



# 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.

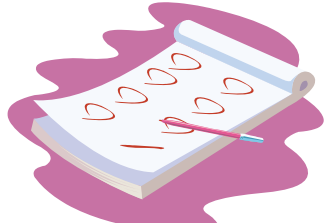
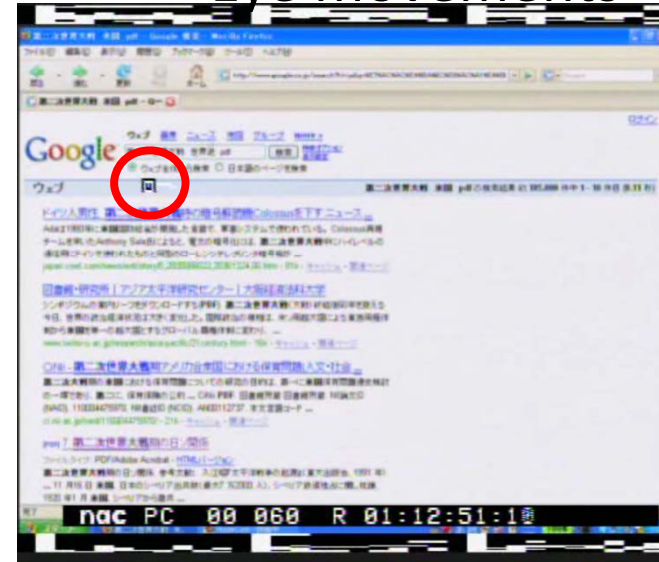
[10] H. Terai, H. Saito, Y. Egusa, M. Takaku, M. Miwa, and N. Kando. Differences between informational and transactional tasks in information seeking on the web. In *IliX '08: Proceedings of the second international symposium on Information interaction in context*, pages 152–159, New York, NY, USA, 2008. ACM.

# Data collection

Screen captured video



Eye movements



Questionnaire



Think-aloud

2007-11-23	09:21:56.704	ページ	http://www.google.co.jp/	Google
2007-11-23	09:22:08.811	検索結果	http://www.google.co.jp/search?h	
2007-11-23	09:22:18.735	検索結果	http://www.google.co.jp/search?h	
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2007-11-23	09:22:32.124	ページ	http://72.14.235.104/search?q=cache:fmkG	
2007-11-23	09:23:05.823	ページ	http://www.google.co.jp/	Google
2007-11-23	09:23:09.839	検索結果	http://www.google.co.jp/search?h	
2007-11-23	09:23:17.830	検索結果	http://www.google.co.jp/search?h	
2007-11-23	09:23:23.378	ページ	http://www.rakuten.co.jp/sardensk/430279	
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2007-11-23	09:32:45.717	検索結果	http://www.google.co.jp/search?h	
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2007-11-23	09:37:44.907	検索結果	http://www.google.co.jp/search?h	
2007-11-23	09:37:50.295	ページ	http://www.geocities.co.jp/WallStreet/60	
2007-11-23	09:39:26.123	ページ	http://www.geocities.co.jp/WallStreet/60	
2007-11-23	09:39:32.622	ページ	http://www.geocities.co.jp/WallStreet/60	
2007-11-23	09:39:42.917	ページ	http://www.geocities.co.jp/WallStreet/60	
2007-11-23	09:40:36.384	検索結果	http://www.google.co.jp/search?h	
2007-11-23	09:40:41.231	ページ	http://ja.wikipedia.org/wiki/%E3%83%AC%E	
2007-11-23	09:43:39.387	検索結果	http://www.google.co.jp/search?h	
2007-11-23	10:39:39.849	検索結果	http://www.google.co.jp/search?h	
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2007-11-23	10:40:34.938	ページ	http://www.jtb.co.jp/kokunai/LargeArea.a	
2007-11-23	10:41:00.305	ページ	http://www.jtb.co.jp/kokunai/LargeArea.a	
2007-11-23	10:41:44.838	検索結果	http://www.google.co.jp/search?h	
2007-11-23	10:41:55.694	ページ	https://www2.e-tabinet.com/quotations/?P	
2007-11-23	10:42:30.504	ページ	https://www2.e-tabinet.com/quotations/?P	
2007-11-23	10:42:50.944	ページ	https://www2.e-tabinet.com/quotations/?P	

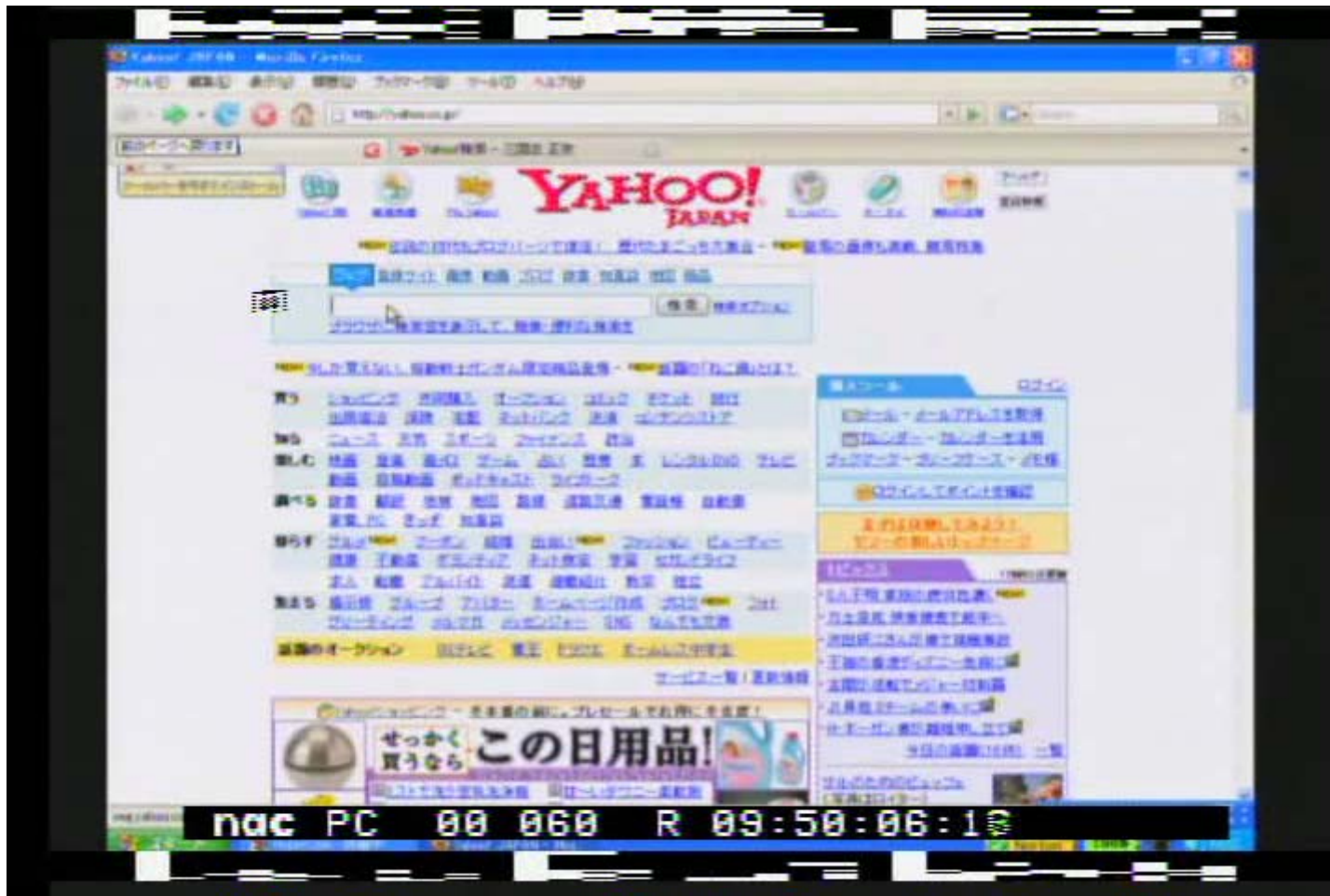
Browsing histories



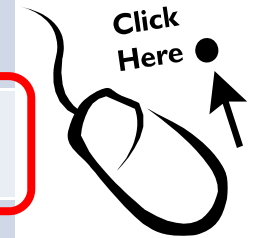
5 Interview

EVIA2008

# Example of eye movements

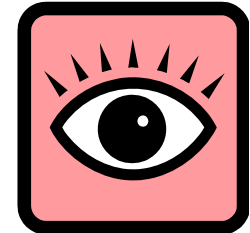


Categories of action	
Search	searching with a search engine
Link	clicking on a page link
Next	going forward to the next page
Back	going backward to the last page
Jump	jumping to a particular page in bookmark
Browse	browsing next search results
Submit	clicking a submit button
Bookmark	adding bookmarks
Change	changing from one tab to another
Close	closing a tab or window

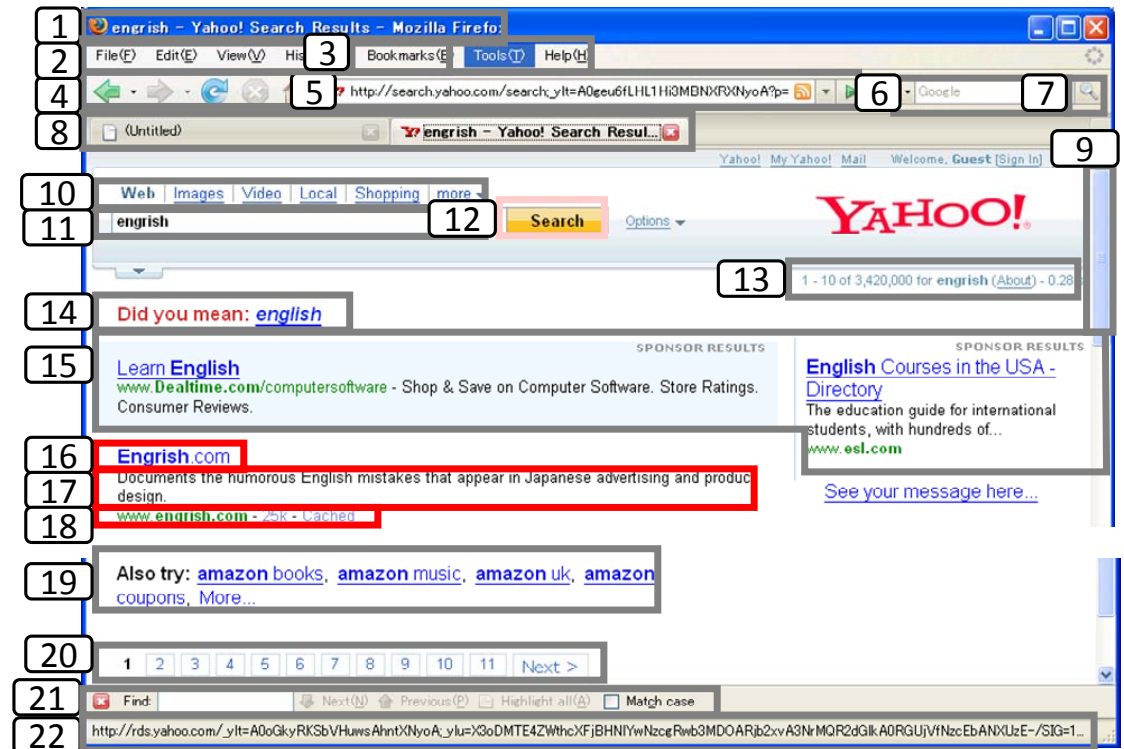




# Definition of lookzones for results pages



- 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

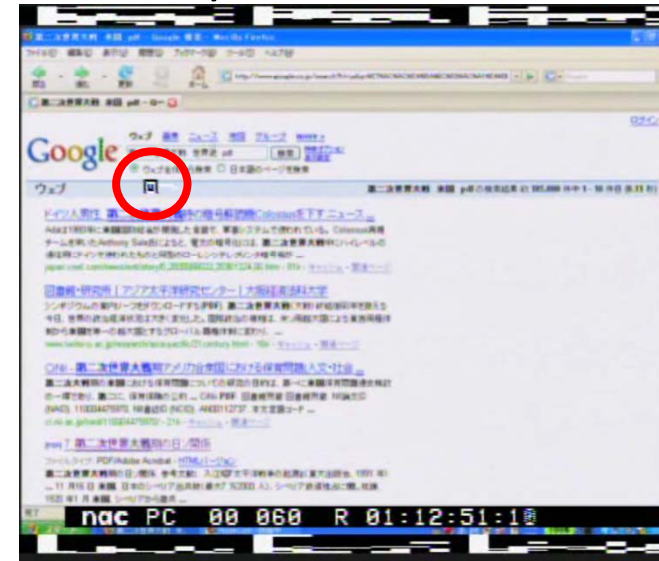




# Adding Annotations to the participants' specific behaviors and eye movements

Screen captured video

Eye movements



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2007-11-23	09:40:36.384	検索結果	http://www.google.co.jp/search?h	
2007-11-23	09:40:41.231	ページ	http://ja.wikipedia.org/wiki/%E3%83%A2%E	
2007-11-23	09:43:39.387	検索結果	http://www.google.co.jp/search?h	
2007-11-23	10:39:39.849	検索結果	http://www.google.co.jp/search?h	
2007-11-23	10:40:06.537	検索結果	http://www.google.co.jp/search?h	
2007-11-23	10:40:30.862	検索結果	http://www.google.co.jp/search?h	
2007-11-23	10:40:34.838	ページ	http://www.jtb.co.jp/kokunai/LargeArea.a	
2007-11-23	10:41:00.805	ページ	http://www.geocities.jp/don_vado/index.j	
2007-11-23	10:41:44.838	検索結果	http://www.google.co.jp/search?h	
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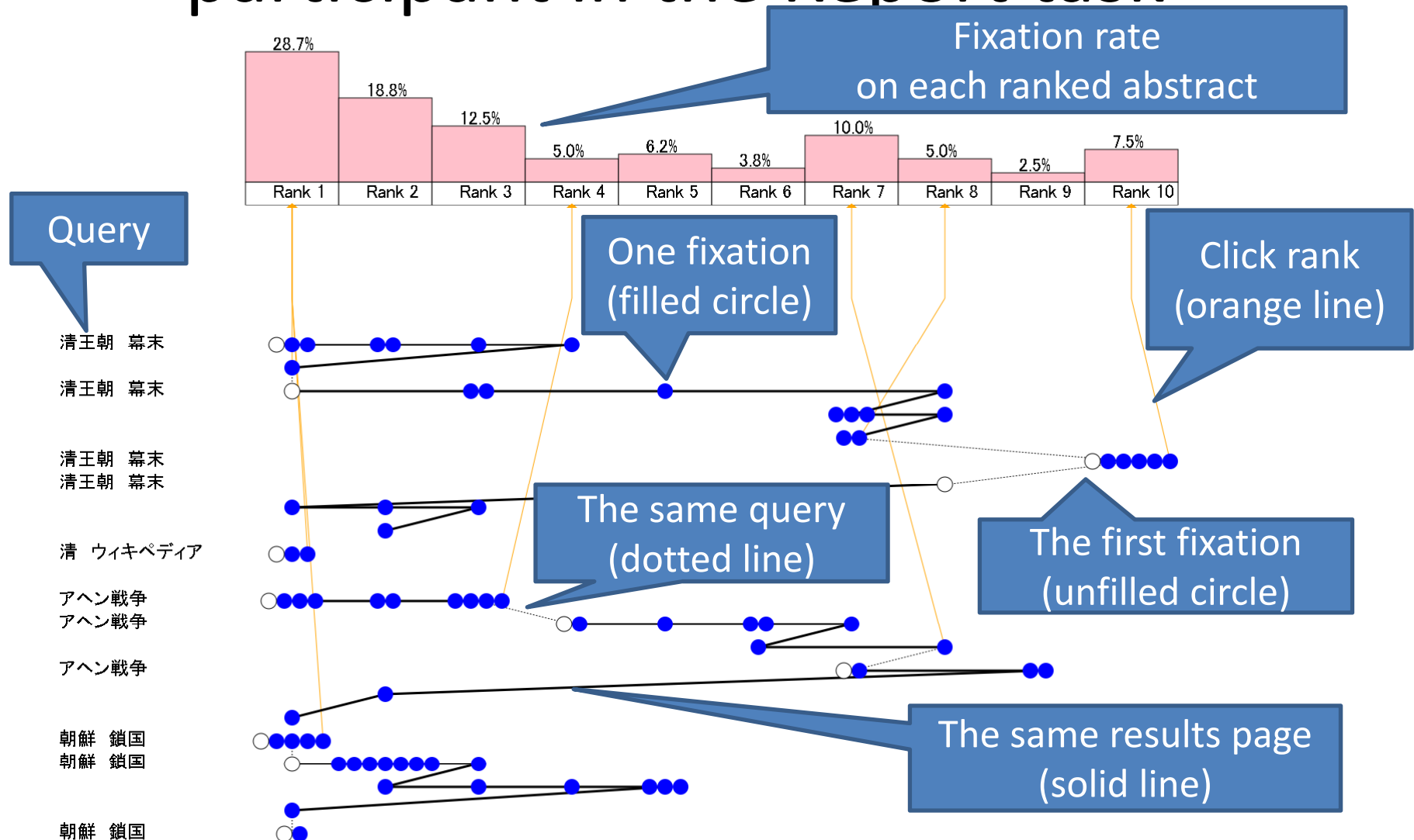
# Adding Annotations to the participants' specific behaviors and eye movements

The screenshot displays the EVIA2008 software interface, which is used for analyzing user behavior and eye movements. The interface is divided into several sections:

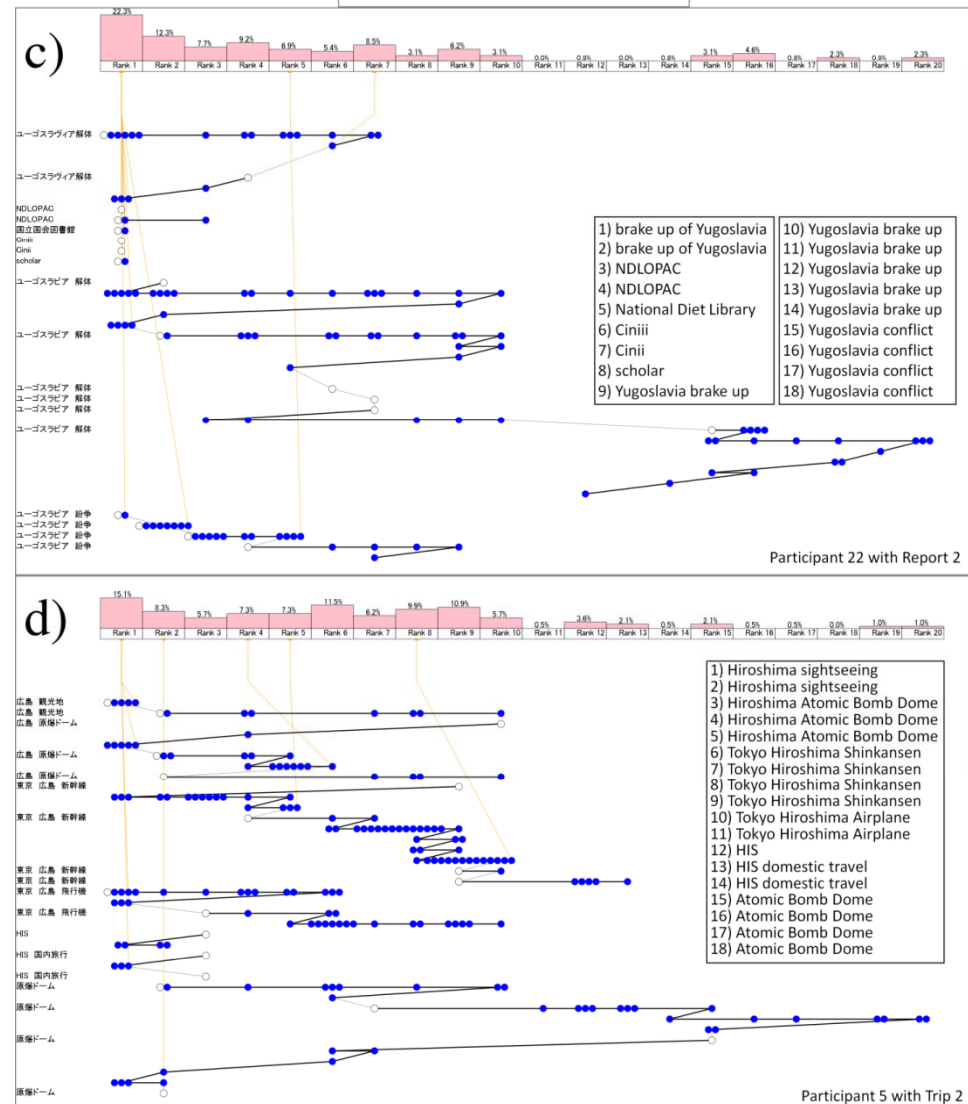
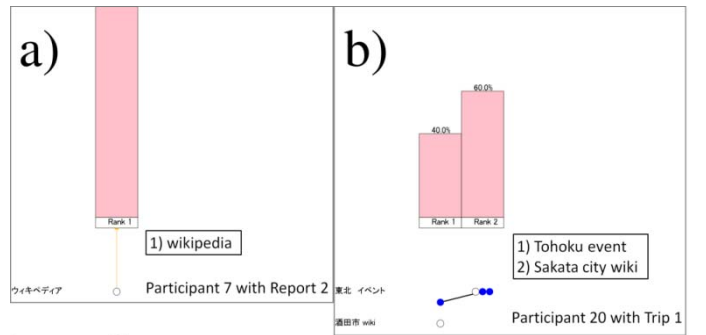
- Screen captured video:** This section shows a video capture window with a red border. It displays a screenshot of a Yahoo! Japan search results page. A red box highlights the video player controls at the bottom of this window.
- Eye movements:** This section shows a video capture window with a red border. It displays a screenshot of the same Yahoo! Japan search results page. A red box highlights the video player controls at the bottom of this window.
- Adding participants' action (E.g. link-clicking):** This section is a table with a blue border. It contains columns for "Position", "対象" (Target), "対象\_詳細" (Target Detail), and "対象\_詳細" (Target Detail). The table lists various actions and their corresponding positions.
- Adding lookzone (E.g. rank):** This section is a table with a blue border. It contains columns for "行動\_詳細" (Action Detail), "行動\_詳細" (Action Detail), "行動\_詳細" (Action Detail), "行動\_詳細" (Action Detail), and "行動\_詳細" (Action Detail). The table lists various actions and their corresponding details.
- Browser logs:** This section is a table with a red border. It contains columns for "Position", "対象", "対象\_詳細", "対象\_詳細", "対象\_詳細", "対象\_詳細", and "対象\_詳細". The table lists various browser logs and their corresponding positions.
- Manual annotations:** This section is a table with a blue border. It contains columns for "行動\_詳細" (Action Detail), "行動\_詳細" (Action Detail), "行動\_詳細" (Action Detail), "行動\_詳細" (Action Detail), and "行動\_詳細" (Action Detail). The table lists various manual annotations and their corresponding details.

The interface also includes a "リセット" (Reset) button and a "ビデオ位置をセット" (Set video position) button. The bottom of the interface shows a status bar with the text "EVIA2008".

# Example of visualization for a participant in the Report task

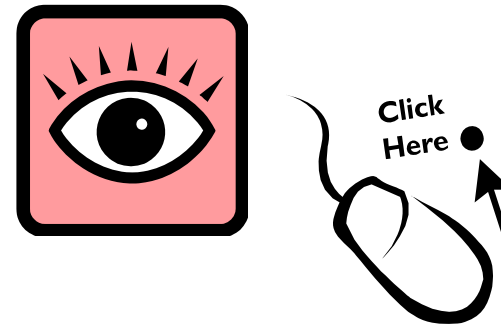


# Example of scanpath visualization for multiple tasks



# 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/>

