

Investigating Gaze Behavior in Faceted Search Interfaces for Library Catalogs

Bill Kules

OCLC/ALISE LIS Research Grant Report
ALISE 2010
January 13, 2010



Outline

- 60-second demo
- Research goals and questions
- Experimental design
- Initial results
- Next steps

Catalog Search Help

lincoln Anywhere My Bookbag

Refine Your Search

Your Search: lincoln > Great Britain

Results 1 - 10 of 252 Sort By: Relevance

Subject

History (146)

Politics and government (36)

England and Wales (22)

Charles (15)

Law (9) Show more

Region

England (50)

United States (16)

Lincoln (England) (11)

Lincolnshire (England) (10)

London (England) (7) Show more

Time Period

Civil War, 1642-1649 (63)

17th century (20)

Charles I, 1625-1649 (17)

1642-1649 (13)

Charles II, 1660-1685 (10) Show more

1. **Lincoln's man in Liverpool : Consul Dudley and the legal battle to stop Confederate warships**
 Author: Cross, Coy F.
 Format: Book (c2007.)

2. **Abraham Lincoln and a new birth of freedom : the Union and slavery in the diplomacy of the Civil War**
 Author: Jones, Howard, 1940-
 Format: Book (c1999.)

3. **Canon law and English common law : Selden Society lecture delivered in the Old Hall of Lincoln's Inn, July 5th, 1982**
 Author: Helmholz, R. H.
 Format: Book (1983.)

4. **Legal records and the historian : papers presented to the Cambridge Legal History Conference, 7-10 July 1975, and in Li...**
 Author: Cambridge Legal History Conference (1975)
 Format: Book (1978.)

5. **Town government in the sixteenth century, based chiefly on the records of the following provincial towns: Cambridge, Ch...**
 Author: Thomas, James Henry, 1884-
 Format: Book (1969.)

6. **The fathers, the reformers, and the public formularies, of the Church of England, in harmony with Calvin, and against t...**
 Author: Allen, John, 1771-1839.
 Format: eBook (1817.)

7. **Further advice to the clergy of the diocess of Lincoln, [electronic resource]**
 Author: Gardiner, James, 1637-1700.
 Format: eBook (1828.)

Faceted Search Findings

- Support exploratory search tasks
- Help with: vague, evolving or ill-defined needs, poor results
- Less “lostness”, more organized
- Help to assess search results
- Not always preferred
- **Appear to affect search actions and tactics**

(Capra et al. 2007, Hearst et al. 2002, Kåki 2005, Kules & Shneiderman 2008, Wilson & schraefel, 2008, Yee et al. 2003)

Faceted Search in Library Catalogs

- Facets played a major role in exploratory searches after brief training
 - Fixation time about 1/3 - 1/2 as much as on results
 - Facets used more at early stage of search (first page of results)

(Kules et al. 2009)

Research Goals

- Investigate a practical implementation issues for libraries
 - Do users need intro or training?
- Improve understanding of how faceted interfaces affect searcher actions and tactics
 - Can we replicate previous results?

Research Questions

Q1) Does gaze behavior differ when training or specialized online help is provided?

- *How many times* and for *how long* do searchers look at major elements (query box, facets, results, breadcrumbs)?

Q2) Does gaze behavior change as searchers become familiar with the interface during the session?

- *How many times* and for *how long* do searchers look at major elements?

Research Questions

Q3) Does gaze behavior differ depending on the stage of search?

- *How frequently* and *how long* do searchers look at major elements (query box, facets, results, breadcrumbs)?
- (Still analyzing this data)

Experimental Design

- N=18 sessions, CUA undergraduates
- 1x3 between-groups design
- Conditions
 1. Baseline with no specific intro to facets
 2. Baseline with 60 sec video on facets
 3. “What’s This” link with no specific intro to facets
- 6 exploratory tasks-balanced Latin square

Catalog Search Help

lincoln Anywhere My Bookbag

Refine Your Search

Subject

- History (146)
- Politics and government (36)
- England and Wales (22)
- Charles (15)
- Law (9)

[Show more](#)

Region

- England (50)
- United States (16)
- Lincoln (England) (11)
- Lincolnshire (England) (10)
- London (England) (7)

[Show more](#)

Time Period

- Civil War, 1642-1649 (63)
- 17th century (20)
- Charles I, 1625-1649 (17)
- 1642-1649 (13)
- Charles II, 1660-1685 (10)

[Show more](#)

Your Search: lincoln > Great Britain

Results 1 - 10 of 252 Sort By: Relevance

- 1. Lincoln's man in Liverpool : Consul Dudley and the legal battle to stop Confederate warships**
Author: Cross, Coy F.
Format: Book (c2007.)
- 2. Abraham Lincoln and a new birth of freedom : the Union and slavery in the diplomacy of the Civil War**
Author: Jones, Howard, 1940-
Format: Book (c1999.)
- 3. Canon law and English common law : Selden Society lecture delivered in the Old Hall of Lincoln's Inn, July 5th, 1982**
Author: Helmholtz, R. H.
Format: Book (1983.)
- 4. Legal records and the historian : papers presented to the Cambridge Legal History Conference, 7-10 July 1975, and in Li...**
Author: Cambridge Legal History Conference (1975)
Format: Book (1978.)
- 5. Town government in the sixteenth century, based chiefly on the records of the following provincial towns: Cambridge, Ch...**
Author: Thomas, James Henry, 1884-
Format: Book (1969.)
- 6. The fathers, the reformers, and the public formularies, of the Church of England, in harmony with Calvin, and against t...**
Author: Allen, John, 1771-1839.
Format: eBook (1817.)
- 7. Further advice to the clergy of the diocese of Lincoln, [electronic resource]**
Author: Gardiner, James, 1637-1700.
Format: eBook (1700.)

Catalog Search Help

lincoln Anywhere My Bookbag

Refine Your Search What's This?

Your Search: lincoln > Great Britain

Results 1 - 10 of 252 Sort By: Relevance

Subject

History (146)

Politics and government (36)

England and Wales (22)

Charles (15)

Law (9)

[Show more](#)

Region

England (50)

United States (16)

Lincoln (England) (11)

Lincolnshire (England) (10)

London (England) (7)

[Show more](#)

Time Period

Civil War, 1642-1649 (63)

17th century (20)

Charles I, 1625-1649 (17)

1642-1649 (13)

Charles II, 1660-1685 (10)

[Show more](#)

1. **Lincoln's man in Liverpool : Consul Dudley and the legal battle to stop Confederate warships**
 Author: Cross, Coy F.
 Format: Book (c2007.)

2. **Abraham Lincoln and a new birth of freedom : the Union and slavery in the diplomacy of the Civil War**
 Author: Jones, Howard, 1940-
 Format: Book (c1999.)

3. **Canon law and English common law : Selden Society lecture delivered in the Old Hall of Lincoln's Inn, July 5th, 1982**
 Author: Helmholz, R. H.
 Format: Book (1983.)

4. **Legal records and the historian : papers presented to the Cambridge Legal History Conference, 7-10 July 1975, and in Li...**
 Author: Cambridge Legal History Conference (1975)
 Format: Book (1978.)

5. **Town government in the sixteenth century, based chiefly on the records of the following provincial towns: Cambridge, Ch...**
 Author: Thomas, James Henry, 1884-
 Format: Book (1969.)

6. **The fathers, the reformers, and the public formularies, of the Church of England, in harmony with Calvin, and against t...**
 Author: Allen, John, 1771-1839.
 Format: eBook (1817.)

7. **Further advice to the clergy of the diocese of Lincoln, [electronic resource]**
 Author: Gardiner, James, 1637-1700.
 Format: eBook (1700.)

Procedure

- Introduction, informed consent
- 60 or 120 second intro video
- Calibrate eye tracker
- Conduct 6 searches
- Questionnaire after each search
- Retrospective review – Stage of search
 - Half-speed video of two searches with gaze data overlaid
 - Subject reported search stage (5 choices)
- Final questionnaire

Search Stages

- A) Coming up with search terms
- B) getting an overview of the results of your search
- C) Extracting specific information from your results
- D) Deciding what to do next
- E) Deciding on a topic

Six Exploratory Tasks

- A) Feminism in the United States
- B) Textile industry on three continents
- C) Great Britain and the colonies in the 20th century
- D) History of the Olympic games
- E) Medical sociology
- F) Native Americans in the Colonial period

Exploratory Task

You are taking a class called “History of the Olympic Games” for which you need to write a research paper. You have yet to decide on a specific topic for this paper. Use the library catalog to explore possible topics and find two. Then find at least three books for each so that you might make a decision as to which topic to write about.

Data Collection

- NCSU Catalog Research Testbed
- Tobii T120 remote eye tracker
 - 17” monitor
 - 120 Hz sampling rate
 - Resolution 1024x768
 - Tobii Studio analysis software
- Gaze fixations
 - Minimum 100 ms
 - 30 pixel radius
- Manually segmented into areas of interest (AOIs)

Catalog Search Help

lincoln Anywhere Query

Refine Your Search Your Search: lincoln > Great Britain

Results: 10 of 152 Sort By: Relevance

Subject

History (146)

Politics and government (36)

England and Wales (22)

Charles (15)

Law (9)

[Show more](#)

Region

England (50)

United States (16)

Lincoln (England) (11)

Lincolnshire (England) (10)

London (England) (7)

[Show more](#)

Time Period

Civil War, 1642-1649 (63)

17th century (20)

Charles I, 1625-1649 (17)

1642-1649 (13)

Charles II, 1660-1685 (10)

[Show more](#)

1. **Lincoln's man in Liverpool : Consul Dudley and the legal battle to stop Confederate warships**
 Author: Cross, Coy F.
 Format: Book (c2007.)
2. **Abraham Lincoln and a new birth of freedom : the Union and slavery in the diplomacy of the Civil War**
 Author: Jones, Howard, 1940-
 Format: Book (c1999.)
3. **Canon law and English common law : Selden Society lecture delivered in the Old Hall of Lincoln's Inn, July 5th, 1982**
 Author: Helmholz, R. H.
 Format: Book (1983.)
4. **Legal records and the historian : papers presented to the Cambridge Legal History Conference, 7-10 July 1975, and in Li...**
 Author: Cambridge Legal History Conference (1975)
 Format: Book (1978.)
5. **Town government in the sixteenth century, based chiefly on the records of the following provincial towns: Cambridge, Ch...**
 Author: Thomas, James Henry, 1884-
 Format: Book (1969.)
6. **The fathers, the reformers, and the public formularies, of the Church of England, in harmony with Calvin, and against t...**
 Author: Allen, John, 1771-1839.
 Format: eBook (1817.)
7. **Further advice to the clergy of the diocese of Lincoln, [electronic resource]**
 Author: Gardiner, James, 1637-1700.
 Format: eBook (1700?)

Descriptive Task Measures

Mean values	1. Baseline	2. 60 sec facet intro	3. What's this link
# of fixations in AOIs	926	860	648
Total fixation seconds in AOIs	185.6	201.2	182.8
# of queries	24.3	19.2	33.7
# of facet adds (narrowing)	17.8	37.7	23.0
# of (facet removes)	3.5	17.2	5.7

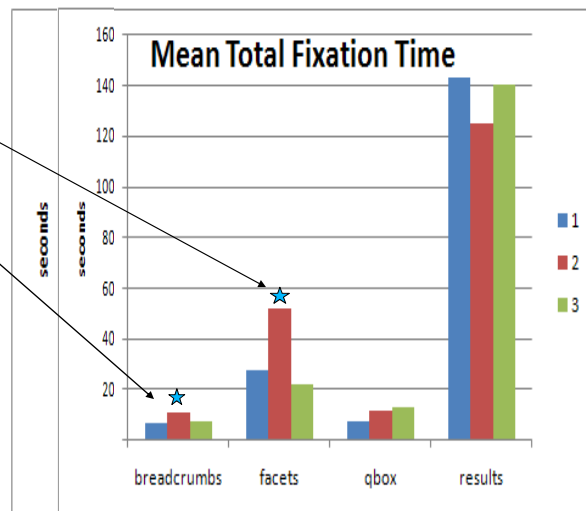
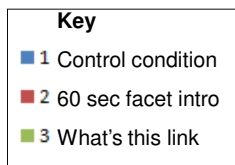
Results

- RQ1 – Does gaze behavior differ when training or specialized online help is provided?
 - AOI fixation counts by condition
 - AOI fixation total time by condition
- RQ 2 - Does gaze behavior change as searchers become familiar with the interface during the session?
 - AOI fixation counts by task sequence number
 - AOI fixation total time by task sequence number

RQ1 – Does gaze behavior differ when training or specialized online help is provided?

Training significantly increased:

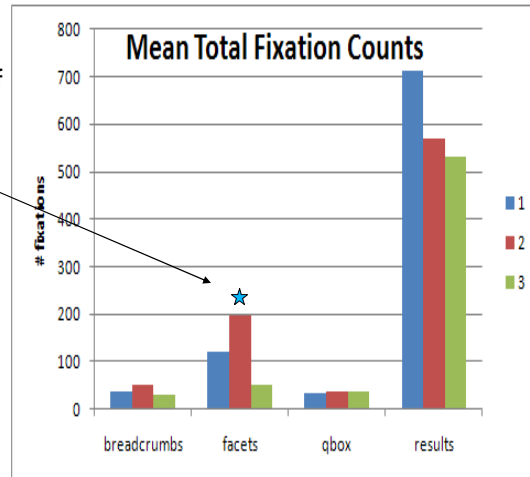
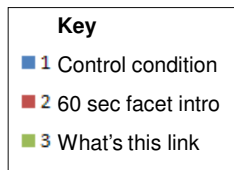
- Mean total fixation time in the facets
- mean total fixation time in the breadcrumbs (slightly)



RQ1 – Does gaze behavior differ when training or specialized online help is provided?

Training significantly increased:

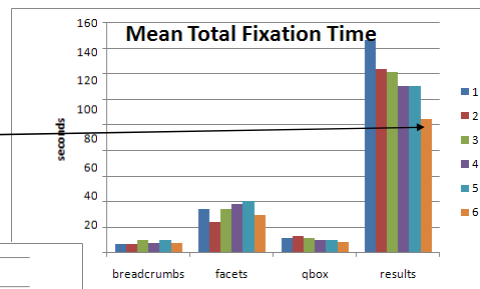
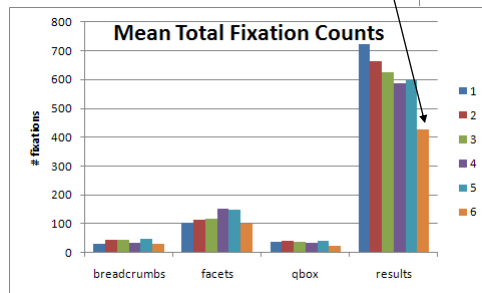
- Mean total number of fixations (vs. help condition)



RQ 2 - Does gaze behavior change as searchers become familiar with the interface during the session?

No significant differences

- Some drop-off in last sequence task, but not significant



Note

Bar #1 = first task

Bar #6 = last task

Limitations

- Tasks
 - One high-level scenario
 - Closely matched facets
 - Researcher provided tasks in lab setting
- Eye tracker
 - Mediocre “capture” rate

Conclusions

- 60 sec video intro increased facet use to about 30%
 - Comparable to previous results
 - Libraries should consider providing intros
- “What’s this” link did not increase facet use
 - Similar to baseline - about 15%
 - Would different visual design help?
- Facet use did not increase later in session
 - May take longer to see changes

Next Steps

- Analyze stage of search data
- Additional factors
 - Number, size and presentation of facets
 - Domain, search knowledge
- Extend measures
 - Compare with click data
- Continue exploring use of gaze replay for retrospective interviews

Acknowledgements

- Collaborators:
 - Robert Capra, UNC Chapel Hill
 - Joseph Ryan, NC State
 - Research assistants - Matt Banta, Abbey Gerken
- This research was generously supported by an OCLC/ALISE LIS Research Grant

Ancillary Material

- <http://www.lib.ncsu.edu/catalog/research/testbed/cuapilot/2009/A/frontpage.php>
- <http://www.lib.ncsu.edu/catalog/research/testbed/cuapilot/2009/B/frontpage.php>