

User Interfaces in the Digital Library

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HCI in the digital library

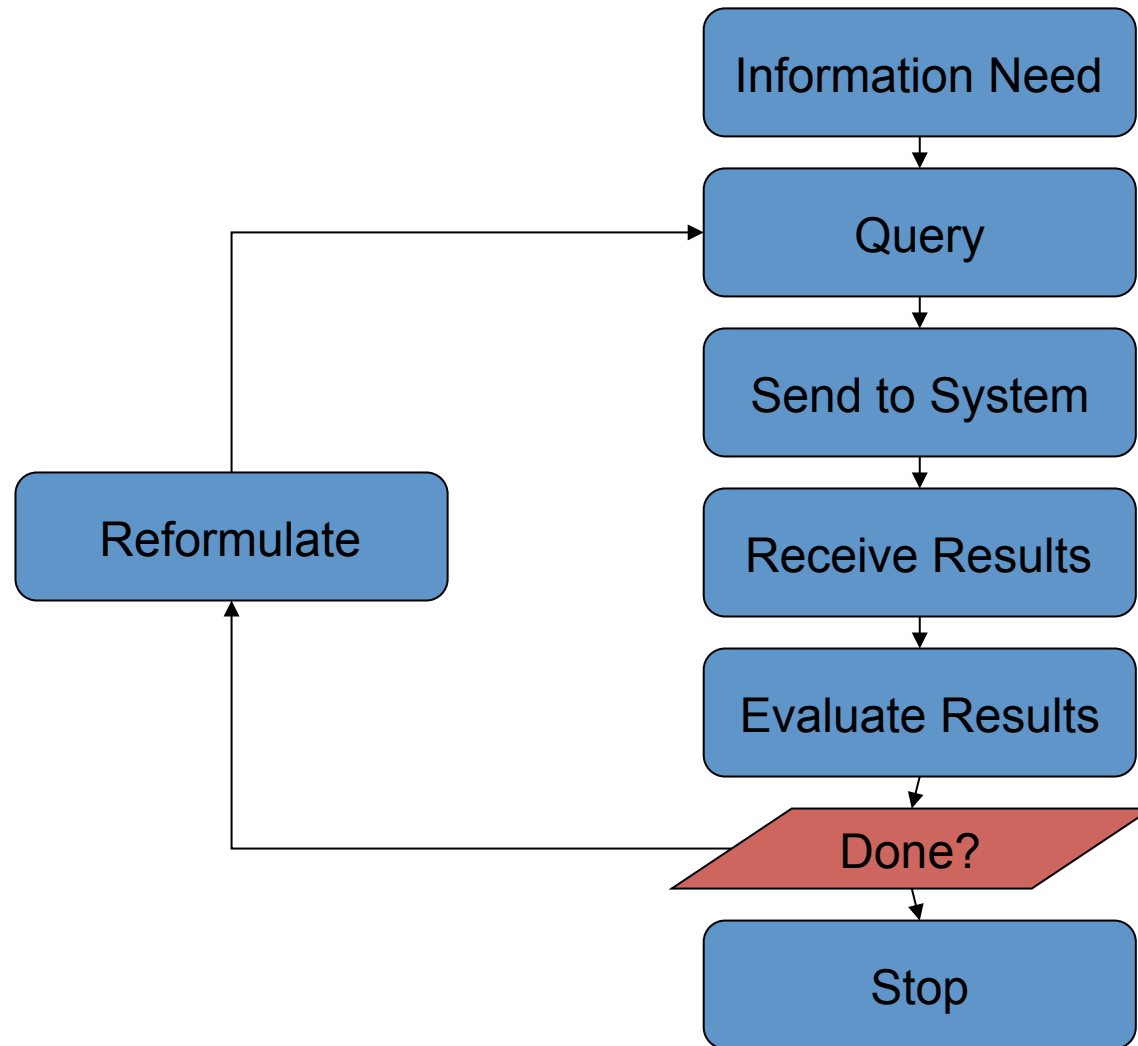
- For digital libraries, it is the means of expediting the information seeking process for a human user

“When an interactive system is well-designed, the interface almost disappears, enabling users to concentrate on their work, exploration and pleasure” – Shneiderman 97

Tenets of HCI

- Offer informative feedback
- Reduce working memory load
- Provide alternative interfaces for novice and expert users

ISP Overview



Evaluating HCI

Subjective

- Ergonomics
- Subjective satisfaction

Objective

- Speed of performance
- Rate of errors
- Time to learn
- Retention over time

Dimensions

- Target Audience
 - Novice vs. Expert
 - Capabilities
- Target Task
- Context / Environment

- In situ vs. Lab environment
- Intrinsic versus Extrinsic

Outline

- Searching
 - Query formulation
 - Displaying results
- Browsing
 - Categories and Hierarchies
- Integrating Frameworks

Query specification

- Old: originated from command line interfaces
 - Suit the system, not the user
 - e.g. “FIND TW Mt St. Helens AND DATE 1981”
- Then: translated for users on OPACs
 - Subject:
 - Date: 1980 – 1985 1986-1990
- Now: graphical means for query specification

VQuery (Jones 98)

The screenshot shows the VQuery interface with a visual query diagram and a list of collections. The diagram consists of several overlapping circles representing terms and their counts:

- lion: 25
- tiger: 16
- Tarzan: 2
- jungle: 10
- elephant: 12
- Jane: 12
- cheetah: 1

The diagram shows the following relationships:

- lion and tiger overlap, with a red dot in their intersection.
- Tarzan and jungle are separate circles.
- elephant and Jane overlap.
- Jane and cheetah overlap.

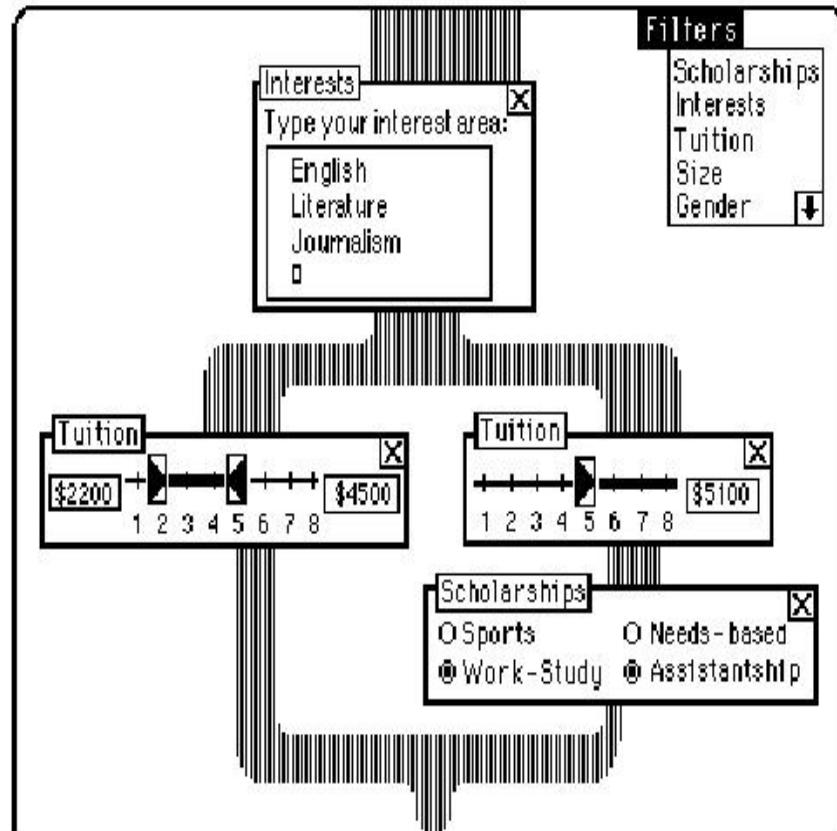
The interface includes a search bar at the top right labeled "Enter new term", a list of collections on the right, and a "Submit Query to NZDL" button at the bottom right. A search result summary is displayed at the bottom left:

Search for any documents in "Oxford Text Archive" containing either lion and tiger ; or jungle ; but not Tarzan

Collections

- Comp Sci Tech. Reports
- MeDoc Collection
- Computists' Communique
- FAQ Archive
- HCI Bibliography
- Indigenous Peoples
- Oxford Text Archive
- Project Gutenberg Collection
- TidBITS

Filter / Flow model



- Users can select from the set of attributes and get an appropriate filter widget
 - (type-in for interest areas, sliders for cost, and buttons for scholarships)
- The widget is placed on the screen with flow lines showing ANDs (sequential flow) and ORs (parallel flows).
- Water flow dynamically indicates relevant # of items

Against a controlled vocabulary

- Lists
 - Seen on last slide from Filter / Flow
 - Only good if limited number of entries
- Partial Fill-in
 - Show possible completions of query terms if under a certain number (~5)
- Re-writing of form fill-in queries
 - Who is the leader of Sudan? →
Who is the head of state of X (Sudan)?

Tiles (Anick et al. 90)

- Use table to represent conjunction and disjunction
 - Conjunction (AND): rows
 - Disjunction: columns
- Use activation to see query preview from index

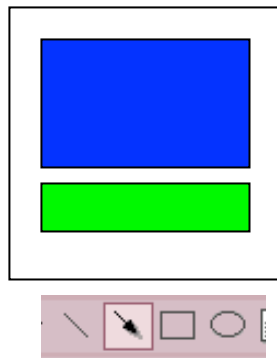
Copy	Backup 313	Saveset 104	From	Tape	Under	V 5.0 344
	Backup Saveset 15			Scratch tape 3		Version 5.0 840
						Version 5

Apply Changes

Display Titles

Query by Example

Query:



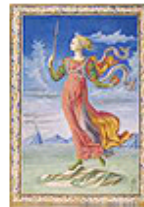
1) Palace in Athens

Klenze, Leo von
1835



2) Allegory o:
Carfhage

Stefano,
Francesco di (
Pesellino)
Circa 1448



3) Allegory of
Rome

Stefano, Francesco
di (Il Pesellino)
Circa 1448



4) Boats at
Saintes-
Maries

Gogh, Vincent
van 1888



5) A Game of
Bowls

Matisse, Henri
1908



6) Lake

Hodler,
Ferdinand
1910-1912s



7) The Top of Etna
from the East.
View from San



8) View of
Lake
Maggiore

- QBIC System
(Flickner et al. 1995)
[http://
www.hermitagemuseum.org/
cgi-bin/db2www/
qbicLayout.mac/qbic?
selLang=English](http://www.hermitagemuseum.org/cgi-bin/db2www/qbicLayout.mac/qbic?selLang=English)

- What's the corollary for text queries?

Faceted Metadata

Faceted objects give rise to easy methods for summarizing the data

- The Flamenco Project

<http://flamenco.sims.berkeley.edu/cgi-bin/flamenco/arts/Flamenco?username=default>

- Facet Map

<http://facetmap.com>

Flamenco Image Search

Media

[aquatint](#) (2025)
[basketry](#) (44)
[book](#) (666)
[ceramic](#) (1008)
[costume](#) (660)
[decorative box](#) (163)
[domestic object](#) (176)
[drawing](#) (2624)
[drypoint](#) (2143)
[etching](#) (9507)
[furnishing](#) (127)
[glass](#) (651)
[more...](#)

Nature

[animal material](#) (515)
[birds](#) (1437)
[bodies of water](#) (3604)
[creatures](#) (801)
[fish](#) (219)
[flowers](#) (1220)
[geological formations](#) (2122)
[heavens](#) (2353)
[hoofed mammals](#) (2480)
[invertebrates and arthropods](#) (330)
[mammals](#) (2116)
[plant material](#) (788)
[more...](#)

Location

[Africa](#) (463)
[Asia](#) (1325)
[Australia](#) (21)
[Central America](#) (134)
[Europe](#) (23331)
[Middle East](#) (78)
[North America](#) (11111)
[Oceania](#) (111)
[Roman Empire](#) (4)
[South America](#) (453)

Places and Spaces

[bridges](#) (592)
[building parts](#) (3088)
[buildings](#) (2393)
[dwellings](#) (1709)
[lawn](#) (20)
[open spaces](#) (1732)
[roads](#) (1480)
[workplaces](#) (753)

Date

[1 - 1000 A.D.](#) (138)
[12th century](#) (3)
[13th century](#) (1)
[14th century](#) (3)
[15th century](#) (76)
[16th century](#) (1225)
[17th century](#) (3058)
[18th century](#) (2287)
[19th century](#) (7552)
[20th - 21th century](#) (18)
[20th century](#) (14295)
[21st century](#) (12)
[more...](#)

People

[aristocrats](#) (974)
[children](#) (2501)
[men](#) (7372)
[occupations](#) (715)
[women](#) (5906)

Shapes, Colors, and Materials

[colors](#) (5861)
[decorations](#) (1441)
[fabrics](#) (345)
[metal](#) (273)
[paper](#) (457)
[shapes](#) (2752)
[visual framing](#) (5911)

Themes

Geographic queries

The screenshot displays a web application interface for youth services. At the top, there are navigation buttons: "Search For Youths", "Word Processor", "Email" (with a notification of 2), and "Phone Book". Below this, a header section provides information for a specific youth: **Bart Simpson**, DOB: 09/25/84, Whereabouts: Greenbelt (H), Charge: NARDP, 11 years old Male, Case Manager: Cindy Ness (410) 324-0191, and medical conditions: Suicide Risk, Diabetic.

The main area features a map of Maryland with several markers: a yellow 'X' for a moratorium, a blue square for a youth home, and several yellow circles for residential and non-residential locations. A legend on the left identifies these symbols. Below the map are buttons for "Show Referral Log" and "Prepare Packet".

On the right side, there is a sidebar with tabs for "Education/Dev.", "General", "Restrictiveness", and "Treatment/Rec.". The "Restrictiveness" tab is active, showing five sliders for different metrics:

- Security:** Slider set to 3 on a scale of 1-9.
- Average Length of Stay:** Slider set to 4 on a scale of 1-5.
- Level of Peer Confrontation:** Slider set to 2 on a scale of 1-3.
- Remoteness/Isolation:** Slider set to 2 on a scale of 1-4.
- Visitation/Leave:** Slider set to 3 on a scale of 1-5.

Each slider has a help icon and a refresh icon. A "Hints" section at the bottom of the sidebar explains that clicking on a slider title displays help and that the vertical line represents the value for the selected facility.

At the bottom left, a "Details" section for the "Donover Youth Center" provides the following information:

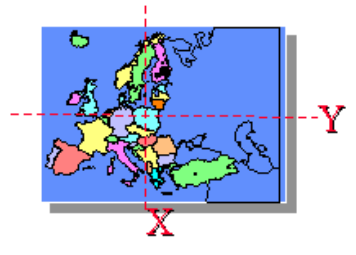
- Name: Donover Youth Center
- Location: 449 Levi St. Tellenston, MD 99401-3949
- Contact: Leonardo Tubbs, Phone: (877) 483-4930
- Type: Drug treatment, DJJ Facility
- On-Ground School: No
- Environment: Rural
- Therapeutic Foster Care: Yes
- MA Approved: Yes
- CON Requested: Yes
- Peer Culture: No

Description: Donover is one of the largest youth centers in the state and it shows. They have huge facilities and human resources but have a reputation for being impersonal from time to time.

- Geospatial data makes the 2 & 3-D visualization a good metaphor

Geospatial queries

1. Point-in-polygon



4. Path

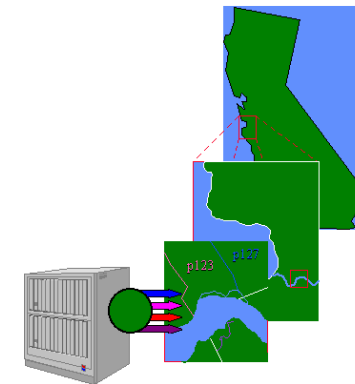
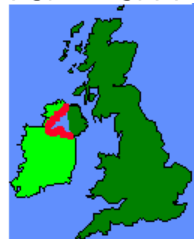


2. Region

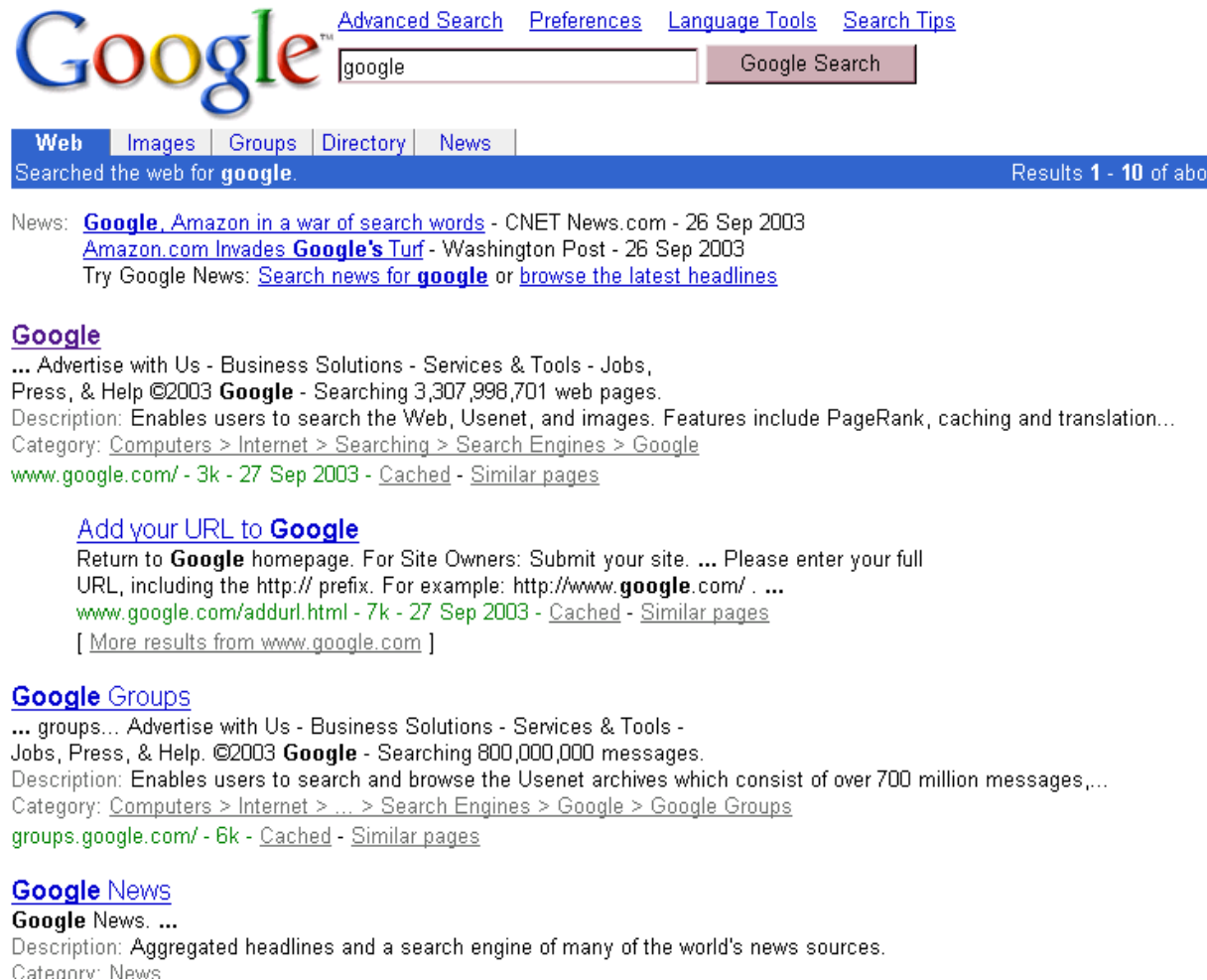


5. Multimedia (QBE)

3. Distance and Buffer Zone



Keyword in Context (KWIC)



The screenshot shows the Google search interface from 2003. The search bar contains the word "google". Below the search bar, there are navigation tabs for "Web", "Images", "Groups", "Directory", and "News". A blue banner indicates "Searched the web for google" and "Results 1 - 10 of abo". The search results include:

- News: [Google, Amazon in a war of search words](#) - CNET News.com - 26 Sep 2003
- [Amazon.com Invades Google's Turf](#) - Washington Post - 26 Sep 2003
- Try Google News: [Search news for google](#) or [browse the latest headlines](#)
- Google**
... Advertise with Us - Business Solutions - Services & Tools - Jobs, Press, & Help ©2003 **Google** - Searching 3,307,998,701 web pages.
Description: Enables users to search the Web, Usenet, and images. Features include PageRank, caching and translation...
Category: [Computers](#) > [Internet](#) > [Searching](#) > [Search Engines](#) > [Google](#)
[www.google.com/](#) - 3k - 27 Sep 2003 - [Cached](#) - [Similar pages](#)

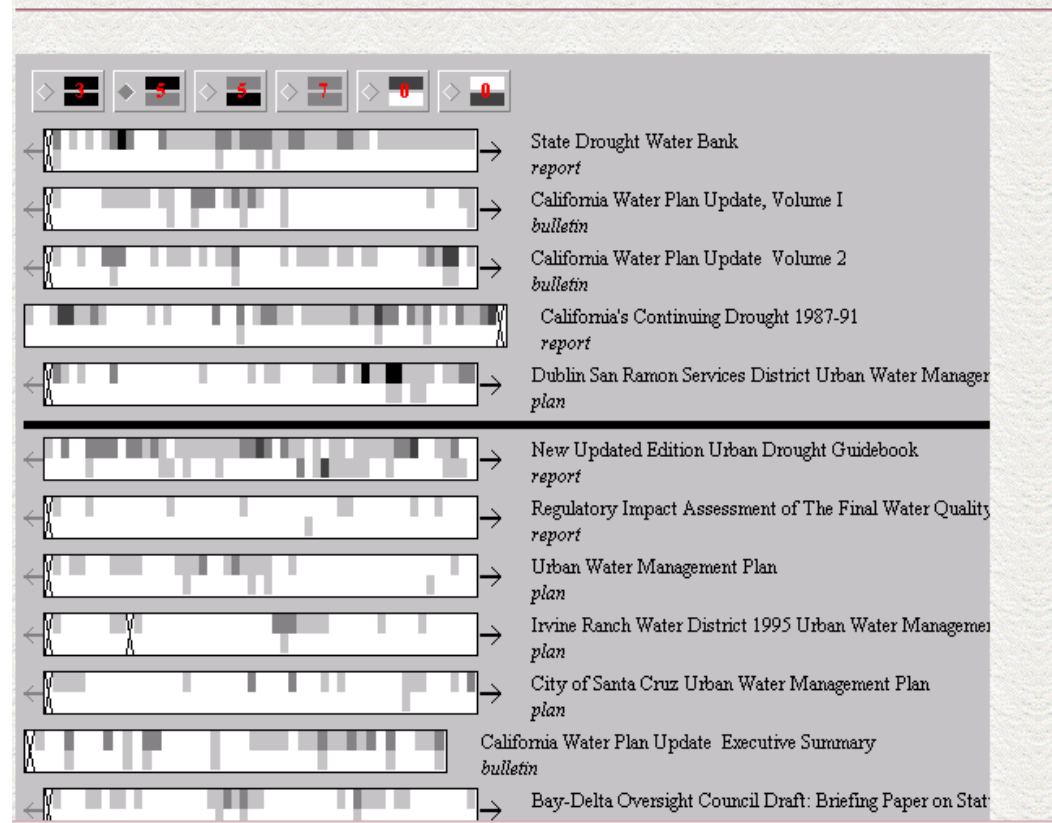
[Add your URL to Google](#)
Return to **Google** homepage. For Site Owners: Submit your site. ... Please enter your full URL, including the http:// prefix. For example: [http://www.google.com/](#)
[www.google.com/addurl.html](#) - 7k - 27 Sep 2003 - [Cached](#) - [Similar pages](#)
[[More results from www.google.com](#)]
- Google Groups**
... groups... Advertise with Us - Business Solutions - Services & Tools - Jobs, Press, & Help. ©2003 **Google** - Searching 800,000,000 messages.
Description: Enables users to search and browse the Usenet archives which consist of over 700 million messages,...
Category: [Computers](#) > [Internet](#) > ... > [Search Engines](#) > [Google](#) > [Google Groups](#)
[groups.google.com/](#) - 6k - [Cached](#) - [Similar pages](#)
- Google News**
Google News. ...
Description: Aggregated headlines and a search engine of many of the world's news sources.
Category: News

Differentiate
Keyword in Context
versus
Query Word in Context

- QWIC: query based
- KWIC: any keyword
(can be from metadata)

Tilebars (Hearst 95)

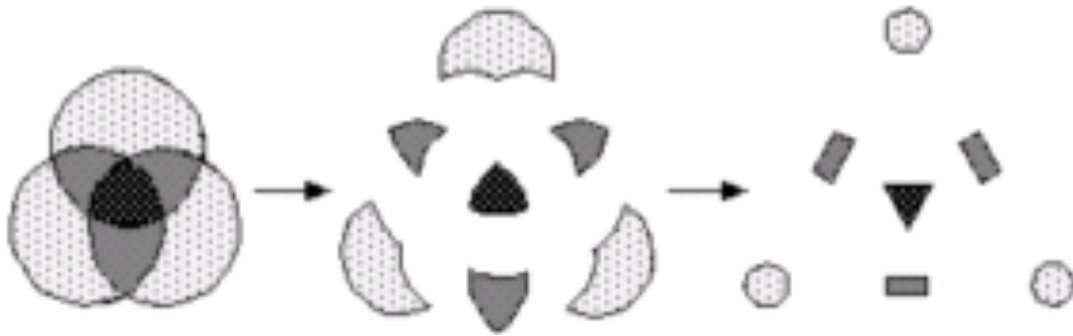
Topic_1: "drought"
Topic_2: "ration"
was submitted to the UC Berkeley Digital Library Database where 187 matching records were found shown in the tilebars display below.



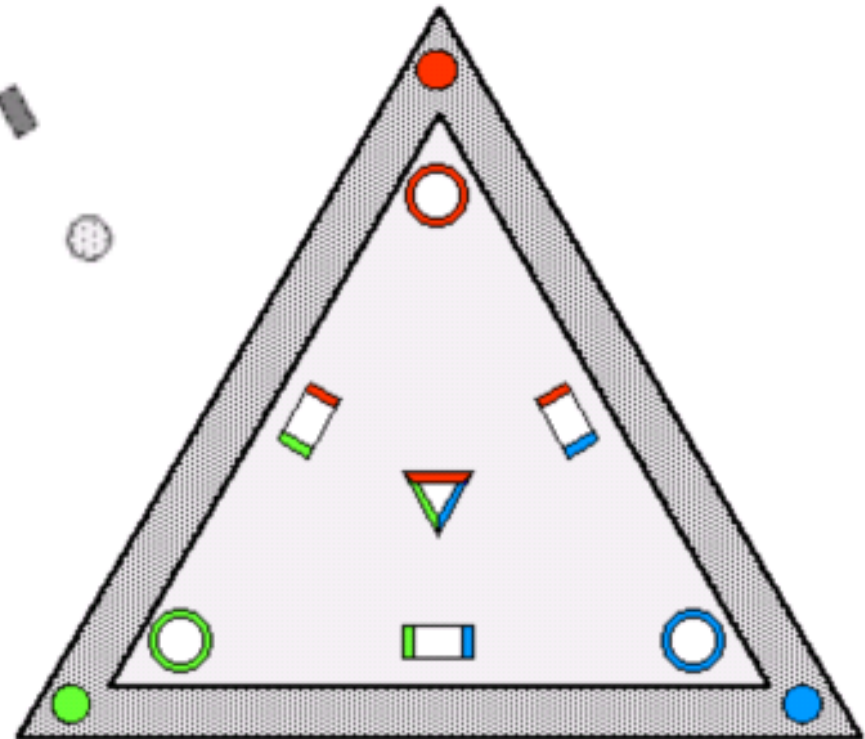
- Each row represents a topic (conjunction)
- The darkness of each tile in a row represent the frequency of occurrence of an item

Infocrystal (Spoerri 95)

- Explosion of the Venn Diagram



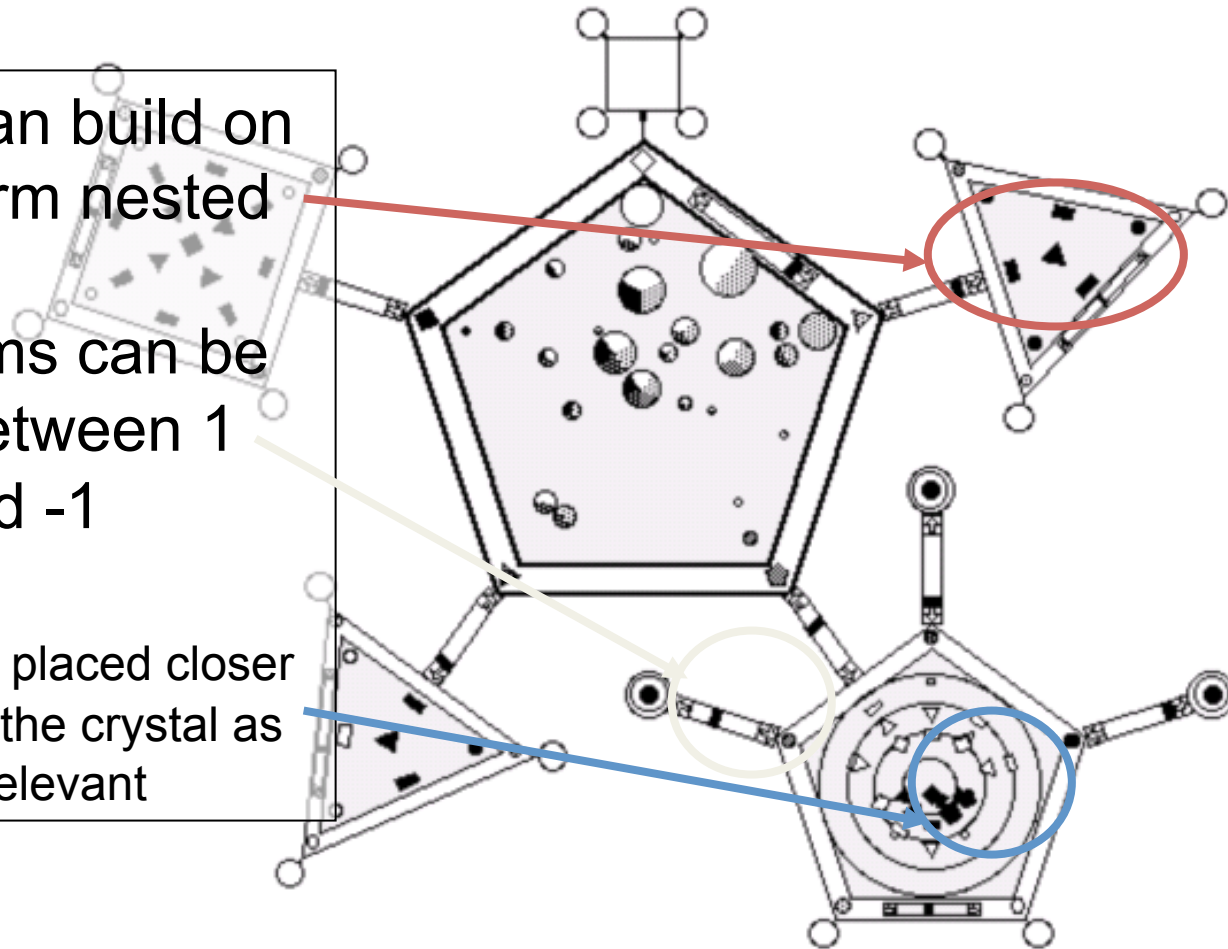
- Uses shape and color to model to organize results



More on Infocrystal

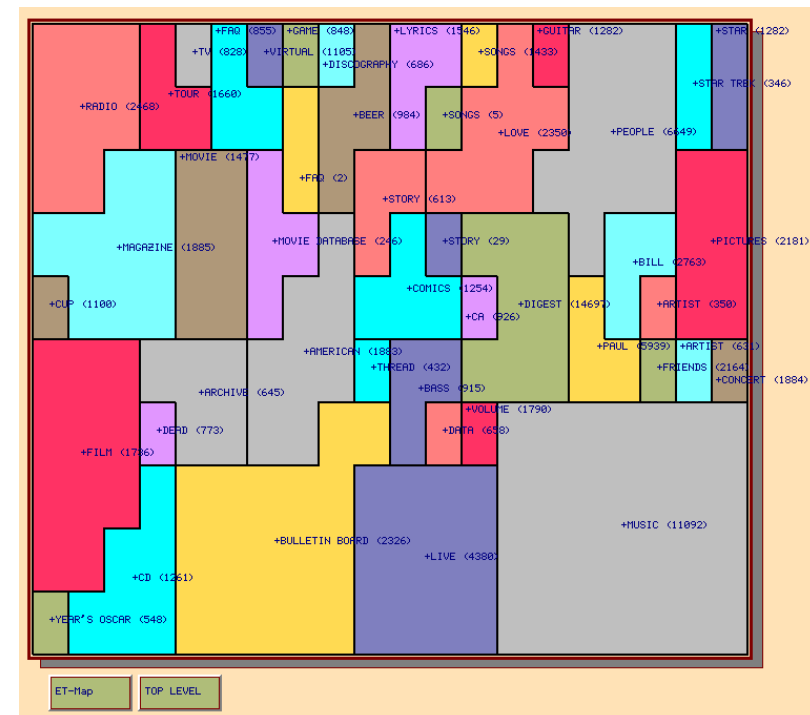
How to create **Nested Queries**?

- Queries can build on others to form nested queries
- Query terms can be weighted between 1 (default) and -1 (logical not)
- The icons are placed closer to the center of the crystal as they are more relevant

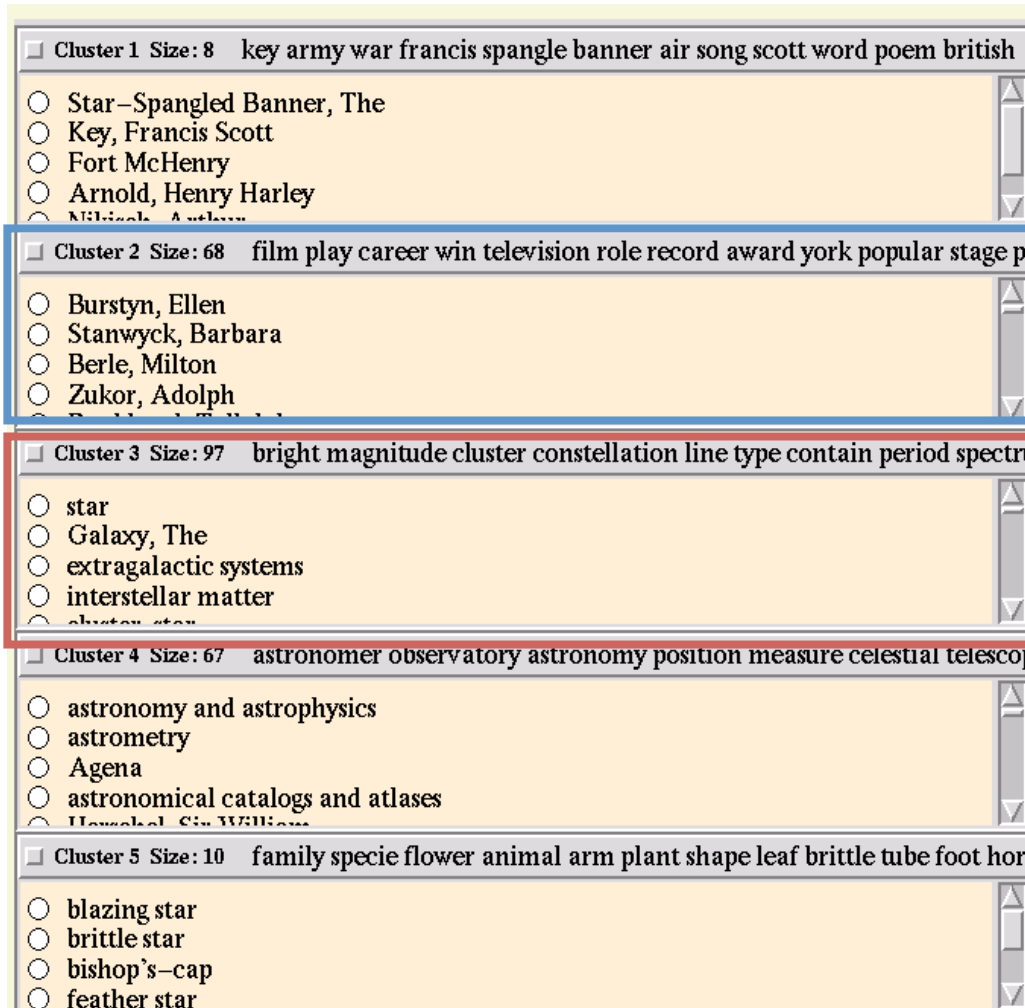


Cartographic Representations

- X and Y dimensions need to connote some real value for users
- Arbitrary use of X,Y plane usually not a good idea, especially if values aren't replicable.



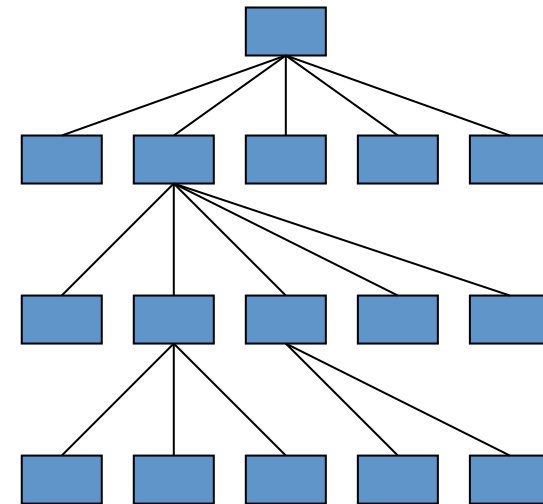
Scatter / Gather



Gradual refinement by selection of clusters:

Gather: select cluster(s)
(relevance feedback)

Scatter: throw them into bins using automatic clustering



Scatter / Gather

Second cluster: stars (of Broadway)

Third cluster: stars (as heavenly objects)

- Musial, Stan
- Bench, Johnny
- Carew, Rod
- Robertson, Oscar
- Beliveau, Jean
- Casper, Billy
- Chinese checkers
- Best, George
- Beamon, Bob

Cluster 2 Size: 47 role stage broadway comedy performance

- Burstyn, Ellen
- Stanwyck, Barbara
- Berle, Milton
- Bankhead, Tallulah
- Murphy, Eddie
- Walsh, Raoul
- Martin, Mary
- Zukor, Adolph
- Cosby, Bill

Cluster 3 Size: 7 music country jazz folk pop paul cowboy lea

- Williams, Hank
- Crosby, Bing
- Campbell, Glen
- Belafonte, Harry
- Shore, Dinah
- Denver, John
- Hampton, Lionel

Cluster 1 Size: 12 black white nuclear hole reaction helium neutron gravitational colla

- stellar evolution
- gravitational collapse
- black hole
- main sequence
- carbon cycle
- mass-luminosity relation

Cluster 2 Size: 49 galaxy type distance stellar variable spectral interstellar brightness ga

- star
- extragalactic systems
- Galaxy, The
- interstellar matter
- cluster, star
- population, stellar

Cluster 3 Size: 29 constellation northern hemisphere sky locate dipper celestial double r

- constellation (astronomy)
- Auriga
- Big Dipper
- Cassiopeia
- Cygnus
- Taurus

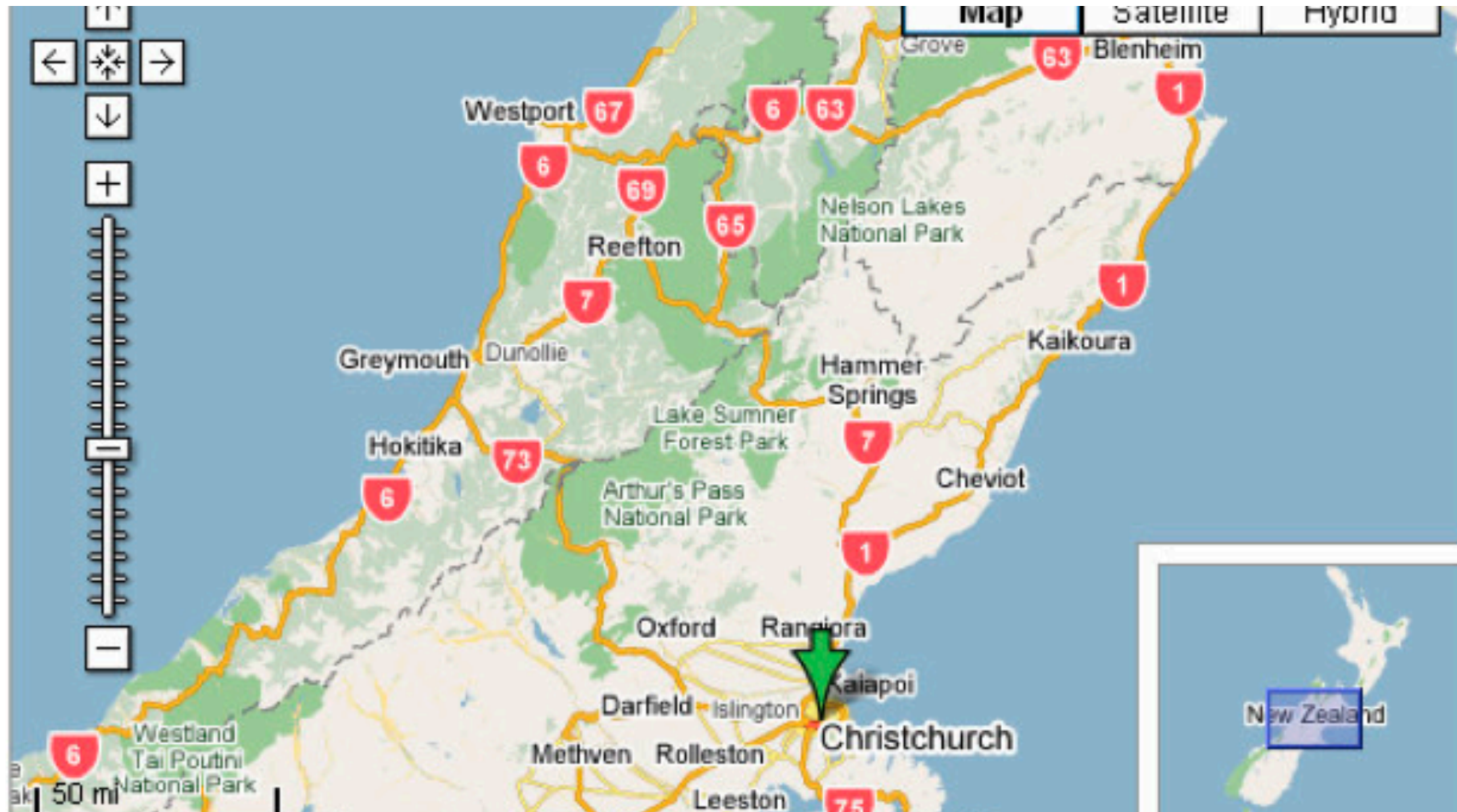
Cluster 4 Size: 7 fraunhofer designate map joseph frown fur wollaston english von davi

The results display: “The big with the small”

- Overview + Details
- Focus + Context
- Magic Lenses
- Zoom / Pan
- Cue Techniques

- Brushing and Linking
- Searching with Browsing

Overview + Details



Superbook

- Searching a software technical manual
- Use a expandable table of contents to show results
- Shows hits within each level as query preview
- Closely modeled by browser in Windows Explorer

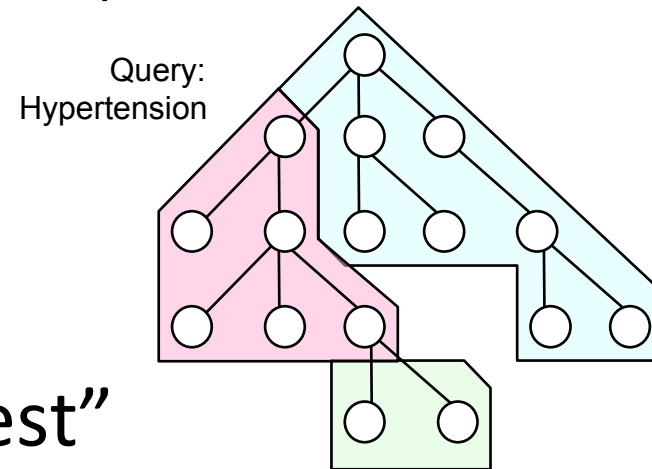
- **12** An Interactive Environment
 - **10** Preface
 - **1** How to Beat the Lottery
 - **1** Tutorial Introduction to
 - **7** Graphical Methods in S
 - **2** Loading in Data
 - ...
 - **3** Building Plots
 - **2** Specialized Plots
 - **2** Advanced Use of S
 - **2** Appendix I

Summarization atop IR

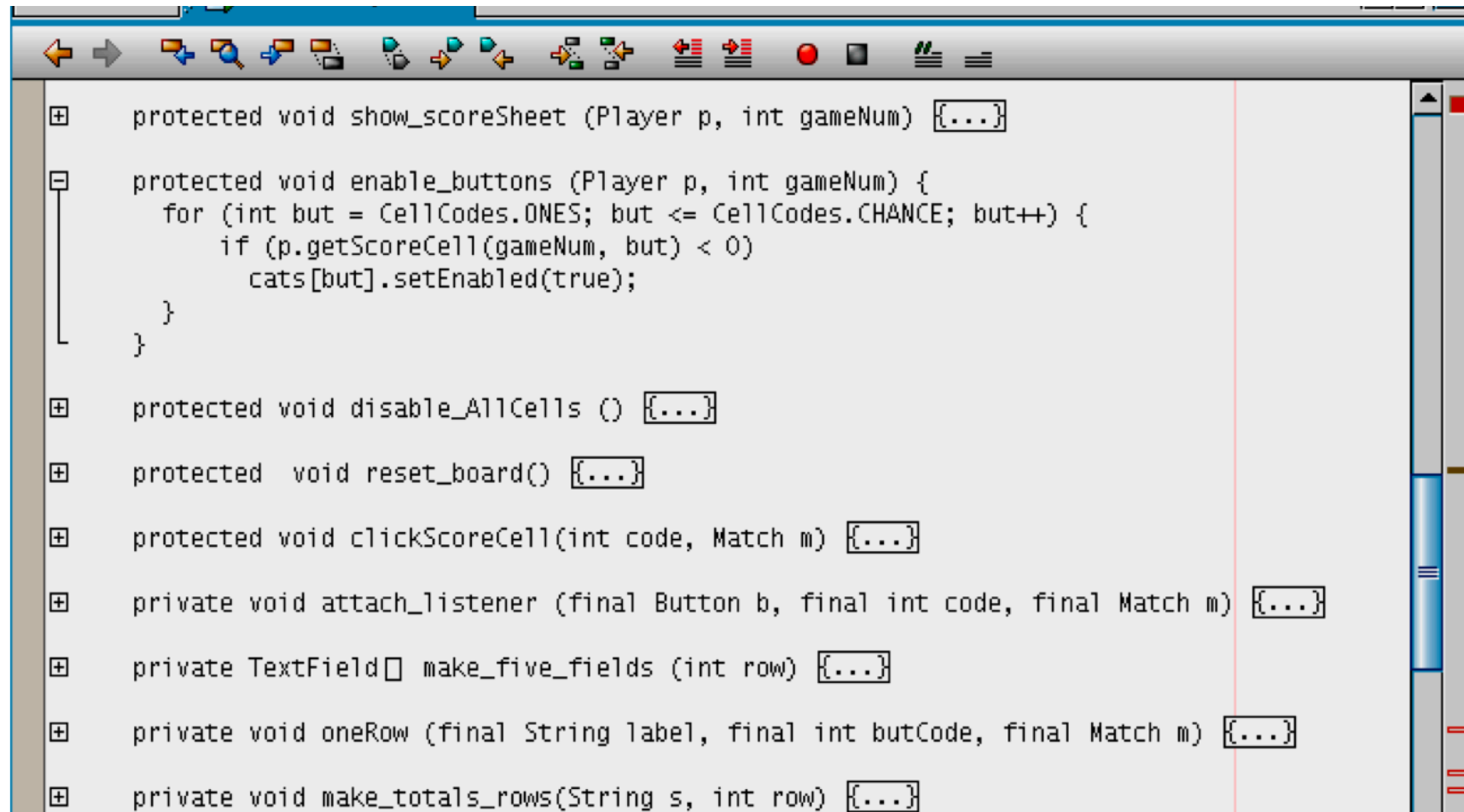
- Like Superbook, but trades focus for extractive summary (Kan et al. 02)

- **Relevant**: information for summary
- **Irrelevant**: too broad or not on topic, for broader queries
- **Intricate**: too detailed, for follow-ups

- Furnas' "Degree of Interest"



Focus + Context in NetBeans IDE



```
protected void show_scoreSheet (Player p, int gameNum) {...}

protected void enable_buttons (Player p, int gameNum) {
    for (int but = CellCodes.ONES; but <= CellCodes.CHANCE; but++) {
        if (p.getScoreCell(gameNum, but) < 0)
            cats[but].setEnabled(true);
    }
}

protected void disable_AllCells () {...}

protected void reset_board() {...}

protected void clickScoreCell(int code, Match m) {...}

private void attach_listener (final Button b, final int code, final Match m) {...}

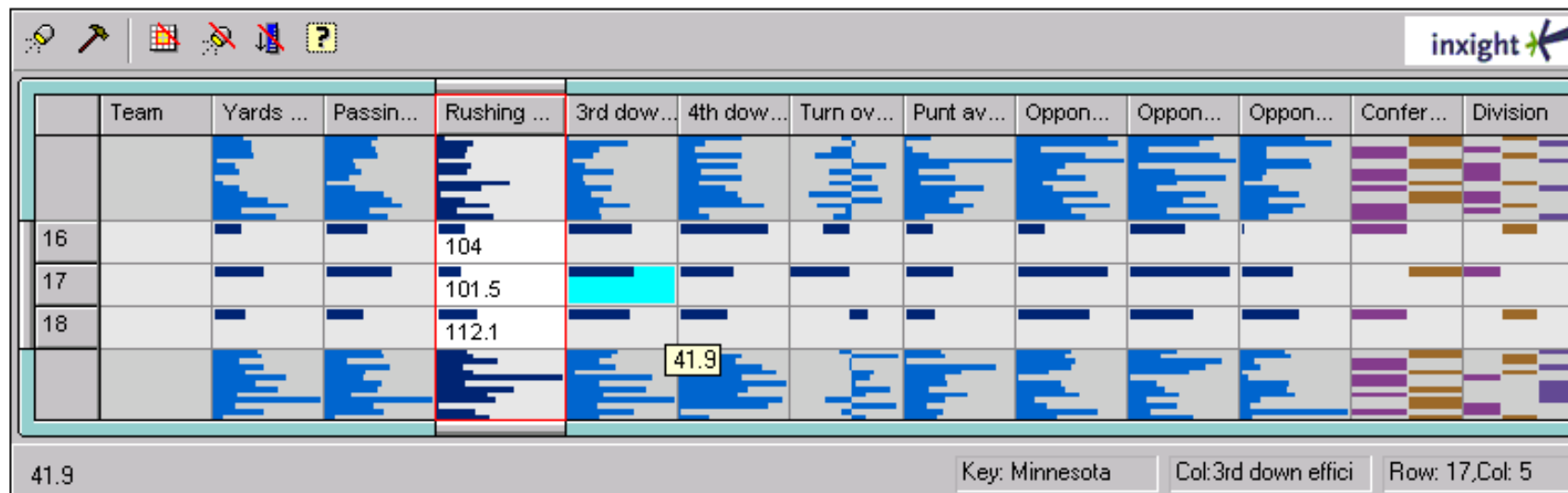
private TextField[] make_five_fields (int row) {...}

private void oneRow (final String label, final int butCode, final Match m) {...}

private void make_totals_rows(String s, int row) {...}
```

Tablelens (InXight)

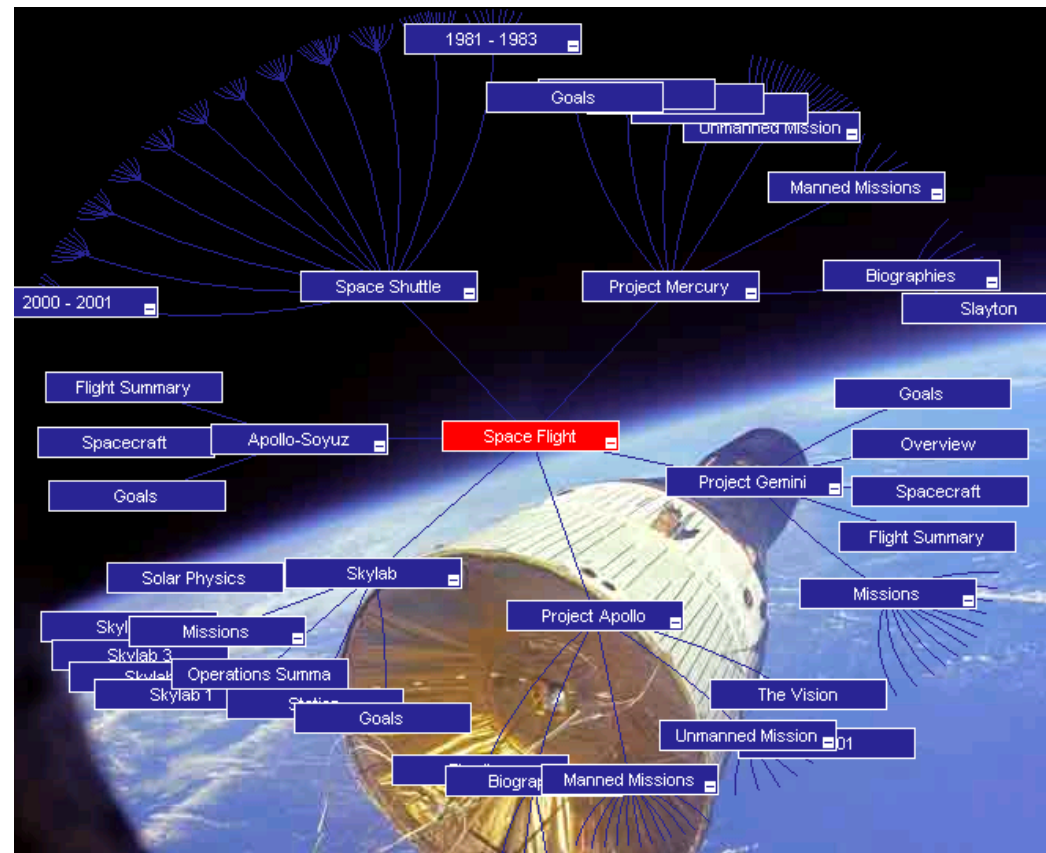
- <http://www.inxight.com/products/sdks/tl/>
- Focus + context to give fisheye distortion to table rows and values



Visualizing Hierarchies

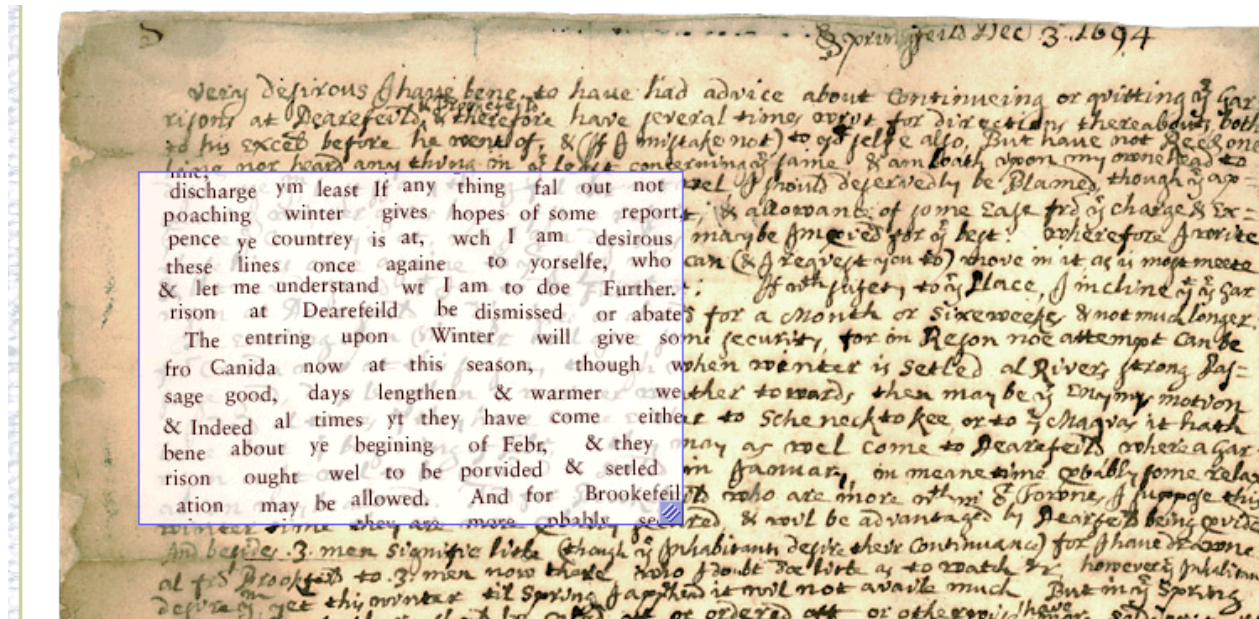
- Fisheye zoom
(Furnas 84)
- One implementation:
Inxight's StarTree

— [http://
www.lexisnexis.com/
startree/
interactiveview.asp](http://www.lexisnexis.com/startree/interactiveview.asp)

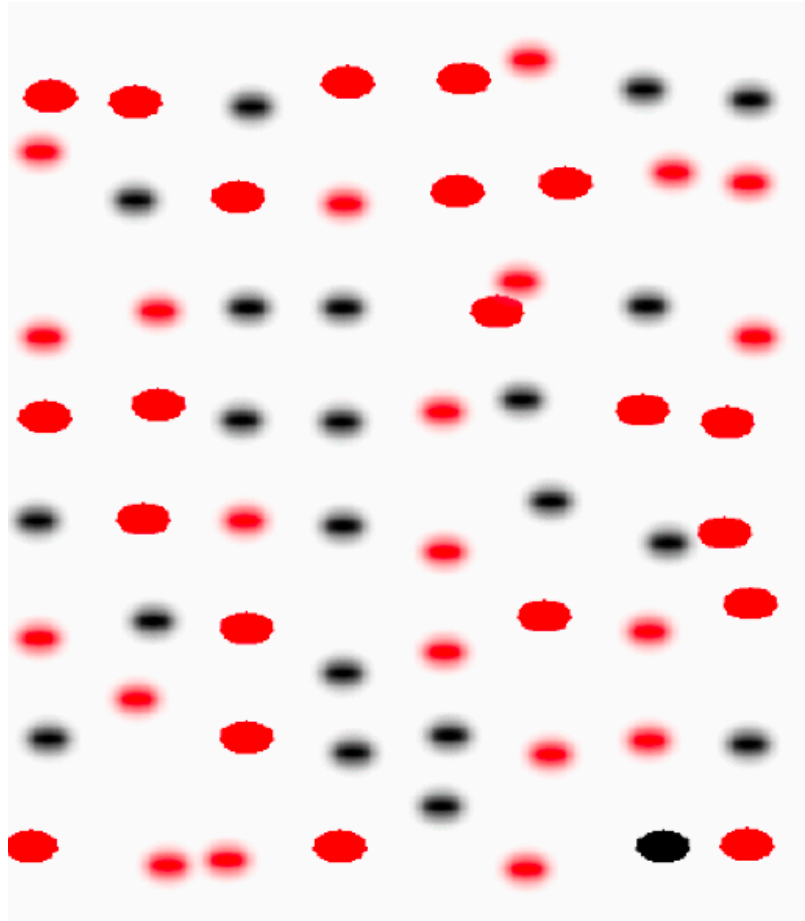


Multiviews via Magic Lenses

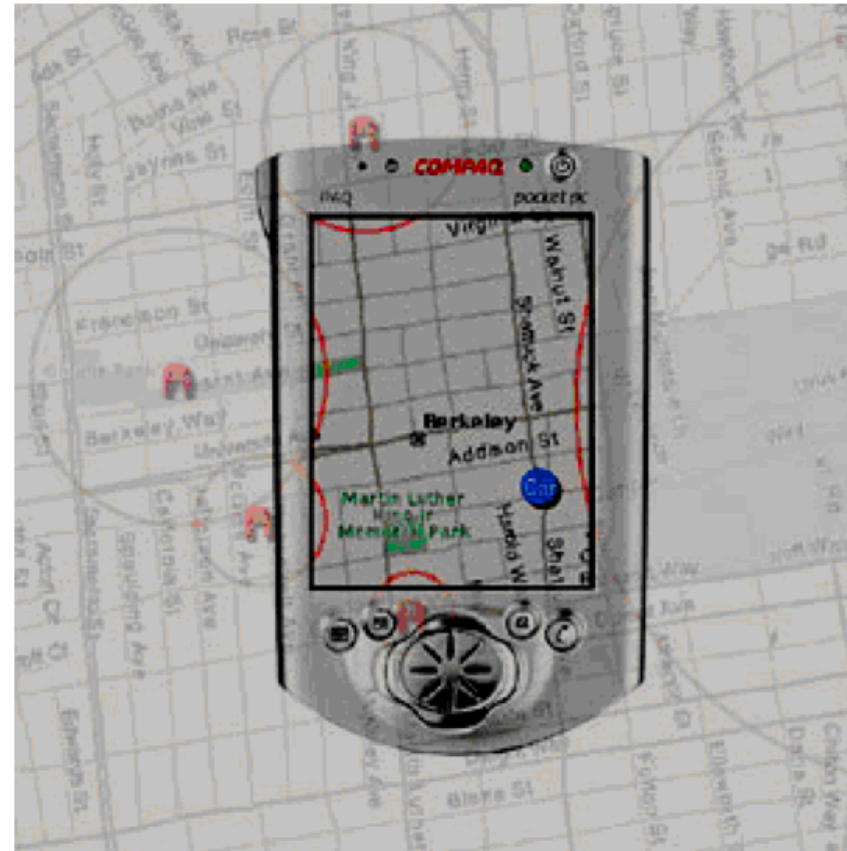
- More than two views of the same space
- Lenses show and hide information that isn't pertinent
- Has been applied in query focusing as well
- Demo: <http://www.memorialhall.mass.edu/activities/media.jsp?itemid=15414&img=0>



Contextual Cues



Depth



Window Decoration

Flamenco Image Search

Multiple Hierarchies: Faceted Queries

Refine your search further within these categories:

Media [\(group results\)](#)

[costume](#) (4), [domestic object](#) (1), [drawing](#) (136), [lithograph](#) (1), [metalwork](#) (1), [print](#) (1)

Location: [all](#) > [Asia](#) > [India](#) [\(group results\)](#)

[Assam, Nagaland](#) (1), [Company School](#) (6), [Deccan \(Maharatha\) School](#) (1), [Deccan School?](#) (1), [Deccan/Hyderabad](#) (1), [Gujarat](#) (3), [Jain School](#) (1), [Kashmir School](#) (15), [Kashmir School \(Afghan?\)](#) (1), [Kashmir School?](#) (1), [more...](#)

Date [\(group results\)](#)

[1 - 1000 A.D.](#) (1), [13th century](#) (1), [15th century](#) (1), [16th century](#) (2), [17th century](#) (12), [18th century](#) (49), [19th century](#) (53), [20th century](#) (3), [date ranges spanning multiple centuries](#) (9), [date unknown](#) (17)

Themes [\(group results\)](#)

[military](#) (30), [mortality](#) (2), [music, writing, and sport](#) (47), [nautical](#) (4), [religion](#) (42)

Objects

[clothing](#) (15), [containers](#) (4), [food](#) (6), [fuel](#) (1), [furnishings](#) (11), [jewelry and riches](#) (3), [lighting](#) (1), [timepieces](#) (1), [vehicles](#) (3), [wares](#) (1)

Nature [\(group results\)](#)

[animal material](#) (6), [birds](#) (18), [bodies of water](#) (14), [creatures](#) (6), [fish](#) (2), [flowers](#) (9), [geological formations](#) (17), [heavens](#) (3),

These terms define your current search. Click the to remove a term.

Location: [Asia](#) > [India](#)

[start a new search](#)

Search



all items



within current results

148 items (grouped by objects)

[view ungrouped items](#)

clothing ¹⁵



A Lady at a Shrine
Anonymous
19th century



A Man Greet a P...
Anonymous
circa 1775



A Young Hill Raj...
Eden
circa 1836 - 1841



Divan Garah Singh
Anonymous
circa 1750 - 1780



Durga
Anonymous
circa 1800



Durga Killing a ...
Anonymous
circa 1770 - 1775



Ganesh and an At...
Anonymous
late 18th century



Hat
no artist
early 20th century



Additional notes on faceted interface

- **Multiple interfaces possible**

- Columnar style
- Drop down list style
- Indented ancestors

Features

- Gives partial results
- Gives multiple filters at once
- A selection drops non-matching items from results
- Allows users to define most useful criteria
- In UI, only show fields that address audience

The screenshot shows the FacetMap web application interface. At the top, there is a navigation bar with links for Home, About, and Contact. Below this, there are options to switch presentation style (COLUMNAR, YAHOO! STYLE, DROP-DOWN, XML DATA) and a sign-up form for receiving announcements. The main content area displays a list of selected headings: '> Any Varietal', '> The World', and '> \$0 through \$1000'. Each heading has a corresponding filter control: 'Limit Varietal to:', 'Limit Region to:', and 'Limit Price to:'. There is also a 'Set' button and a field for 'or select value: [] through []'. Below the filters, a message states 'You've narrowed your search down to 19 results. Here are the top 10.' followed by a list of wine products: Delaforce 1977 Vintage Port, Delaforce 1994 Vintage Port, Delaforce 1995 Quinta Da Corte, Croft 1983 Quinta Da Roeda, Cockburn Fine Ruby, Cockburn Fine Tawny, Cockburn 10 year-old Tawny, Cockburn 20 year old Tawny, Cockburn NV Special Reserve, and Cockburn 1995 Anno Late Bottled Port.

Conclusions

- Systems show more advanced text, graphics, and animation but some are not evaluated
- Tighter integration in query and display
- Simultaneous browsing and searching support at all levels
- Display attributes dictate useful alternatives
 - To think about: mobile applications, newer UI technologies

To think about

- What types of information do these various UI need to calculate at run-time and what types can be pre-computed?
- How do these UI support the tenets we mentioned at the beginning?
- Do you feel that HTML / WWW has enhanced UI design or deterred its creativity?
- For images and audio:
 - When is query by example a useful technique and when is it inferior to a search using metadata?