Search Strategies and Heuristics

Introduction

Although a logical approach is fundamental to good database searching, searching is often more of an art than a science. Rather than being governed by well defined rules or algorithms, it is largely governed by heuristics. The heuristics or guidelines for modifying search strategies should be treated as rules-of-thumb: techniques which will often work, but not always.

An interactive approach is essential because of the heuristic nature of searching. Remember these guidelines when you search:

1. **Treat your initial strategy as a hypothesis.**
   a. Your first strategy is a guess about how authors and indexers will describe the topic. There will be vocabulary problems you haven't anticipated.
2. **Browse your initial results to find other approaches to the search**
   a. Give serendipity a chance
   b. View complete records. Make sure you have displayed all the fields in the records.
3. **Try several alternate strategies.**
   a. As you browse records you will probably see more than one approach to searching the topic.
   b. Take the time to try each strategy, then pool the results at the end.
   c. Don't be lazy! A properly conducted search will save time in the long run.
4. **Use the database thesaurus function but don't assume perfect indexing!**
   a. Understand the advantages of using a controlled vocabulary.
   b. Consider alternate headings because there may be more than one way to index the topic.
   c. Be wary if there aren't exact descriptors for your concepts.
      i. When an exact descriptor isn't available the indexer must use the "closest" one available. Often there are several close matches and indexers won't use them consistently.
      ii. In addition, if the heading isn't an exact match for one of your search concepts, it won't retrieve exactly what you want!
   d. Consider a natural language / keyword search if needed.
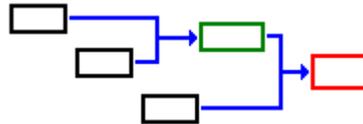   e. Use the explode function carefully.

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Specific Strategies

Approach to searching:

There are 3 common strategies for approaching a search.
1. The Building Blocks Approach
2. Citation Pearl Growing
3. Successive Fractions

Building Blocks

The building blocks approach is the basic approach to searching. It is a logical approach and easy to understand.
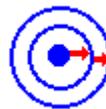
The search problem is broken into discrete facets or concepts.

1. Vocabulary for each concept is identified and a search strategy formulated.

2. Each concept is searched separately.

3. The concepts are then combined into the final search.

4. Success still depends on the searcher's willingness to be flexible and to learn from the initial search results.

Often each concept is treated as a separate search and is refined by trial and error. The citation pearl growing or successive fractions approaches may be used to develop the searches for each concept.

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Citation Pearl Growing

Using one good article to search for others.

> If you can assume that *articles on the same topic are assigned the same descriptors*, then searching is simply finding the right set of descriptors. One approach to identifying the right set of descriptors is to examine the indexing of a highly relevant paper. This approach to searching is called *Citation Pearl Growing*.

> Because the searcher looks at the subject indexing on a relevant record, he doesn't have to be familiar with the indexing system used in the database. The record shows the searcher how an indexer assigns terms to a relevant item.

Citation Pearl Growing often involves several repetitions of the basic strategy. The number of repetitions depends on the success of previous repetitions and the amount of material needed.

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The strategy:

1. Begin with a known relevant article (the pearl).
    a. If a known relevant article isn't available, conduct a high precision search limiting all terms to the title field.
2. Search the database for that article's record.
3. Review the descriptors (subject indexing) assigned to the record.
4. Conduct a new search using the relevant descriptors from the pearl.
5. Examine any new relevant records retrieved.
6. Review the descriptors assigned to the new records.
7. Conduct a new search using any additional relevant descriptors found in the new records.
8. Repeat the process (steps 5-7) with additional relevant records until enough relevant material has been retrieved.

Example:

A colleague saw the following paper on the use of Lamotrigine to treat obesity and, knowing you are good at searching, asked if you could find any more like it:

Merideth, C.H. (2006). *A single-center, double-blind, placebo-controlled evaluation of lamotrigine in the treatment of obesity in adults*. Journal of Clinical Psychiatry, 2006 Feb; 67(2): 258-62

You decide to retrieve the article in Medline and use the citation pearl growing approach to find others. Here is the article's MeSH indexing:

TI: **A single-center, double-blind, placebo-controlled evaluation of lamotrigine in the treatment of obesity in adults.**

MAJOR MESH:
> **Anticonvulsants/therapeutic use**
> **Obesity/drug therapy**
> **Triazines/therapeutic use**

MINOR MESH:

Adult	Obesity/blood
Anticonvulsants/pharmacology	Obesity/psychology
Body Mass Index	Personal Satisfaction
Double Blind Method	Placebos
Drug Administration Schedule	Quality of Life
Health Status	Treatment Outcome
Hemoglobin A,	Triazines/pharmacology
Glycosylated/analysis	**Weight Gain/drug effects**
Lipids/blood	

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Upon review, it appears that there are some useful headings:

- Anticonvulsants and Triazines for the drug lamotrigine..
- Weight gain and obesity for the obesity concept.
- Since the subheadings look appropriate you decide to include them too.
- Because there isn't an exact MeSH heading for the drug, you will simply include it as a general search term.

Your strategy is:

S1   lamotrigine
S2   *MH* Anticonvulsants/tu *OR* MH Triazines/tu
S3   *MH* Weight Gain/de OR MH Obesity/dt
S4   S1 *AND* S2 *AND* S3

Below are some of the citations retrieved, including the "pearl". If you need more, you can examine their MeSH indexing to see if there are other headings to include.

TI: **Weight issues for people with epilepsy--a review.**
AU: Ben-Menachem E,
SO: Epilepsia 2007; Vol. 48 Suppl 9, pp. 42-5

TI: **Impact of lamotrigine and lithium on weight in obese and nonobese patients with bipolar I disorder.**
AU: Bowden CL, Calabrese JR, Ketter TA, et al.
SO: The American Journal Of Psychiatry, 2006 Jul; Vol. 163 (7), pp. 1199-201

TI: **Psychosis in multiple sclerosis associated with left temporal lobe lesions on serial MRI scans.**
AU: Reiss JP, Sam D, Sareen J
SO: Journal Of Clinical Neuroscience, 2006 Feb; Vol. 13 (2), pp. 282-4

TI: **A single-center, double-blind, placebo-controlled evaluation of lamotrigine in the treatment of obesity in adults.**
AU: Merideth CH
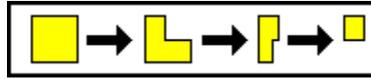SO: The Journal Of Clinical Psychiatry, 2006 Feb; Vol. 67 (2), pp. 258-62

TI: **Role of valproate across the ages. Treatment of epilepsy in children.**
AU: Aldenkamp A, Vigevano F, Arzimanoglou A, Covanis A
SO: Acta Neurologica Scandinavica. Supplementum 2006; Vol. 184, pp. 1-13

TI: **Higher androgens and weight gain with valproate compared with lamotrigine for epilepsy.**
AU: Morrell MJ, Isojärvi J, Taylor AE, Dam M, et al.
SO: J, Epilepsy Research, 2003 May; Vol. 54 (2-3), pp. 189-99

TI: **Lamotrigine versus valproate monotherapy-associated weight change in adolescents with epilepsy: results from a post hoc analysis of a randomized, double-blind clinical trial**.
AU: Biton V, Levisohn P, Hoyler S, et al.
SO: Journal Of Child Neurology, 2003 Feb; Vol. 18 (2), pp. 133-9

TI: **Increase in postprandial serum insulin levels in epileptic patients with valproic acid therapy.**
AU: Luef G, Abraham I, Hoppichler F, et al.
SO: Metabolism: Clinical And Experimental, 2002 Oct; Vol. 51 (10), pp. 1274-8

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Successive Fractions

Narrowing a general search by adding additional topics.

Successive fractions is useful for searching broad topics which result in the retrieval of a large number of records. Once the initial search is performed the searcher will then either have a series of useful restrictions to apply or will scan a large number of records to determine what restrictions would be useful. Successive fractions is a useful approach for searchers who are unfamiliar with the search topic.

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Example

Initial Search:

Suppose you have been asked to write a paper on some aspect of treating or controlling lymphedema. You are unfamiliar with the literature on this topic. Your initial search is:

S1   Lymphedema / prevention-and-control, rehabilitation, therapy   421

After seeing the number of records retrieved you realize you must narrow the topic. You examine several of these records.

First restriction:

After browsing through these records, you should see a variety of restrictions to the topic. These include:

- lymphedema in breast cancer / mastectomy patients,
- the use of compression stockings / bandages to treat lymphedema,
- lymphedema of the lower extremity / leg,
- and others.

Combining any one of these topics with the original set *(#1)* yields the following results:

S2   S1 and (MH "Breast neoplasms+" OR mastectom*)   132
S3   S1 and (MH "Leg+" OR (lower N2 extremit*) OR (lower N2 limb?)) 85
S4   S1 and (stocking* OR compression)   115

If the number of records found is still to large then you could examine more records from the new set to identify additional restrictions.

Suppose you decide to focus on lymphedema in breast cancer patients. After restricting the initial results to those discussing breast cancer or mastectomy, you examine several of the records from this new set.

Second restriction:

After examining these records you decide to narrow the focus even more to the use of compression as a treatment modality. Pressure is the MeSH heading used for compression:

S5   S2 and (MH pressure or compression)   33

Since the number of records retrieved has now dropped to what you consider a manageable number, the search is finished.

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General Advice

1. Search the most specific aspect first
2. Don't search topics that are implied by the database
3. Use NOT cautiously and infrequently
4. Use Truncation and Wildcards
5. Use proximity operators -- don't enter phrases

Strategies for modifying precision and recall

The strategies for modifying recall and precision are complimentary. If a given heurisitic is likely to increase precision then doing the opposite will increase recall.

1. Add or drop concepts, or change how some concepts are combined.
2. Modify the vocabulary
3. Restrict to highly relevant fields
4. Use for 1 or 2 key concepts, not every concept
5. Modify word proximity

Limit retrieval using non-subject parameters

When there is a large number of relevant papers on the topic and no obvious way to further restrict the search - or if the goal is to find only a few representative papers - consider limiting by publication type and other non-subject parameters:

- Review articles
- Case reports
- Clinical trials
- Recent publication years
- Special journal subsets

For example:
Consider limiting to any papers written in the last 2 years plus reviews for the last 5 or 10 years: *S# AND (PT review OR DT 2008-2010)*

Also consider eliminating certain publication types:
- *S# NOT PT case reports*
- *S# NOT PT letter*