In depth analysis of user information seeking behavior is indispensable

- Differences between tasks and information needs:
  - Info. gathering for report writing vs. Info. gathering for trip planning

- Type of users (differences of experience):
  - Undergraduates (11) vs. Graduates (5)

Collected data:
- Browsing history logs
- Screen captured video
- Eye movement
- Thinking aloud
- Interviews, etc...

We proposed analytical frameworks:

- "Lookzone": Set of categories indicating which part of resulting pages participants looked at.
- "Web action categories": We defined 10 action categories for analyzing a user's behavior on the Web
- "Link Depth": How far searchers browse into search engine result pages (SERP).
- "Concept map": Measuring the change in the user's knowledge due to the search by comparing these before and after maps.
- "Taxonomy of Knowledge Modification and Knowledge Utilization Patterns": Frameworks for content-analyzing the think-aloud and interview data.

We developed tools for collecting and analyzing data:

- "COPATT": Platform for integrating browsing history logs, screen captured video, eye movement, and annotating users' actions.
- "QT-Honey": New client side logging tool based on Lemur Query Log Toolbar (Lemur project).
- "VizCMaps": Visualization tool for pre- and post-concept maps
- "Scanpath2SVG": Visualization tool for eye movement data.

(Updated 2013-06-22)
“Web action categories”

<table>
<thead>
<tr>
<th>Web action categories</th>
<th>Undergraduates (n=9)</th>
<th>Graduates (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Report Mean(SD)</td>
<td>Trip Mean(SD)</td>
</tr>
<tr>
<td>Search</td>
<td>8.00 (4.37)</td>
<td>6.27 (4.92)</td>
</tr>
<tr>
<td>Link</td>
<td>19.36 (6.26)</td>
<td>35.64 (8.65)</td>
</tr>
<tr>
<td>Next</td>
<td>0.45 (0.78)</td>
<td>0.91 (1.08)</td>
</tr>
<tr>
<td>Back</td>
<td>17.45 (7.51)</td>
<td>22.27 (13.80)</td>
</tr>
<tr>
<td>Jump</td>
<td>2.64 (1.61)</td>
<td>2.64 (1.92)</td>
</tr>
<tr>
<td>Browse</td>
<td>1.82 (2.25)</td>
<td>0.18 (0.57)</td>
</tr>
<tr>
<td>Submit</td>
<td>1.27 (2.60)</td>
<td>3.00 (2.80)</td>
</tr>
<tr>
<td>Change from one tab to another</td>
<td>2.45 (3.73)</td>
<td>6.20 (11.35)</td>
</tr>
<tr>
<td>Close tabs or windows</td>
<td>0.38 (0.64)</td>
<td>0.84 (1.49)</td>
</tr>
</tbody>
</table>

Undergraduates were more likely to click links during the trip task than during the report task. Graduates tend to use multiple tabs and windows. Graduates bookmarked more pages than the undergraduates.

“Lookzone”

Graduates tend to use more advanced web browser features, e.g., search bars and tabs. Snippet areas more attractive in report tasks than trip tasks.

“Concept map”

Graphical representation (Novak & Gowin, 1984)

Pre-search concept map

Common Node : Nodes exist in both pre and post cmaps
Lost Node : Nodes exist only in a pre cmap
New Node : Nodes exist only in a post cmap

VizCMaps: Combined graph of pre- and post-search concept maps

VizCMaps illustrates what a user has learned during the search and how the user’s knowledge representations have changed.

Outcomes

(Detailed info is available at http://crc.es.jp.org/)

- Terai et al., IIiX2008 (Oct. '08)
- Kando et al., Dagstuhl Seminar (Mar. '09)
- Miwa, Organizing a Panel at AISI&IT (Nov. '09)
- Egusa et al., HCISS 2009, (Jan. '10)
- Takaku et al., JSIK Journal (Sep. '10; online: May '10)
- Egusa et al., IIX2010(Aug.'10)
- Saito et al., AIRS2010(Dec.'10)
- Miwa et al., Information Research (Sep. '11)
- Saito et al., CogSci2012 (Aug. '12)