Visualization of User Eye Movements for Search Result Pages

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Introduction

• Visualization techniques for the user behavior using search engine results pages.
• Our visualization method provides an overview of a user’s actual visual behavior
  – using the logs for eye movement data
  – and browser link-clicking.
• Background goals
  – Understanding users’ search process as a cognitive model
  – Supporting users’ exploratory search behavior on the Web
Data from a user experiment
-- Eye movement and link-clicking --
Experimental design

- Participants:
  - Eleven undergraduate students
  - Five graduate students

- Tasks:
  - Report writing task
  - Trip planning task

- The participants had 15 minutes to do each task.

Please refer to Terai et al. [10] for more details on the experiment.

Data collection

Screen captured video

Eye movements

Questionnaire

Think-aloud

Browsing histories

Interview

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Example of eye movements
<table>
<thead>
<tr>
<th>Categories of action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search</td>
<td>searching with a search engine</td>
</tr>
<tr>
<td>Link</td>
<td>clicking on a page link</td>
</tr>
<tr>
<td>Next</td>
<td>going forward to the next page</td>
</tr>
<tr>
<td>Back</td>
<td>going backward to the last page</td>
</tr>
<tr>
<td>Jump</td>
<td>jumping to a particular page in bookmark</td>
</tr>
<tr>
<td>Browse</td>
<td>browsing next search results</td>
</tr>
<tr>
<td>Submit</td>
<td>clicking a submit button</td>
</tr>
<tr>
<td>Bookmark</td>
<td>adding bookmarks</td>
</tr>
<tr>
<td>Change</td>
<td>changing from one tab to another</td>
</tr>
<tr>
<td>Close</td>
<td>closing a tab or window</td>
</tr>
</tbody>
</table>
Definition of lookzones for results pages

1. title bar  
2. menu  
3. bookmark  
4. toolbar  
5. URL bar  
6. search bar  
7. search bar button  
8. tab  
9. link for services  
10. query box  
11. search button  
12. scroll bar  
13. number of hits  
14. link for ads  
15. spell check  
16. title  
17. snippet  
18. URL  
19. related search  
20. link for next page  
21. find in a page  
22. status bar

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Adding Annotations to the participants’ specific behaviors and eye movements

Screen captured video

Eye movements

Browsing histories
Adding Annotations to the participants’ specific behaviors and eye movements

- Screen captured video
- Eye movements
- Adding participants’ action (E.g. link-clicking)
- Adding lookzone (E.g. rank)
- Browser logs
- Manual annotations
Example of visualization for a participant in the Report task

Fixation rate on each ranked abstract

One fixation (filled circle)

Click rank (orange line)

The same query (dotted line)

The first fixation (unfilled circle)

The same results page (solid line)
Example of scanpath visualization for multiple tasks
Conclusion

• Data from a user experiment
  – Eye movement data
  – Browser link-clicking

• Visualization for Web seeking
  – Understand user’s behavior on the search results page during a overall search task.
  – Compare behaviors among different tasks and different users.
Thank you for your attention

• We will present a poster at the tomorrow’s poster session.
  – Please come to our poster and look the visualization in A0 size poster.
• Thank you for your comments and questions.
• Information on our project (CRES) is available from http://cres.jpn.org/