Do Users Benefit from Controlled Vocabularies in Search Interfaces?

Ying-Hsang Liu¹, Paul Thomas², Jan-Felix Schmakeit³, Tom Gedeon³

¹ School of Information Studies, Charles Sturt University, Australia
² CSIRO, Australia
³ Research School of Computer Science, Australian National University, Australia

EuroHCIR 2012, Nijmegen, the Netherlands – 24 August 2012

Introduction

Current IR systems primarily designed for specified search (Belkin, 2008) as user's articulation of information needs. A gaze-tracking study to assess whether users pay attention to controlled vocabularies, such as MeSH (Medical Subject Headings) terms. Design of natural search user interface to support query reformulation tasks.

Research Questions

What components of document surrogates do searchers look at when reformulating their queries?

Do searchers even notice MeSH terms in standard search interfaces? If they do notice them, how do searchers use the displayed MeSH terms in their search processes?

If they are used at all, do MeSH terms lead to better search performance and efficiency?

Methods

User experiment to assess the effect of displayed MeSH terms on search behaviours and performance

4 factorial design (4 search interfaces and 4 search topic pairs); 4 Graeco-Latin square design

Search system built on Solr, using OHSUMED test collection

Search task: Find the best query for clinical topics

Sample search topic:
Imagine that you are 88-year-old with subdural. You would like to find information about reviews on subdurals in elderly.

Gaze tracking uses FaceLab; Eyeworks for data recording and analysis; Emotiv headset records EEG

Entry and exit questionnaires collecting user background information and cognitive styles

Contact details

Web: http://ruyhliu.phpfogapp.com
Email: yingliu@csu.edu.au

Preliminary Findings

Participants glanced at MeSH terms: 8% of fixations on MeSH terms in interfaces B to D (compared with 6% on document titles and 12% on abstracts)

MeSH terms were very seldom used (1 out of 44 queries)

MeSH terms on top of interface received little attention

Figure 2: Heat map and areas of interest (AOI) of all search tasks.

Future Research

Consideration of search task

Recruitment of students with biomedical background

Effect of cognitive styles and search behaviours on cognitive load

Figure 1: Search interfaces distinguished by display and generation of MeSH terms.
Background

- Current IR (information retrieval) systems designed for specified search (Belkin, 2008)
- Short queries, user’s articulation of information needs after the initial search
- Natural search user interface
- User characteristics of cognitive styles
- Usefulness of controlled vocabularies from IR perspectives
Background

- Controlled vocabularies
  - MeSH (Medical Subject Headings) terms

- Use of controlled vocabularies for searching
  - PubMed query translation
  - Medline via Ovid: Map Term to Subject Heading
  - Proquest: Suggested Subjects
  - EBSCOhost: Subjects
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PubMed

Search Details

Query Translation:

"skin neoplasms"[MeSH Terms] OR ("skin"[All Fields] AND "neoplasms"[All Fields]) OR "skin neoplasms"[All Fields] OR ("skin"[All Fields] AND "cancer"[All Fields]) OR "skin cancer"[All Fields]

Result:

129085

Translations:

skin "skin neoplasms"[MeSH Terms] OR ("skin"[All Fields] AND "neoplasms"[All Fields]) OR "skin neoplasms"[All Fields] cancer OR ("skin"[All Fields] AND "cancer"[All Fields]) OR "skin cancer"[All Fields]
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EBSCOhost

An intervention based on protection motivation theory in reducing skin cancer risk.
Subjects: SKIN -- Cancer; CANCER -- Prevention; CANCER; CANCER -- Treatment; SOLAR radiation -- Physiological effect; RISK factors

Database: Academic Search Complete
Add to folder
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ProQuest

2954 Results *

Suggested subjects

Economic crisis • Economic crisis AND Australia • Economic crisis AND Asia • Economic crisis AND Regulation of financial institutions

Sort results by:

Relevance

GFC Financial sells its residential mortgage unit


... Phoenix-based GFC Financial Corp. is selling its residential...

Citation/Abstract • Link to full text • Find a copy

ProQuest
Research questions

1. What components of document surrogates do searchers look at when reformulating their queries?

2. How do searchers use the displayed MeSH terms in search processes?

3. Does the use of displayed MeSH terms lead to better search performance and efficiency?
Experimental design

- 4 search interfaces of an experimental system based on Solr
- Search interfaces distinguished by display of controlled vocabularies and method of generation

<table>
<thead>
<tr>
<th>Interface</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Interface A</td>
<td>Google style</td>
</tr>
<tr>
<td>Interface B</td>
<td>Per query, ProQuest</td>
</tr>
<tr>
<td>Interface C</td>
<td>Per query, ProQuest + EBSCO</td>
</tr>
<tr>
<td>Interface D</td>
<td>Per document, EBSCO</td>
</tr>
</tbody>
</table>
Search interface A

Imagine that you are 88-year-old with subdural. You would like to find information about reviews on subdural in elderly. When you are done, you can move to the next task.

Your search for subdural returned 332 results.

   McArdle CB; Richardson CJ; Hayden CK; Nicholas DA; Crofford MJ; Amparo EG. Radiology 163(2):387-94
   The authors prospectively evaluated 82 neonates, ranging in gestational age from 29 to 44 weeks postconception, with magnetic resonance (MR) imaging at 0.6 T. Twenty-two cases of hemorrhage in 15 infants were identified. Ultrasound (US) and computed tomography (CT) were superior to MR in the first few days after parenchymal hemorrhage, since at this time lesions were apparent on only T2-weighted images. After the first 3 days, MR was the single best modality because (a) hemorrhage on CT became imperceptible in the 2d week, whereas the high...

2. Obstructive hydrocephalus treated by ventriculocystocorticostoma.
   Kock-Jensen C; Sogaard I. Surg Neurol 27(5):491-4
   The present report describes the late treatment of obstructive hydrocephalus in a patient in whom all conventional drainage techniques failed due to foreign-body reaction. A combination of subdural autodrainage and the ventriculosystoma principle carried out by means of laser surgery was successful in achieving adequate drainage. The patient subsequently showed considerable improvement both clinically and psychologically after the operation. Sixteen months postoperatively the patient is in good health and a computed tomography scan...
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Search Interfaces

Interface “A” mimics web search with no controlled vocabulary.

Interface “B” adds MeSH terms to the interface at the top of the screen.

Interface “C” uses the same MeSH terms as “B” but displays them alongside each document.

Interface “D” mimics EBSCOhost that provide MeSH terms alongside each document.

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Recruitment of students with biomedical background.

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Search interface C
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Test collection

Dataset from OHSUMED (Hersh et al., 1994)

• MEDLINE from 1987 to 1991

• 348,566 records

• “the data is incomplete and out-of-date”
Search topics

• Selection
  • Randomly select a total of 8 topics based on the proportion of judged relevant documents
  • Two topics from each of the quartiles
  • A total of 4 search topic pairs
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Sample search topic

ID: 78

Imagine that you are 42-year-old black man with hypertension.

You would like to find information about beta blockers and blacks with hypertension, utility.
Arrangement of experimental conditions

- 4x4 factorial design; 4x4 Graeco-Latin Square

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<thead>
<tr>
<th></th>
<th>A₂</th>
<th>A₄</th>
<th>C₁</th>
<th>B₂</th>
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<td>D₃</td>
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Interfaces: A, B, C and D; search topic pairs: 1, 2, 3 and 4.
Experimental procedure

- Background questionnaire
- Search session: 1 practice topic, 8 topics (7 mins for each)
- Post-search session questionnaire
- Exit session questionnaire
- Cognitive style test (wholistic-analytic)
- FaceLab eye-tracking + Eyeworks
- Emotive headset (EEG)
- Search logs, mouse clicks, time spent…
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- Revision of experimental materials
- Consideration of search task
- Recruitment of students with biomedical background
- Full-scale user study
- Do users benefit from controlled vocabularies in search interfaces? In *Proceedings of the 2nd European Workshop on Human-Computer Interaction and Information Retrieval*, 2012.
This study has been supported by School of Information Studies, Charles Sturt University Research Fellowship. Ying-Hsang Liu is working as Visiting Fellow at Research School of Computer Science, The Australian National University.

Thank You!
Questions or Comments?