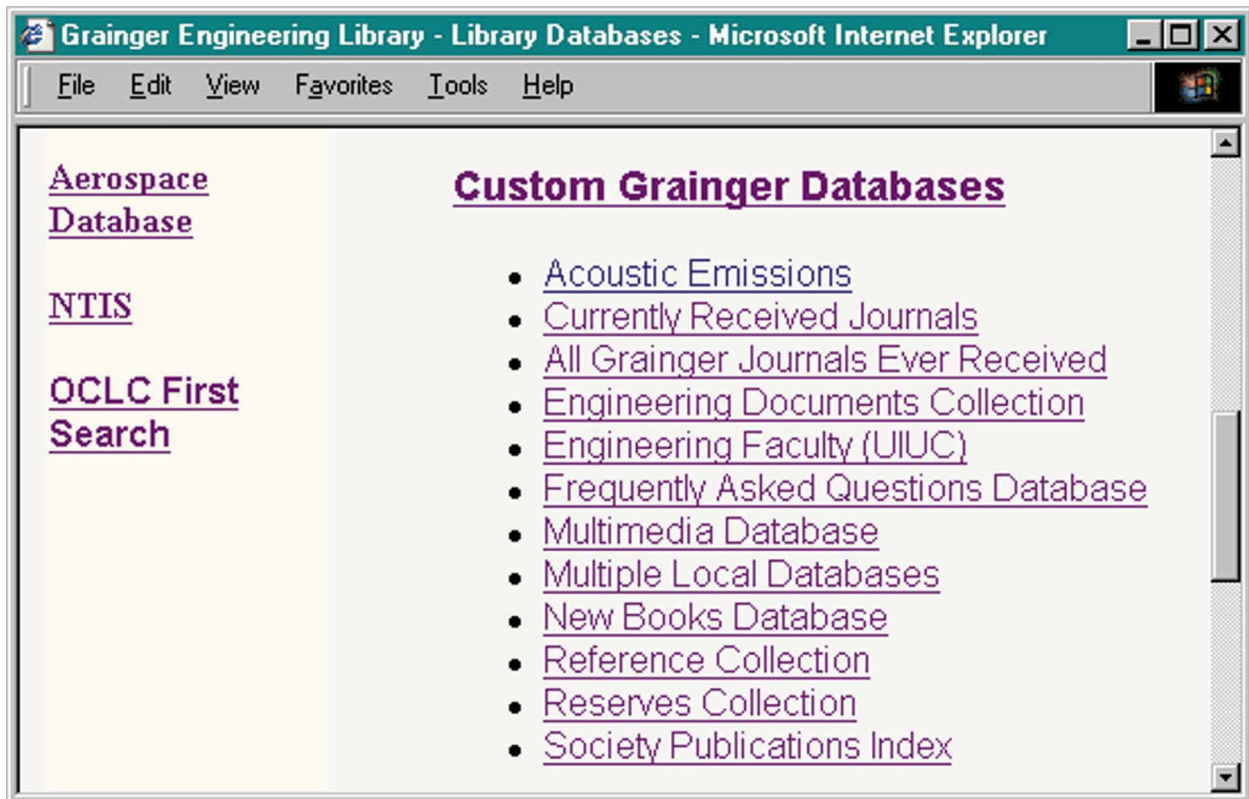


Figure 2 Grainger Home Page Custom Databases



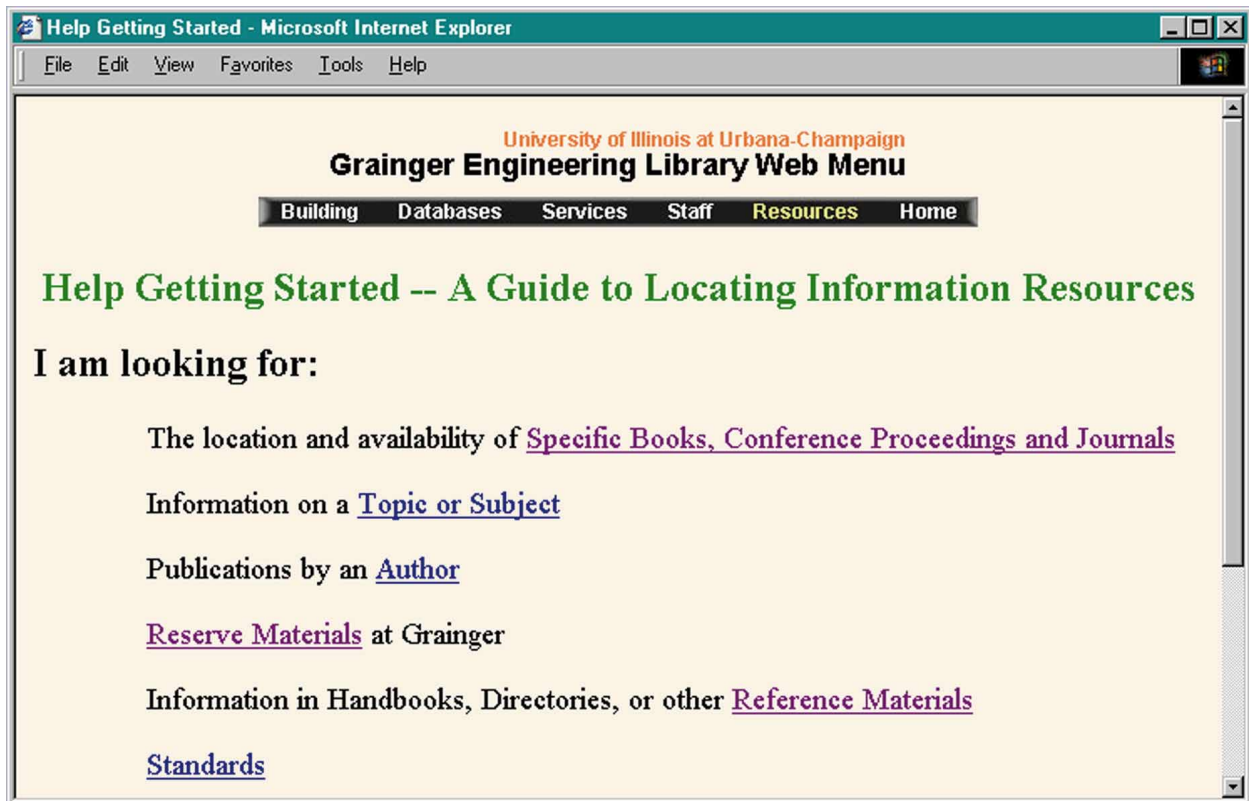


Figure 3 Help Getting Started top-level menu

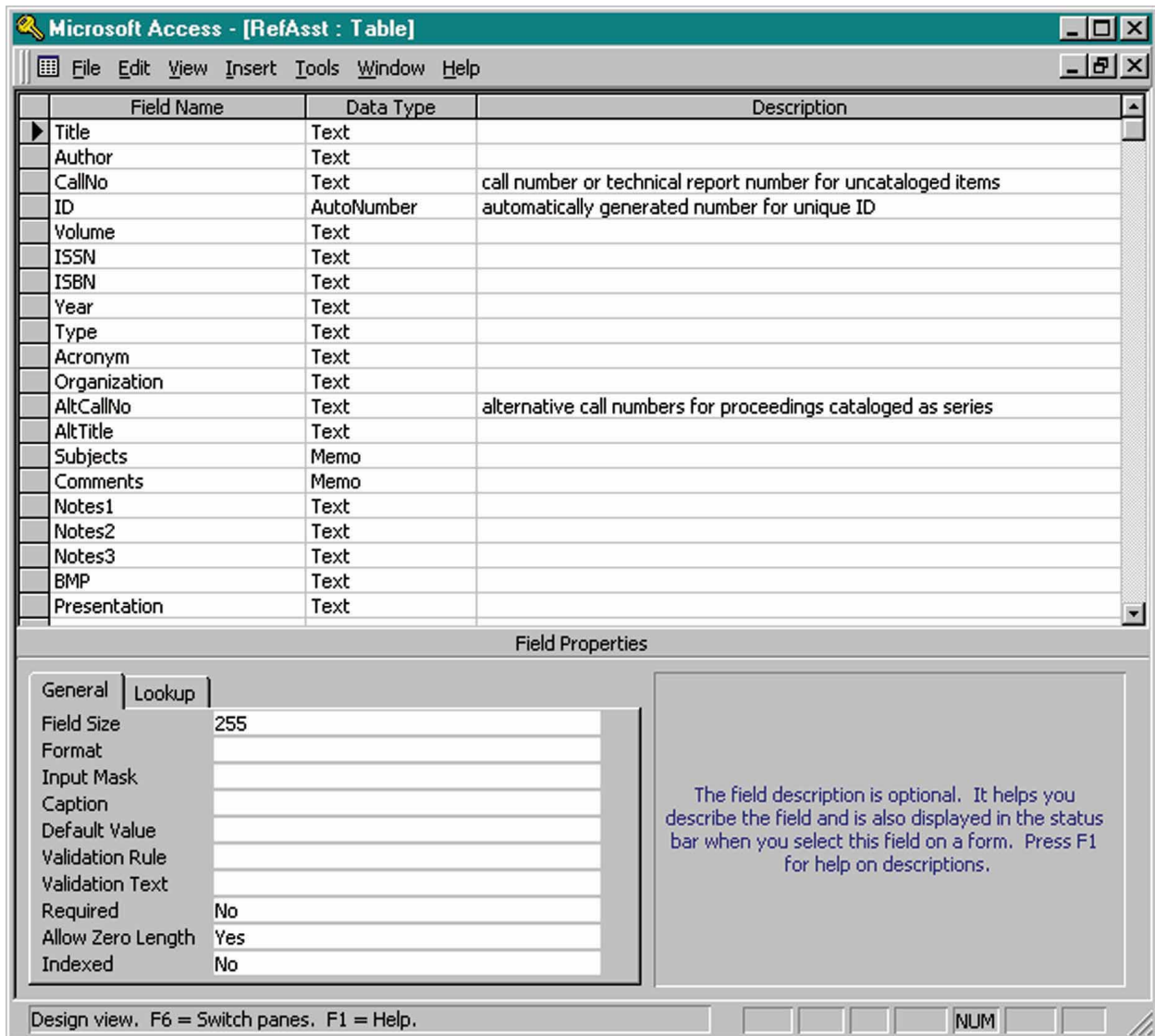


Figure 4 Database Design View

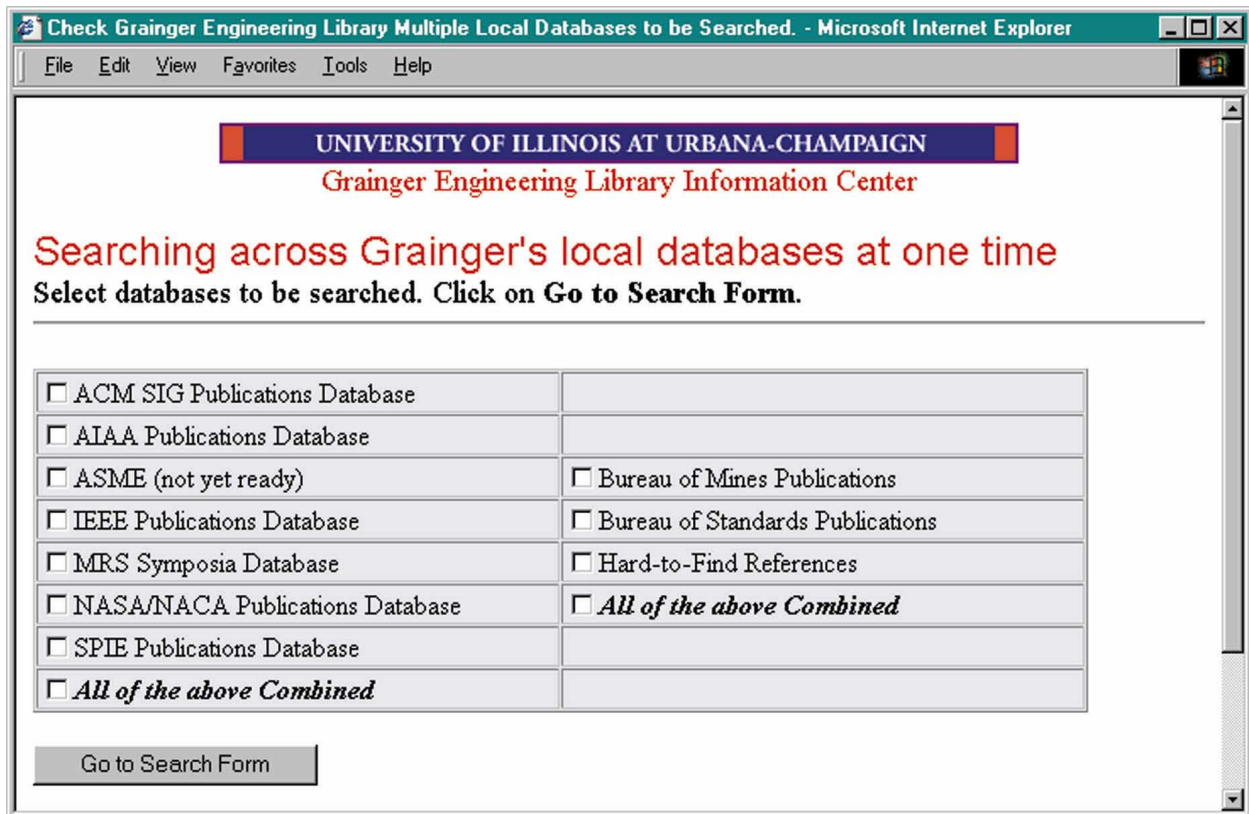


Figure 5 Multiple Local Database Selection Menu

The Grainger Engineering Library Information Center Reference Collection - Microsoft Internet Explorer

File Edit View Favorites Tools Help

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## Search Grainger Reference Collection Database

Please Enter Terms in **ONE** or **MORE** of the Search Boxes Below.

**Title and Subject words Combined:**

**Title Word(s):**

**Subject Term (Word or Phrase):**

**Type of Reference Tool**  
(To select Click on arrow) Search all Types

**Author Name or Organization:**  
(e.g. *Smith, ASME*)

**Call Number: (complete or partial)**

**Comments or Notes:**

MUST contain ALL terms       Display matches ONE at a time  
 CAN contain ANY of the terms       Display matches 15 at a time

Perform Search

Figure 6 Reference Collection Database Search Form

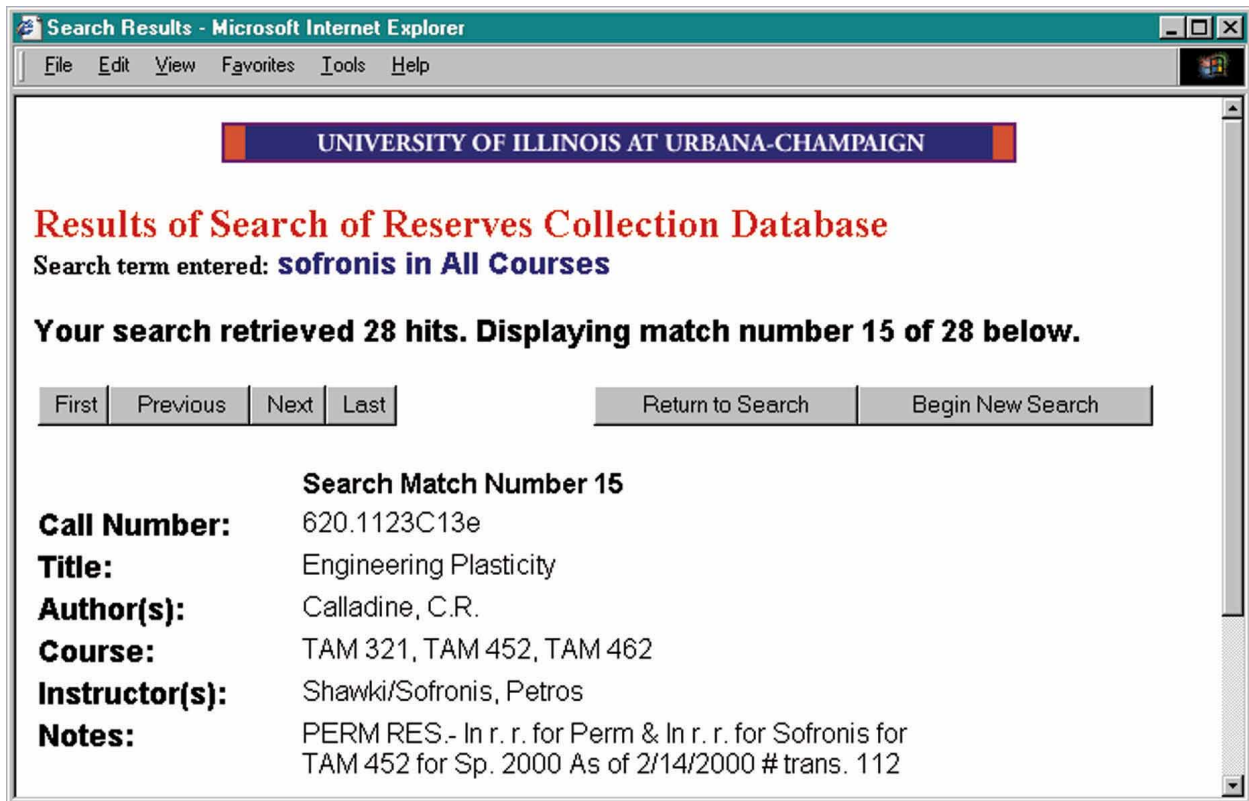


Figure 7 Navigation Buttons