PubMed Interact: an Interactive Search Application for MEDLINE/PubMed

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Abstract
Online search and retrieval systems are important resources for medical literature research. Progressive Web 2.0 technologies provide opportunities to improve search strategies and user experience. Using PHP, Document Object Model (DOM) manipulation and Asynchronous JavaScript and XML (Ajax), PubMed Interact allows greater functionality so users can refine search parameters with ease and interact with the search results to retrieve and display relevant information and related articles.

Background
With the growing trend towards evidence-based principles in medicine, skills in literature search are of practical importance to health professionals. The goal of the project is to develop an interactive search interface to bridge the gap between new and advanced users of MEDLINE/PubMed.

System Description
PubMed Interact is a Web-based application built on an Apache server with HTML, JavaScript and PHP (Figure 1). It uses Entrez Programming Utilities to send search queries, retrieve results in XML format and display the citation list. Once the search results are loaded, dynamic HTML, DOM tree manipulation and Ajax scripting transforms the static page into an interactive application. Common Web standards were adopted during script coding and the application should work in standards-compliant Web browsers.

The project improved on the search interface of SLIM[1] which uses JavaScript slider bars to control search parameters. Other features in common with SLIM include the information box, which displays automatic term mapping details, and the ability to hide or display abstracts. What distinguishes PubMed Interact is the use of Ajax scripting techniques and extensive DOM tree manipulation to retrieve information from the server and modify citation details without the need to reload the page.

The features of PubMed Interact include:

Toggle limits display. Slider bars and search limits can be toggled to appear or disappear from page view for better control of the search interface.

Count preview. The resulting total count of a search, along with the assigned limits, can be previewed in the search interface without submitting the form.

Item deletion. Users can delete citations from the main result list without reloading the page.

Relevance lists. Users can label citations according to relevance. High and low relevance lists allow users to store citations in two categories. Users can view each list, uncategorized items or all loaded citations.

Display and add related articles. Related articles of each citation can be retrieved and loaded on the same page. If the citation of the related article is not in the main result list, users can simply click on a link to view more details and add that citation to the main list, where it is inserted directly below the original citation. These features allow users to interact with a citation and extract relevant information without interrupting workflow on the same page. Only the top 10 related articles of each citation are displayed.

Auto-append article. This feature, also called A3, automatically appends succeeding citations from the original search results after deleting a citation. This is disabled by default and can be activated using a checkbox. The new citations are inserted at the bottom of the main result list.

Availability and Requirements
PubMed Interact can be accessed at the URL http://pmi.nlm.nih.gov/interact/. Ajax scripts and DOM manipulation require components available only in the more recent and standards-compliant browsers. JavaScript should be enabled to take full advantage of all interactive functions. In-house testing demonstrated that the application works in Mozilla Firefox 1.5 for Windows, Mac and Linux, Internet Explorer 5.5 and Opera 8.5 for Windows and Safari 2.0.3 for Mac OS 10.4.5.

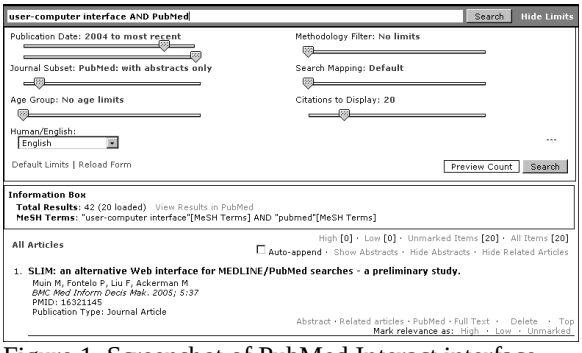

Figure 1. Screenshot of PubMed Interact interface

References
1. Muin M, Fontelo P, Liu F, Ackerman M. SLIM: an alternative Web interface for MEDLINE/PubMed searches-a preliminary study. BMC Med Inform Decis Mak. 2005 Dec 1;5:37.