Finding Knowledge Structure: A Sensemaking Oriented Search Mechanism

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Outline

- Information Seeking in Sensemaking
  - Seeking structuring ideas
  - Query initiated navigation

- A new search mechanism
  - Query Initiated Structure Exploration
  - A toolset
The context of Information Seeking

Wilson, 1981

Marchionini, 2006
Sensemaking (Dervin 1999)
Seeking information to bridge knowledge gap.
Sensemaking (Russell et al, 1993)
Developing successively more sophisticated representations and using them to organize information in service of a task.

Idea for Structuring

Structured Knowledge Representation

Information Seeking
Information Seeking and Sensemaking

- Where do ideas for structures come from?
- What is the role played by information seeking in representation construction?
- How can a computer system help in representation construction?
A topic comprehension task

- Prepare a talk on an unfamiliar topic
- Search for relevant information
- Sketch an outline of the talk
Seeking Structure by Query Initiated Navigation

Knowledge Representation

Change/Grow/Validate Structures

Inadequacy & Uncertainty

Needs for growing, changing, or validating structures

Queries (General/related keywords)

Search results
(Information patches that may contain structuring ideas)

Search
Prevalence and Success of Query Initiated Navigation

<table>
<thead>
<tr>
<th></th>
<th>Sessions not followed by navigation</th>
<th>Sessions followed by navigation (QIN)</th>
<th>Totals</th>
<th>Percent from QIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Sessions that resulted in NO Bookmarks</td>
<td>636</td>
<td>42</td>
<td>678</td>
<td>6.2</td>
</tr>
<tr>
<td>Number of Sessions that resulted in at least one Bookmark</td>
<td>227</td>
<td>107</td>
<td>334</td>
<td>32.0</td>
</tr>
<tr>
<td>Totals</td>
<td>863</td>
<td>149</td>
<td>1012</td>
<td>14.7</td>
</tr>
<tr>
<td>Percent resulting in Bookmarks</td>
<td>26.3</td>
<td>71.8</td>
<td>33.0</td>
<td></td>
</tr>
<tr>
<td>Number of Bookmarks Created</td>
<td>281</td>
<td>216</td>
<td>497</td>
<td>43.5</td>
</tr>
</tbody>
</table>

73% of the navigation sessions are within one website.
Design Implication

- Seek information \( \rightarrow \) Seek knowledge structure

- Enhance structure exploration in the Query Initiated Navigation
  - Find rich information patches (websites) with good navigation structure
  - Help users navigate through a website
Finding rich information patches (websites)

- **Structure Exploration Algorithm:**
  - **Step 1.** Find websites that hold information about the topic.
  - **Step 2.** For each of such website:
    - **Step 2.1.** Content Analysis
    - **Step 2.2.** Linkage Analysis
    - **Step 2.3.** Page Analysis
    - **Step 2.4.** Calculate a quality score of the website using a utility function based on the topic coverage, network topology and quality of individual pages.
  - **Step 3.** Rank the websites based on the quality score and return the websites with high scores.

*The challenge: Find an appropriate utility function in a vast function space.*
Seeking Utility Function – A Toolset

**Topic structure in a website**
- Topic coverage
- Amount of information on a topic
- Quality of information on a topic

**Navigation structure in a website**
- General traversibility
- Accessibility of relevant topics
- Overview page
- Enhancement on navigation structure

**Content analysis tools**

**Page analysis tools**

**Link analysis tools**
Content analysis tools

Network analysis tools

Page analysis tools
Structured Query and Search

Structured query

Structured search results
Helps on Website Navigation

Links with strong Information Scent are highlighted

Overview of the network of relevant pages
Future Work

- Explore the website utility function

- User study on the efficiency and effectiveness of the new search mechanism.
Important Points

Seek information  ➔  Seek knowledge structure

Enhance structure exploration in Query Initiated Navigation

Locate good websites  ➔  Help navigation
Thanks!

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