The Information School of the University of Washington

Visual Search Engine Evaluation

Efthimis N. Efthimiadis

efthimis@u.washington.edu

Information School

University of Washington

Agenda

- Motivation
- Aims & Objectives
- Methodology
- Results
- Conclusions

The Information School of the University of Washington

Background & Motivation

- The presentation of information by SE is fundamental to their usability.
- Most SEs present a simple ranked list.
- Visualization of results is active & growing research area
- A number of SEs that use a visual or hybrid UI exist:

  e.g., Kartoo, Quintura, Grokker, Mooter, WebBrain, PageBull, Snap
- few comparative usability studies of visual search engines

Comparative usability evaluation studies of visual search engines

- visually impaired users of Google, Yahoo, HotBot, Vivisimo & Kartoo (Andronico *et al.*, 2004).
- visual vs.textual display of information using the Google, Yahoo, Grokker & Kartoo (da Silva & Freitas, 2006)
- treemap display of results was compared with Google, SRC, Kartoo & Clusty (Chu *et al.*, 2007).

Comparative usability evaluation studies of SE are complicated (White & Marchionini, 2006; Käki & Aula, 2008):

- search is highly domain-dependent and user-dependent
- variation between individual's information-seeking habits adds complexity to the selection of both appropriate experimental conditions & test metrics.

The Information School of the University of Washington

The Information School of the University of Washington

Aim

- investigate how people search when using
  a visual user interface (UI)
  compared to
  the traditional text-based UI.

The Information School of the University of Washington

Goals & Objectives:

(a) compare how people search using three types of UIs (visual, text, hybrid);

(b) identify user satisfaction level with each system for completing a search;

(c) establish how the visualizations help/hinder users with the search/navigation process;

(d) study how the query formulation and reformulation process is affected by the visual UIs.

METHODOLOGY

Methodology

- Participants
- Tasks
- Search engines
- Study design
- Data collection Instruments

Participants

	Undergraduate Students	Graduate Students
n = 24	12 (4 male, 8 female)	12 (6 male, 6 female)
Age Range Count	18-20: 9 21-25: 2 46-50: 1	21-25: 2 26-30: 5 31-35: 3 36-40: 1 41-45: 1

- Convenience sample
- Recruited from UW student population
- Grads: LIS and Information Management
- Undergrads: non-iSchool students taking an iSchool intro to tech class

The Information School of the University of Washington

Search Tasks

- Developed three scenarios
  (TREC interactive track, and Borlund & Ingwersen, 2000)

- Query Types used (Broder 2002):
  - Informational
  - Transactional

The Information School of the University of Washington

Scenarios

1. Aspirin
2. Browser security plug-in
3. Tour de France

Scenario 1 - Aspirin

- A family friend, a woman in her mid-50's, is concerned about heart attacks because of her family history.
- She's heard that taking a daily dose of aspirin can reduce the risk of heart attacks in some patients, but she has also heard that Aspirin has certain side effects.
- She will be visiting her doctor in a few days and wants to find information about this in order to have an educated conversation with her physician.
- To help her you volunteered to search and identify at least two pros or cons of taking large doses of Aspirin.

The Information School of the University of Washington

Scenario 2 – Security Plug-In

- You are concerned about protecting sensitive personal data and maintaining privacy when you use the internet.
- Plug-ins are small, free-downloadable programs that work with your Internet Browser such as Firefox or Internet Explorer.
- You use the Firefox web browser but you realize that there are more than 150 Firefox plug-ins related to privacy and security.
- Can you find authoritative information that recommends five to ten of the best plug-ins for your use?

Scenario 3 – Tour de France

- You live in Seattle, WA.
- Next summer you're planning to take a bicycle trip that will follow the route of the annual "Tour De France" bike race.
- You're interested in several pieces of information.
  1. How much will it cost to ship your bicycle to Paris?
  2. Identify some package tours that might include lodging, ground transportation, a guide and the price ranges.
  3. Find narratives and tips from people who have made this trip in the past.

The Information School of the University of Washington

The Information School of the University of Washington

Baseline = Google

Visual UI = KartOO

Hybrid = see & find quintura

SEARCH ENGINES

STUDY DESIGN

Study Design

- within-subjects design
- Latin square design to account for learning effects for both systems and topics

  User {u#}, System {g, k, q}, Scenario {1, 2, 3}

u1	g1	k2	q3	u4	k1	q2	g3	u7	q1	g2	k3
u2	g2	k3	q1	u5	k2	q3	g1	u8	q2	g3	k1
u3	g3	k1	q2	u6	k3	q1	g2	u9	q3	g1	k2

- no user training on SE prior to study
  - assumption Web SE need to be intuitive and no training should be required to search (Hearst 2007)

DATA COLLECTION INSTRUMENTS

Questionnaires

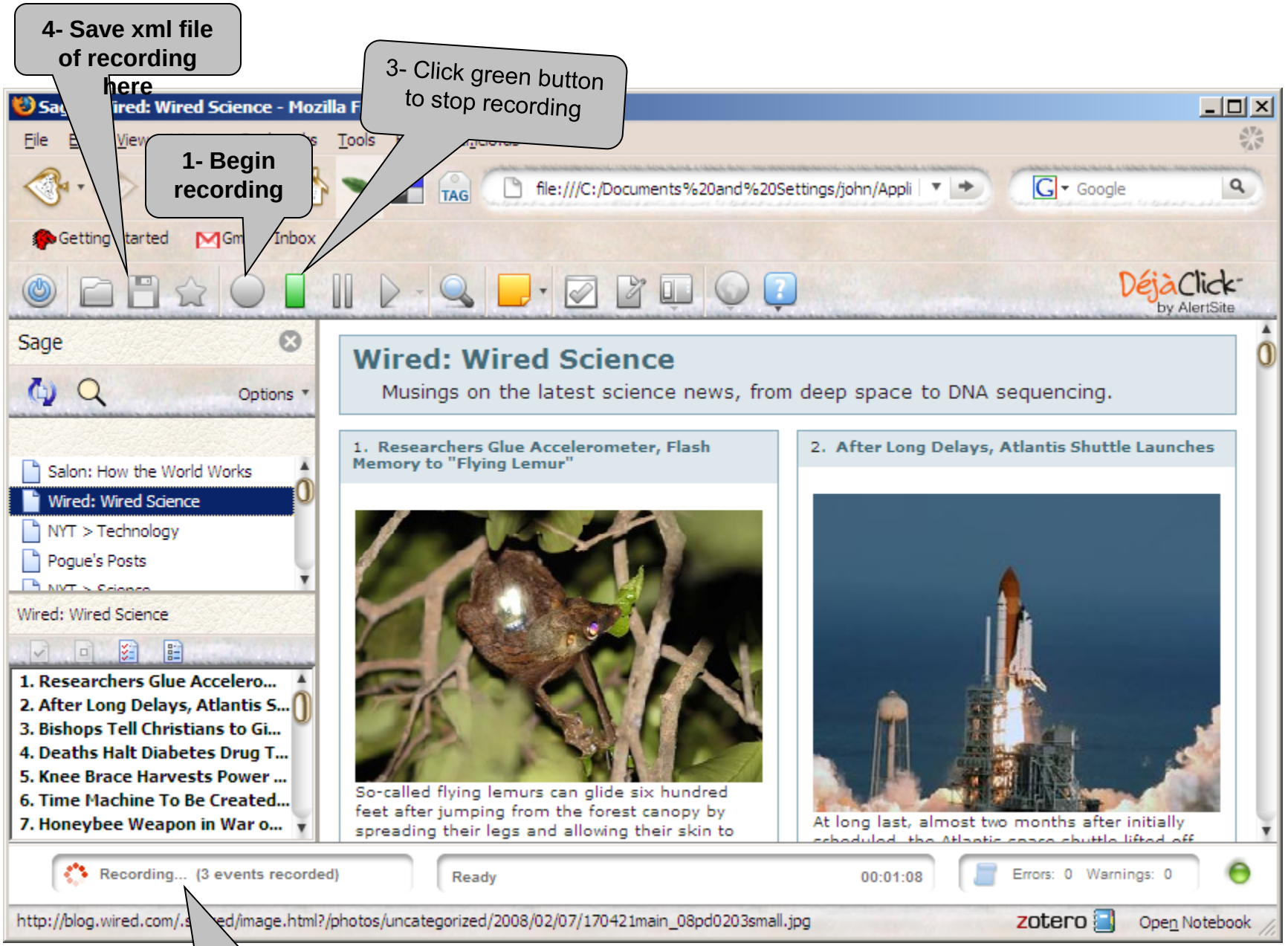
- Data was gathered using Catalyst, a web-based survey tool
  - questions on a 9-point scale
- Initial survey (x1);
  - gathered demographic data and information about the subject's computer use, web search experience, history & habits
- Pre-search survey (x3);
  - gathered information on the subject's prior knowledge of the scenario, after reading the scenario
- Post-search survey (x3);
  - gathered information about the subject's experience with a search engine and scenario
- Final survey (x1);
  - gather comparative information about the three search engines & search process

The Information School of the University of Washington

Recording user/SE interaction

plug-in for the Firefox browser.

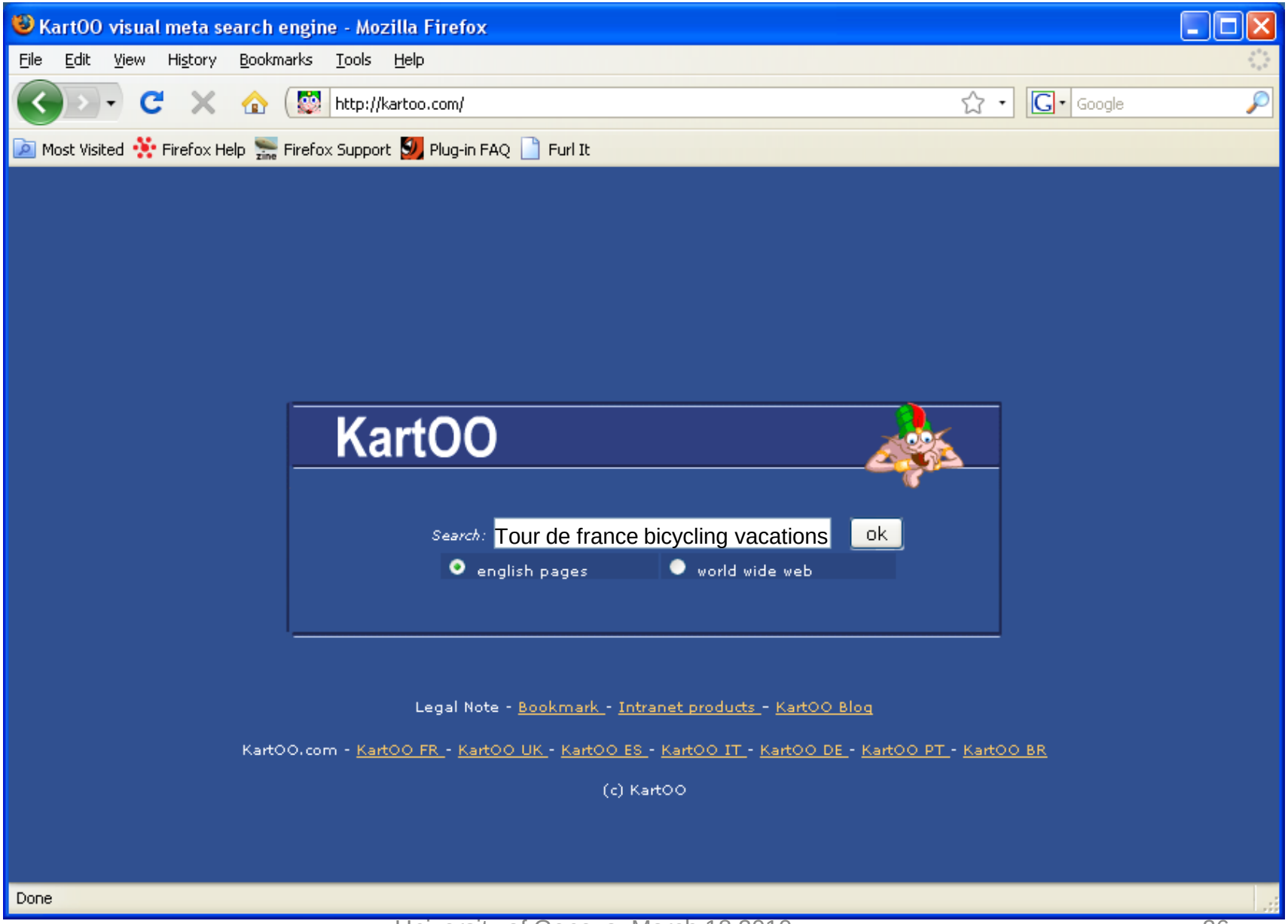
- Records entire session with Audio & Video, allows playback
- Collects information on:
  - keywords used to search,
  - URLs visited,
  - time it takes to complete the search task.


4- Save xml file of recording here
3- Click green button to stop recording
1- Begin recording
Wired: Wired Science - Mozilla F
File
Tools
file:///C:/Documents%20and%20Settings/john/Appli
Google
Getting started
Inbox
DéjàClick by AlertSite
Sage
Options
Salon: How the World Works
Wired: Wired Science
NYT > Technology
Pogue's Posts
Wired: Wired Science
1. Researchers Glue Accelero...
2. After Long Delays, Atlantis S...
3. Bishops Tell Christians to Gi...
4. Deaths Halt Diabetes Drug T...
5. Knee Brace Harvests Power ...
6. Time Machine To Be Created...
7. Honeybee Weapon in War o...
Wired: Wired Science
Musings on the latest science news, from deep space to DNA sequencing.
1. Researchers Glue Accelerometer, Flash Memory to "Flying Lemur"
So-called flying lemurs can glide six hundred feet after jumping from the forest canopy by spreading their legs and allowing their skin to
2. After Long Delays, Atlantis Shuttle Launches
At long last, almost two months after initially
Recording... (3 events recorded)
Ready
00:01:08
Errors: 0 Warnings: 0
zotero
Open Notebook
2- Indicates that recording is on

Overview of the

SEARCH ENGINE USER INTERFACES

KartOO Home



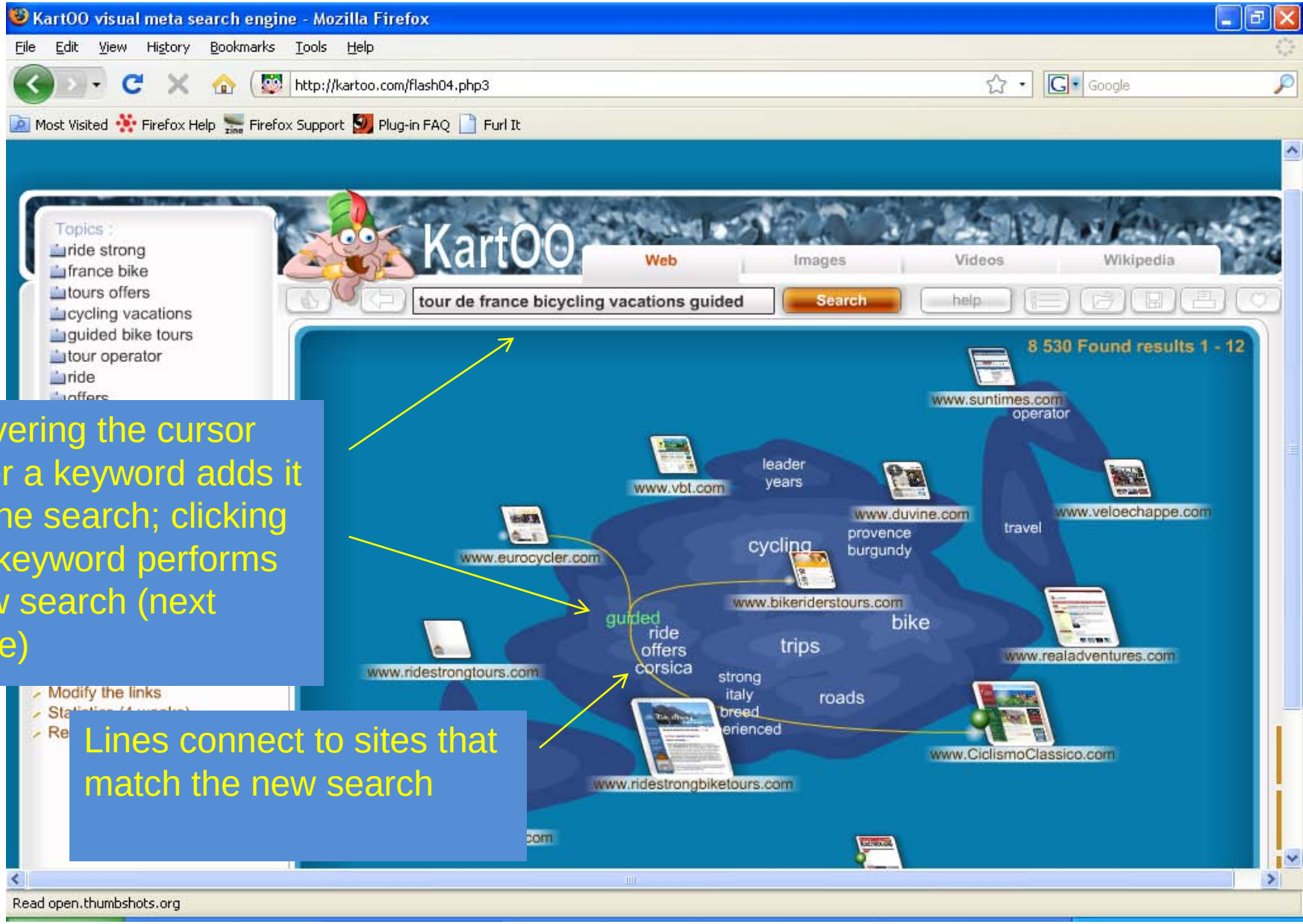
The Information School of the University of Washington

KartOO Results Page

White text are suggested keywords for search refinement; thumbnails are sites that match the current search

The Information School of the University of Washington

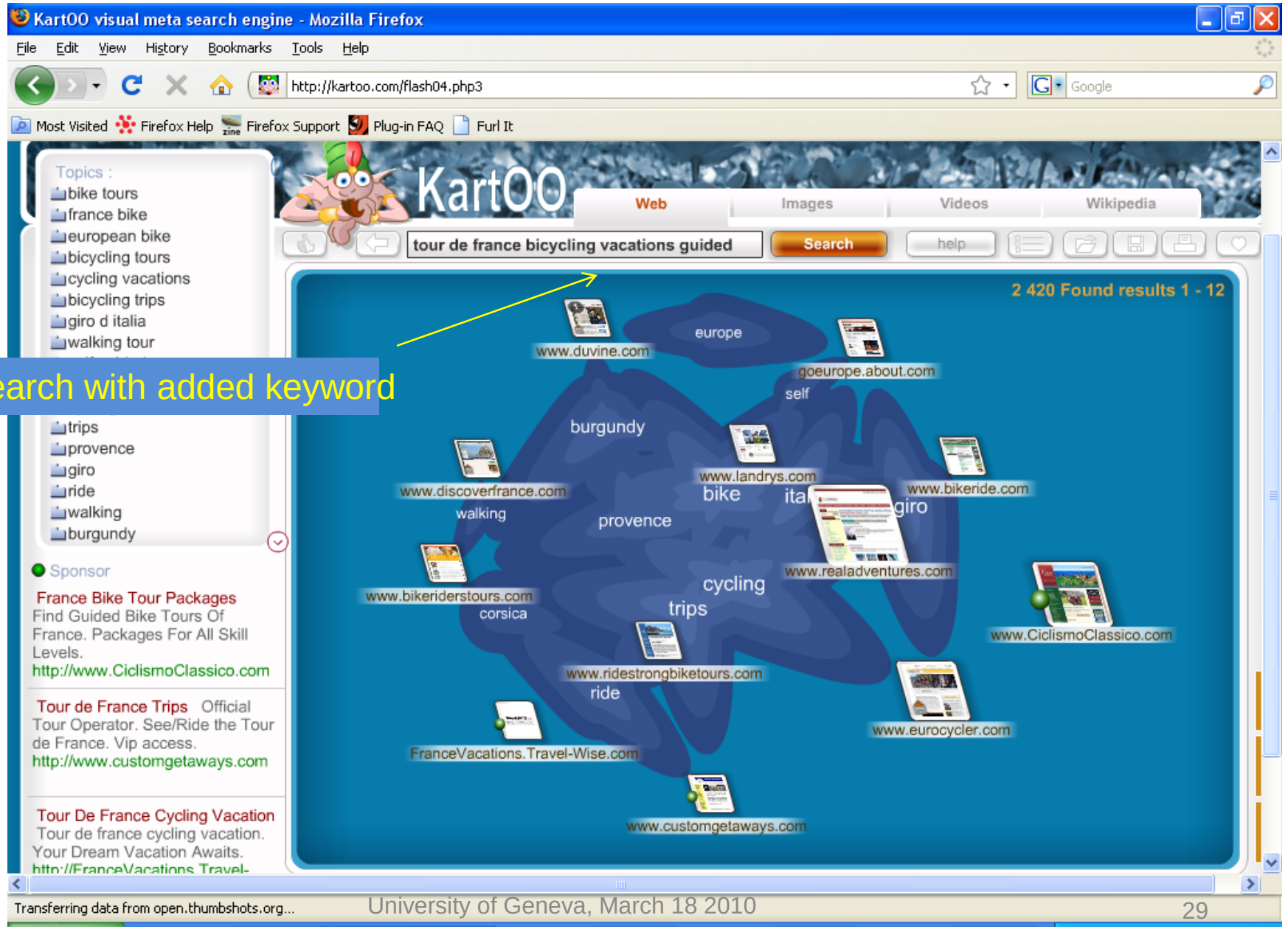
KartOO Results Page: Using keyword refinement

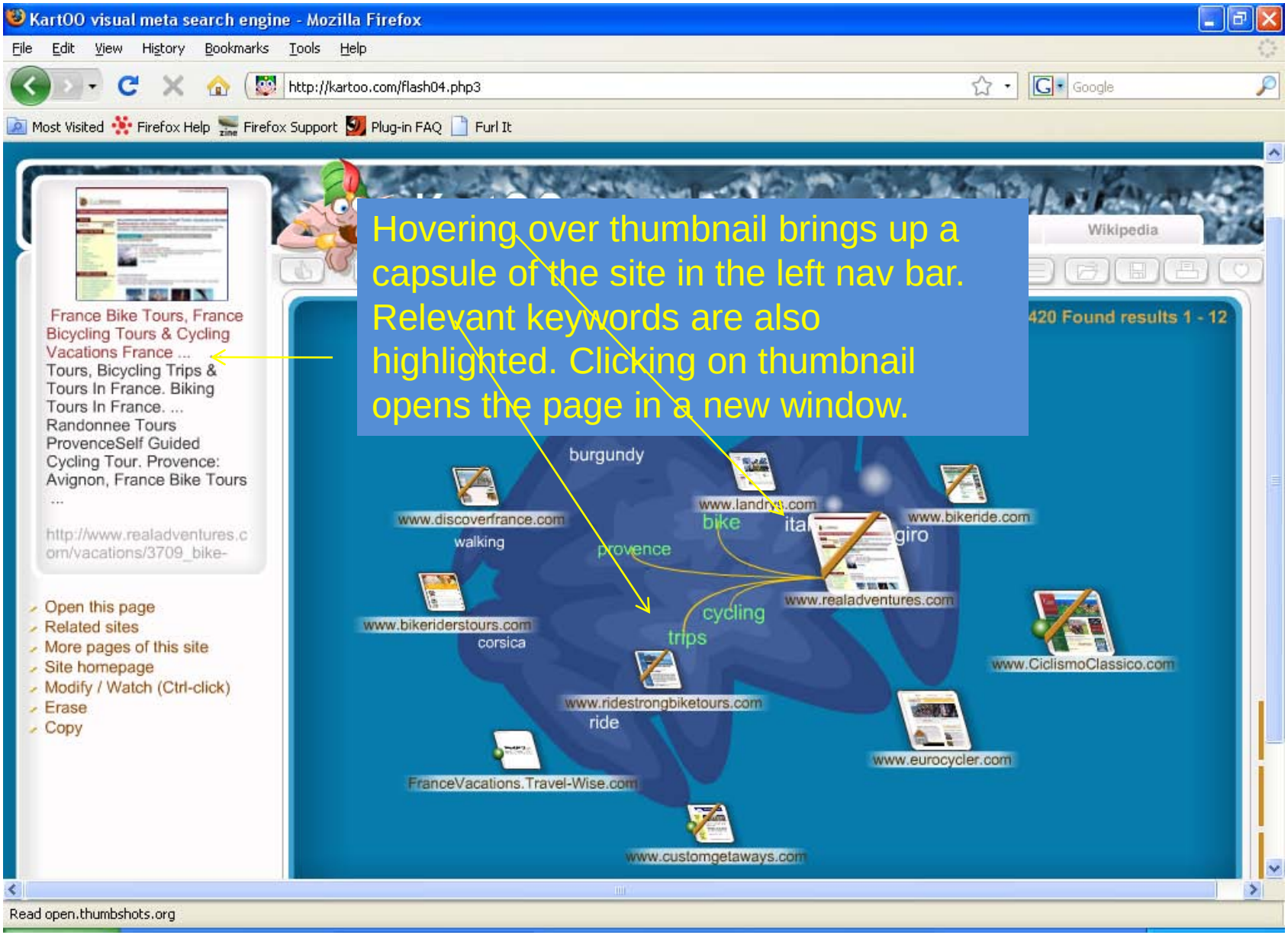


Hovering the cursor over a keyword adds it to the search; clicking on keyword performs new search (next slide)

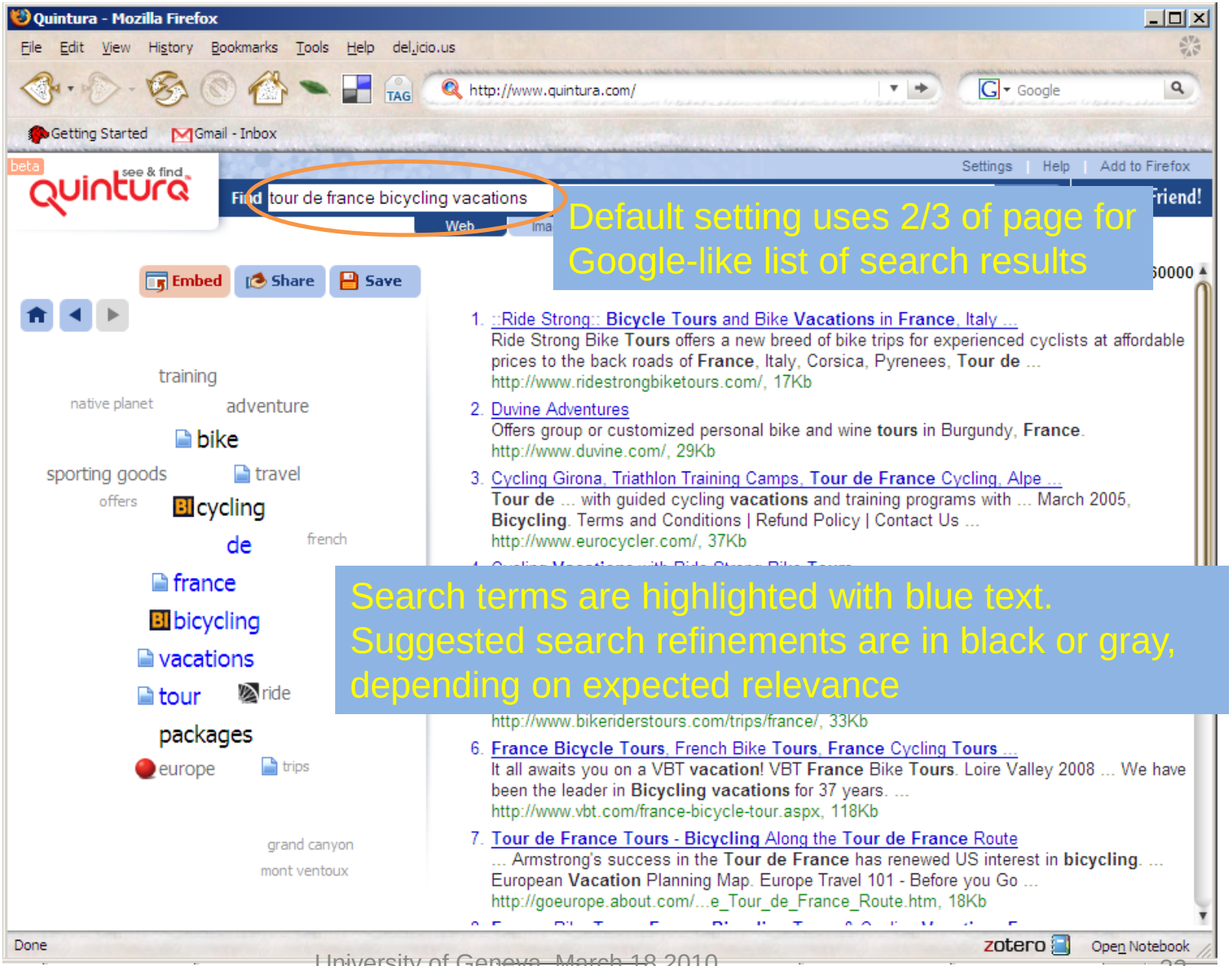
Lines connect to sites that match the new search

KartOO Results Page: Using keyword refinement

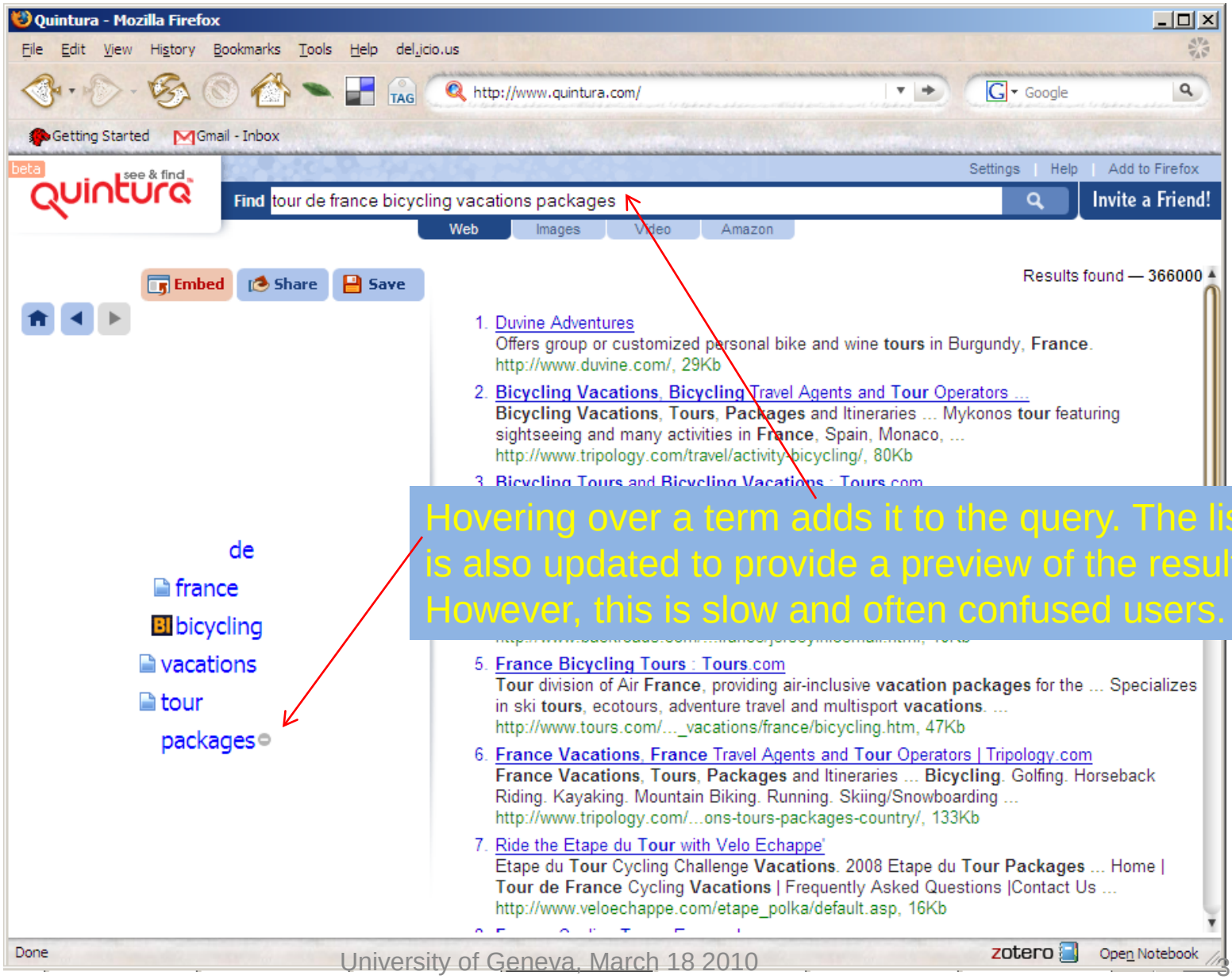



KartOO visual meta search engine - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://kartoo.com/flash04.php3
Most Visited Firefox Help Firefox Support Plug-in FAQ Furl It
Wikipedia
420 Found results 1 - 12
Hovering over thumbnail brings up a capsule of the site in the left nav bar. Relevant keywords are also highlighted. Clicking on thumbnail opens the page in a new window.
France Bike Tours, France Bicycling Tours & Cycling Vacations France ...
Tours, Bicycling Trips & Tours In France. Biking Tours In France. ... Randonnee Tours ProvenceSelf Guided Cycling Tour. Provence: Avignon, France Bike Tours ...
http://www.realadventures.com/vacations/3709_bike-
Open this page
Related sites
More pages of this site
Site homepage
Modify / Watch (Ctrl-click)
Erase
Copy
burgundy
www.discoverfrance.com
walking
www.landry.com
bike
www.bikeride.com
giro
provence
www.realadventures.com
www.bikeriderstours.com
corsica
cycling
trips
www.CiclismoClassico.com
www.ridestrongbiketours.com
ride
www.eurocycler.com
FranceVacations.Travel-Wise.com
www.customgetaways.com
Read open.thumbshots.org

Quintura Search Results

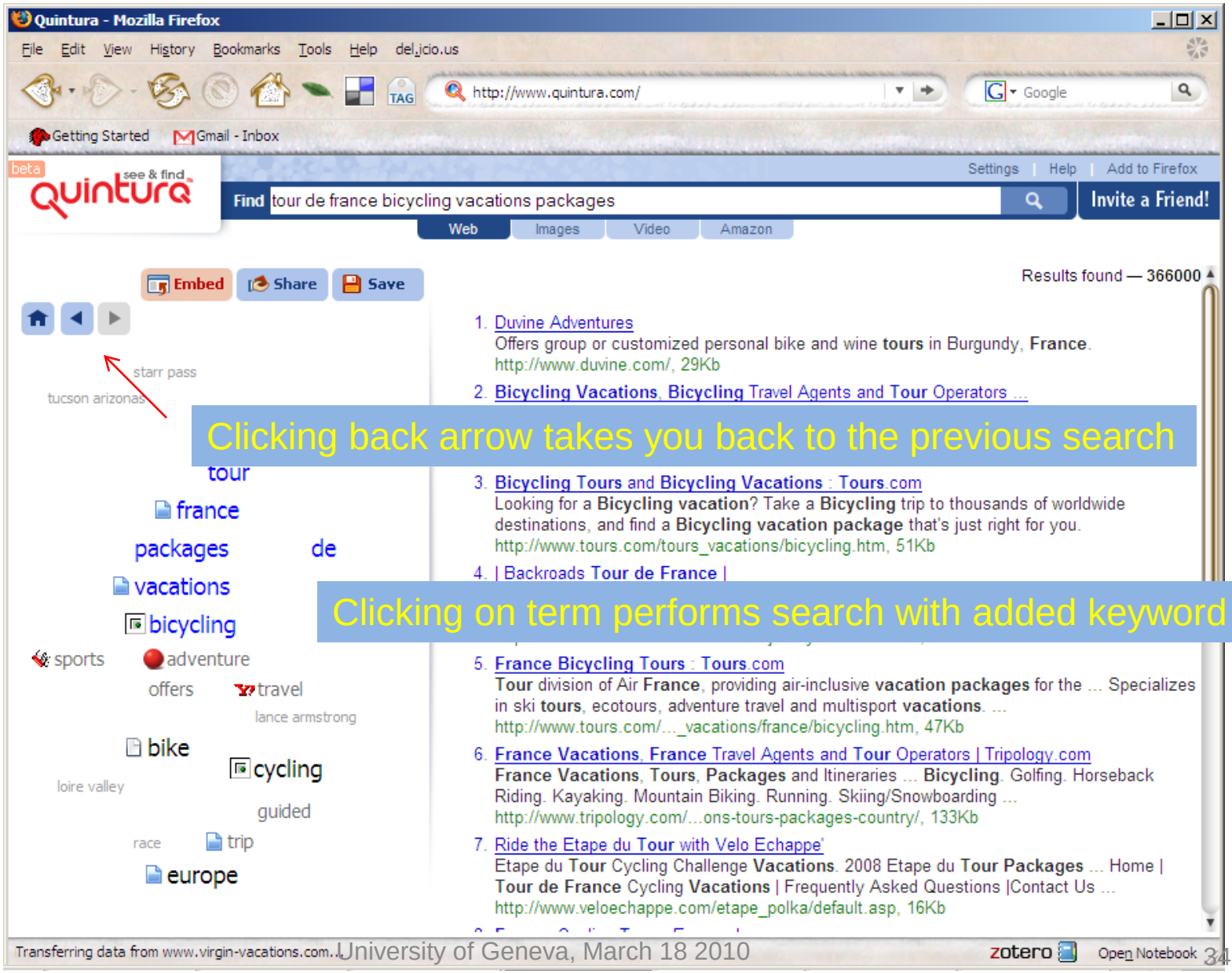


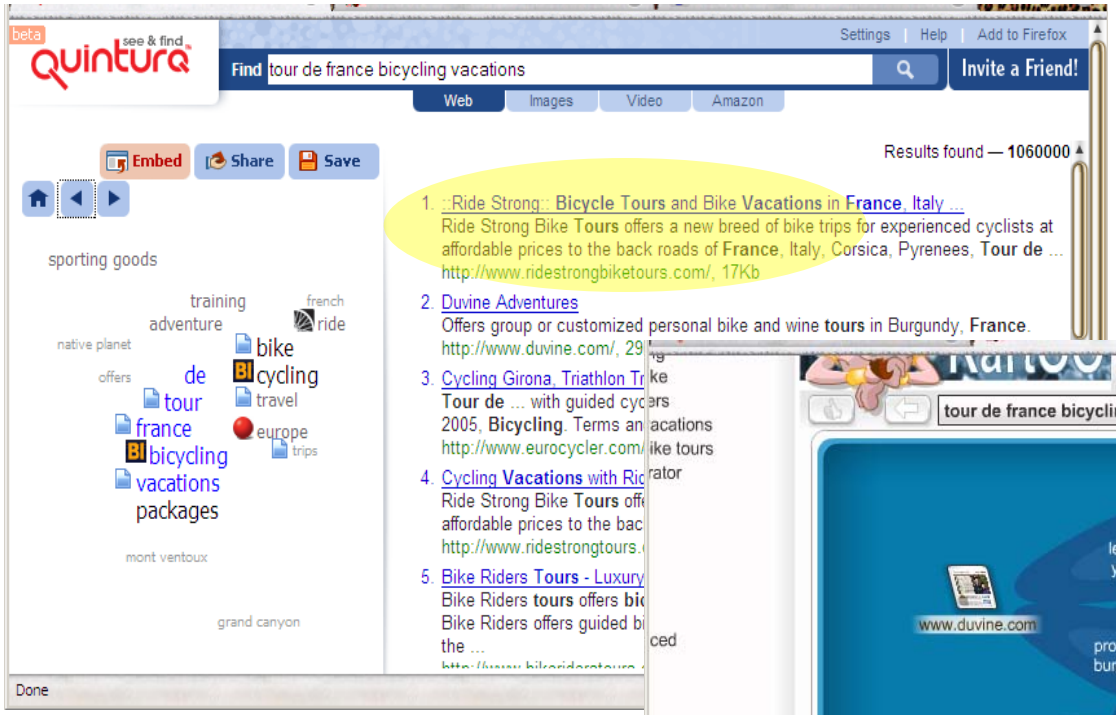
Quintura: Using the term cloud for search refinement

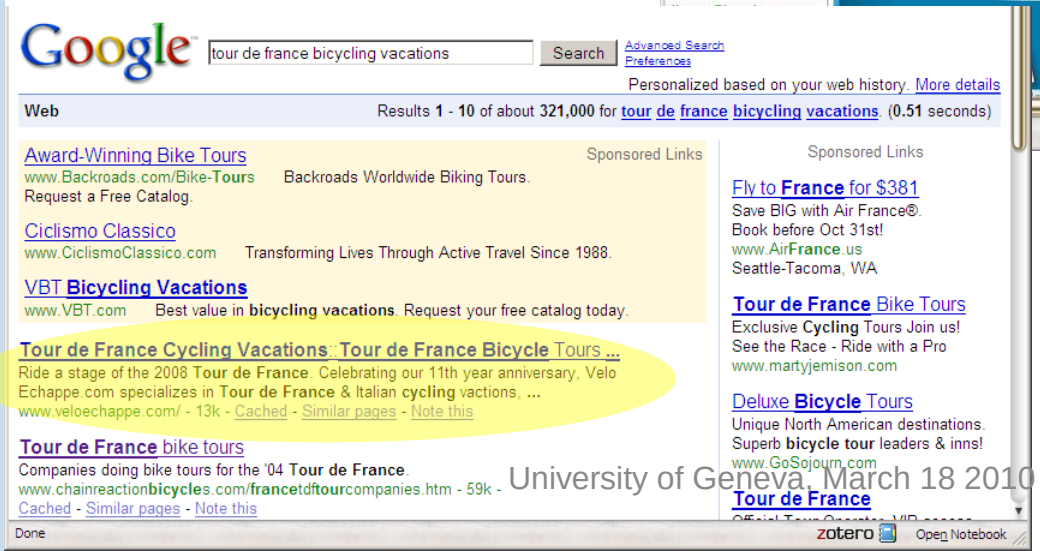


The Information School of the University of Washington

Quintura: Using the term cloud for search refinement







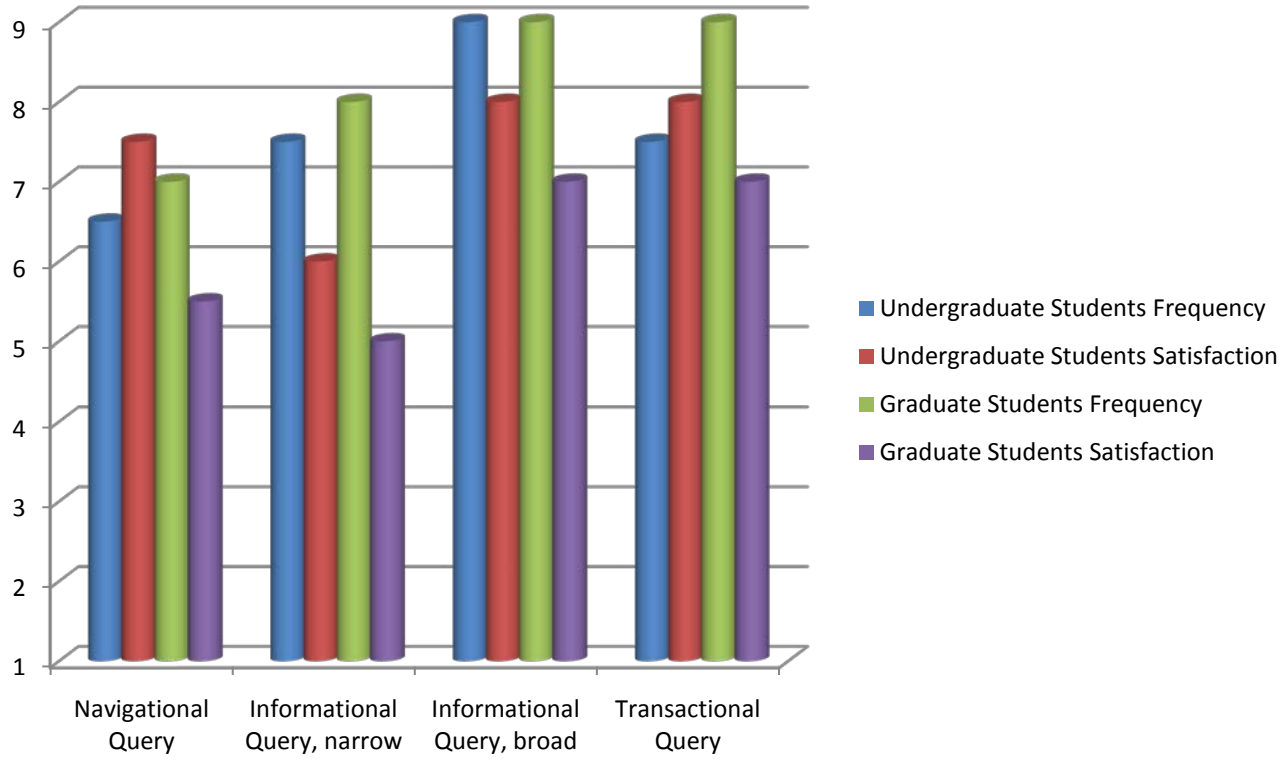
All three search engines provide correct answers with the initial search. KartOO confuses users – who don't realize they've answered the question! Quintura less so.

- Frequency & Satisfaction of web search
- Interaction time
- # of queries
- # of terms
- Familiarity with scenario topic
- % of correct responses
- Perceived satisfaction w/results & SE
- Testimonials
- Would you search Kartoo/Quintura again?

Selective presentation of

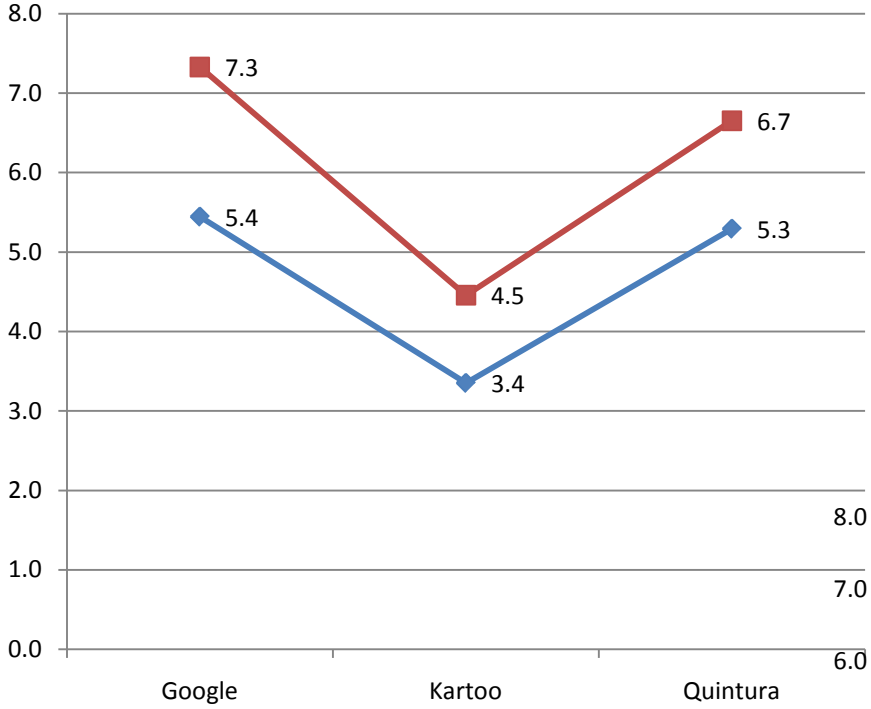
RESULTS

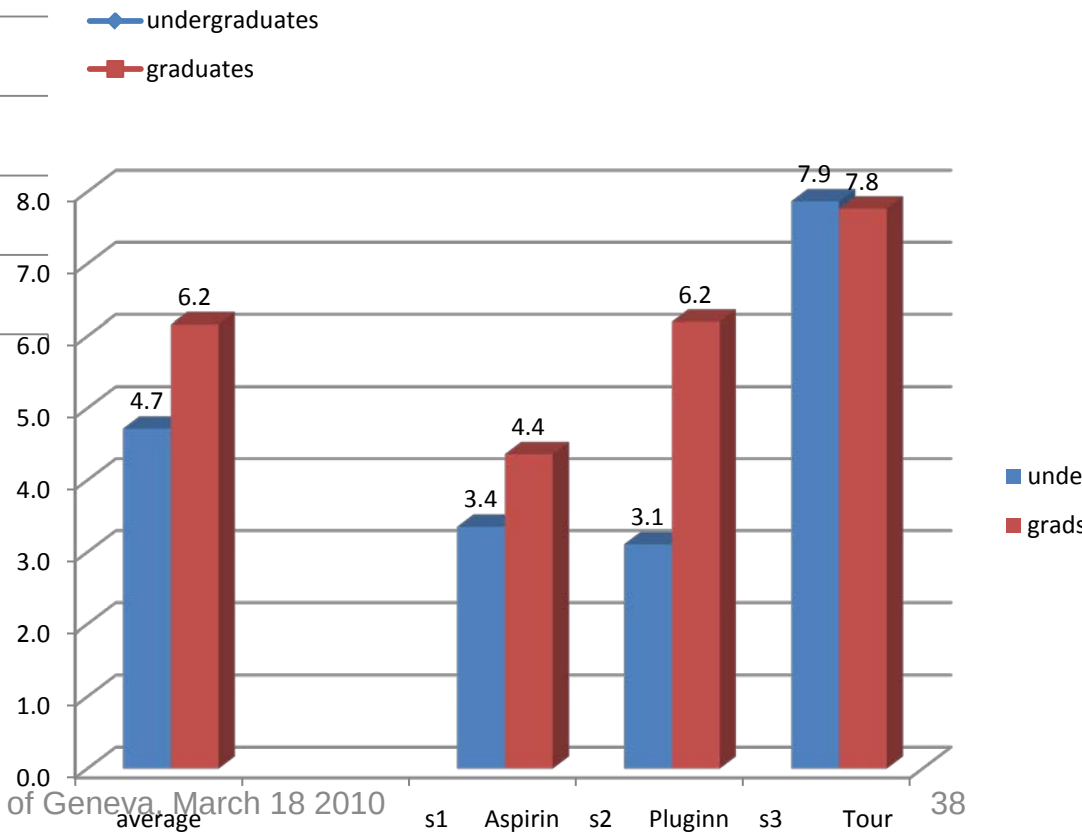
Frequency & satisfaction with web search (self-reported)



- Scale on y-axis: 1 (no satisfaction/low frq) – 9 (high satisfaction)
- Frequency: Grad (3) > Undergrad (1)
- Satisfaction: Grad (4) < Undergrad (2)

Average Interaction Time per SE, Scenario, and Group (in Minutes)





Queries: selected examples

Average number of query terms per scenario:
s1 = 5; s2 = 4; s3 = 3.7

S1

- aspirin (single word)
- aspirin heart attack
- aspirin "large dose" "pros and cons"
- "heart attacks" aspirin site:.gov
- pros and cons of taking Aspirin for heart attacks (natural language)
- "heart attacks" aspirin ("daily dose"|dosage) "side effects" pros cons inurl:webmd (advanced)

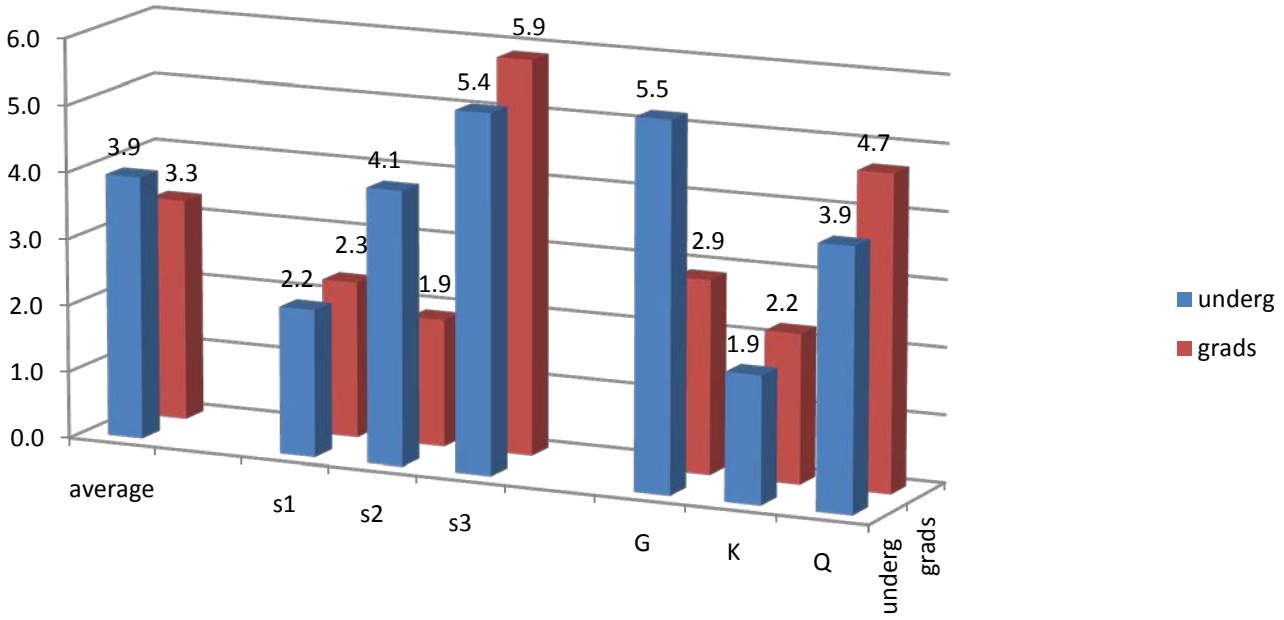
S2

- best plug-ins
- Firefox plug-ins
- firefox privacy plug in
- best security plug-ins for web browsers
- firefox plugins security recommendation

s3

- tour de france
- paris
- Bicycle shipping cost
- bicycle shipping seattle paris
- USPS bulk shipping
- france transportation cost info
- Price to ship bicycles from seattle to paris
- Bicycle tours , "Tour De France"
- tips for people who have traveled to Paris for Tour De france
- packages tours include lodging , ground transportation , guides and price ranges in Paris

Average number of queries

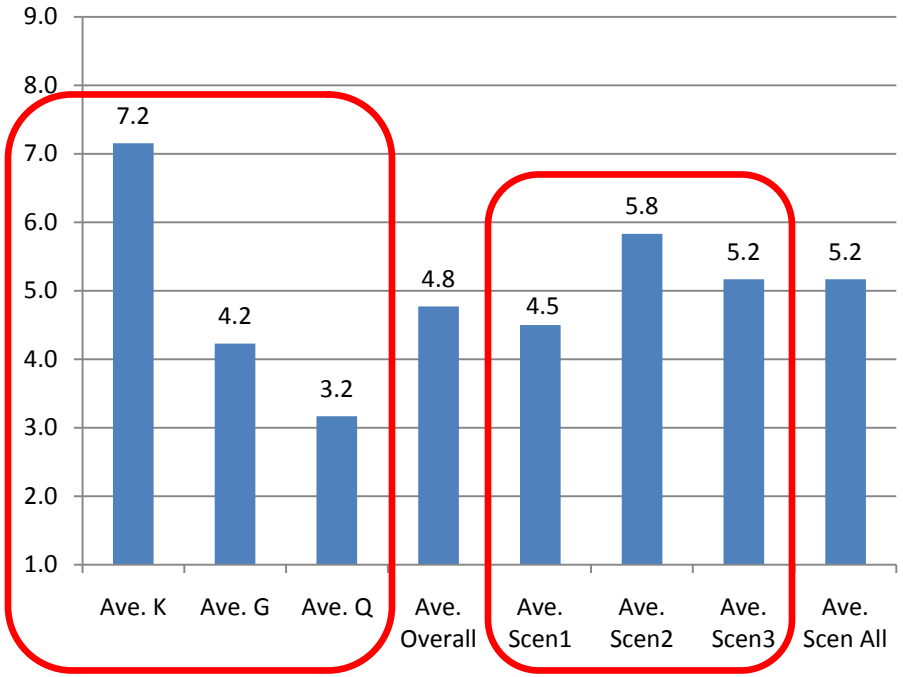


- Overall
- By scenario
- By search engine

The Information School of the University of Washington

- Familiarity with the subject matter (9=high)
  - 1 (aspirin use) = 5.3
  - 2 (privacy plug-ins) = 4.3
  - 3(tour de France) = 4.1
- average difficulty per SE and scenario

  (9=most difficult)



Correctness of results by scenario & by subject group

Scenario	Undergraduates	Graduate Students
1, Aspirin - pros	58%	55%
1, Aspirin - cons	33%	45%
2, Plug-in	8%	36%
3, shipping	8%	18%
3, tours	58%	27%
3, narratives	33%	18%

The Information School of the University of Washington

median perceived satisfaction with the search results and with the search engine

	Undergraduates		Graduate Students	
Perceived Satisfaction	Results	SE	Results	SE
1, Aspirin, google	8.5	9.0	5.5	6.5
1, Aspirin, kartOO	**4.5**	**3.5**	**5.0**	**4.5**
1, Aspirin, quintura	7.5	8.5	7.0	7.0
2, plug-in, google	**6.5**	7.0	3.0	7.0
2, plug-in, kartOO	8.0	**3.5**	**1.0**	**1.0**
2, plug-in, quintura	7.0	6.0	5.5	5.5
3, Tour de F, google	4.5	7.0	5.5	6.5
3, Tour de F, kartOO	**3.0**	**2.0**	**2.0**	**2.0**
3, Tour de F, quintura	6.5	7.0	5.0	5.5

9 point scale, with 1 being not at all satisfied, and 9 being completely satisfied

Do you have any additional comments regarding the search engine?

KartOO

- It doesn't give me any clear indication of actual relevance or the real content of the page to which I would be navigating.
- I'm sorry to say that the "visual" aspect of this search interface doesn't seem helpful...
- It gave me a headache.
- The layout is terrible. You have to search manually through the search results. Not good.
- ...who made that?
- The layout was significantly different than what I'm used to seeing with a search engine. That threw me off for a second, but it was also relatively easy to adjust to the "new" layout style. I liked that the layout was based on graphics, rather than simply text.
- I liked the amoebas. Also, I thought the groupings were helpful in choosing sites.

The Information School of the University of Washington

Do you have any additional comments regarding the search engine?

Quintura

- I did not like it at all. Visually confusing and a ridiculous waste of technology.
- Aside from the cloud on the left, I did not find it noticeably different from Google.
- "cloud" idea is interesting, but no one will use it if the google way is right there.
- The right side of the search engine was similar to google, therefore I felt used to it. the left side was completely diffcult.
- I preferred the dual display of top hits on the right and the graphic display of subject relationships on the left. On the right I had the option of getting directly to sites. On the left, it supported serendipitous exposure to related topics. If I had difficulty articulating my search question, this contextualization of related topics could assist in refining how I phrased my terms.

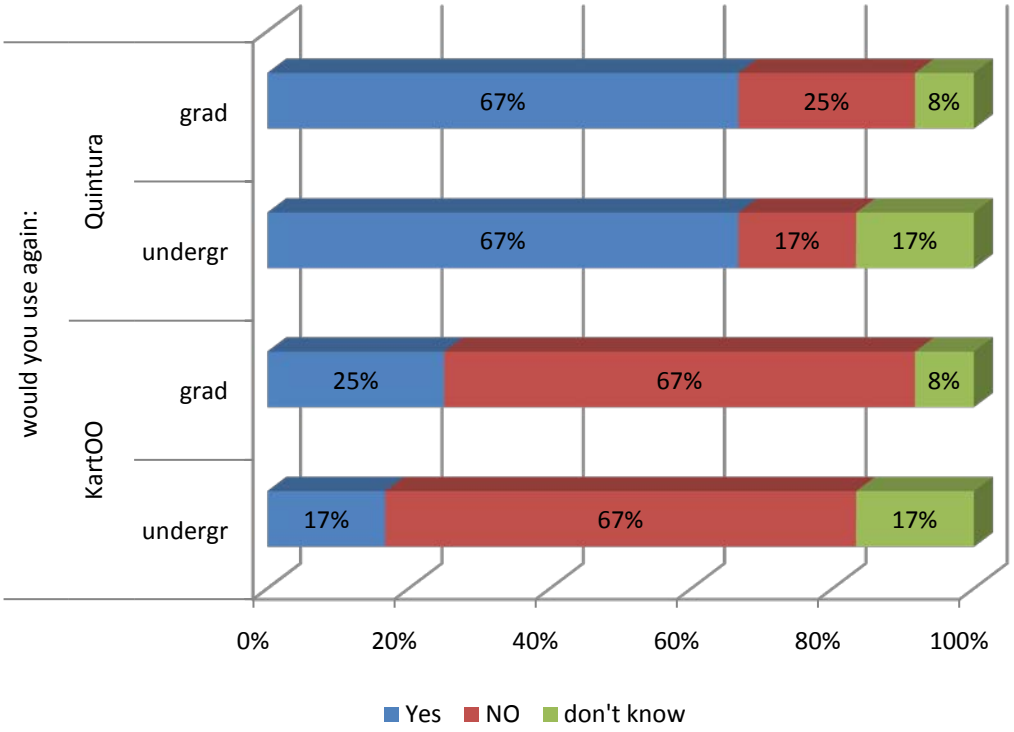
Do you have any additional comments regarding the search engine?

Google

- Even though the search didn't go well, I was still satisfied with it.
- Google is my favorite search engine.
- Typically, I'm very satisfied with Google, but in this case, it was very frustrating.

The Information School of the University of Washington

Would you use K or Q again?



participants had most difficulty with Kartoo,

they felt at home when searching with Google's text-based UI

they opted to use the text-UI of Quintura because of familiarity, and either ignored or criticized the term cloud.

CONCLUDING REMARKS

Visual Search: summary of comments

Searchers had:

- Difficulties interacting with graphical UIs
- Difficulties in understanding what is displayed &
  how to relate the “visualization” to the “text search” they are familiar with
- Increased frustration with search interaction & search results

The Information School of the University of Washington

Questions ???