Human-Computer Information Retrieval: Finding and Understanding What We Need

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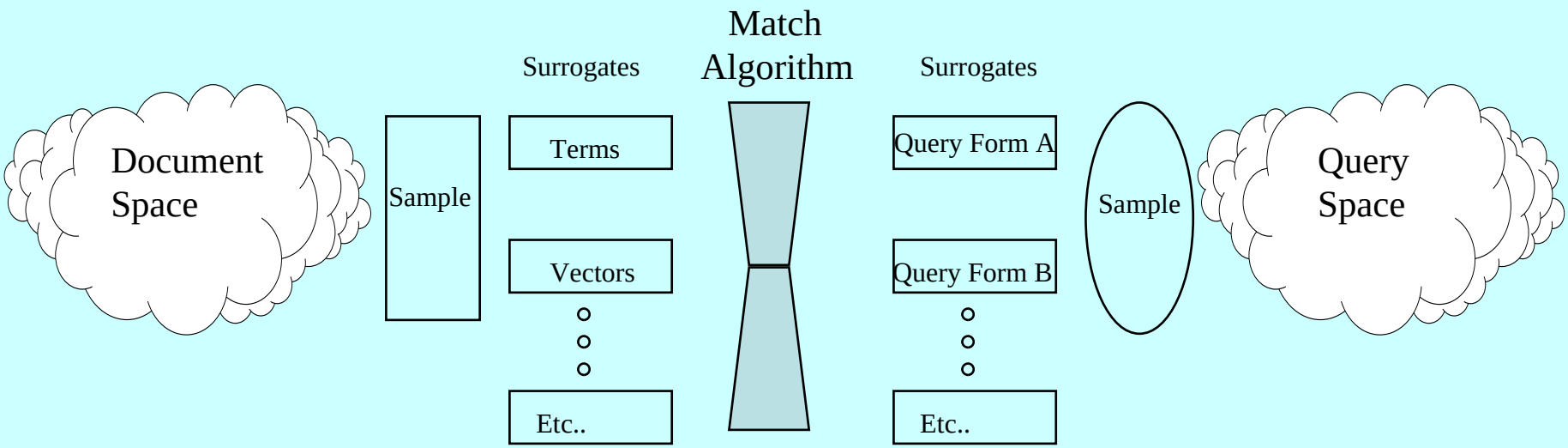
Message

- HCI and IR are related fields that have strong (staid?) traditions that have been energized (jolted?) by WWW.
- The intersection of these fields offers interesting new opportunities for high-impact R&D
- Integrating the human and system interaction is the main design challenge: syminforosis—people continuously engaged with meaningful information

Outline

- IR and the WWW
- HCI and the WWW
- HCIR rooted in system development
- Examples
  - Open Video
  - Relation Browser
- Challenges and Opportunities

Content-Centered Retrieval as Matching Document Representations to Query Representations



A powerful paradigm that has driven IR R&D for half a century.
Evaluation metric is effectiveness of the match. (e.g., recall and precision).

Content Trend

- Content Features (queries too)
  - Not only text
    - Statistics, images, music, code, streams, biochemical
  - Multimedia, multilingual
  - Dynamic
    - Temporal (e,g., blogs, wikis, sensor streams)
    - Conditional (e.g., computed links, recommendations)
- Content Relationships
  - Hyperlinks, new metadata, aggregations
  - Digital Libraries, personal collections
- Content acquires history

Responses to Content Trend

- Link analysis
- Multiple sources of evidence (fusion)
  - Authors' words (e.g., full text IR)
  - Indexer/abstractor words (e.g., OPACs)
  - Authors' citations/links (e.g., ISI, Google)
  - Readers' search paths (e.g., recommenders, opinion miners)
  - Machine generated features and relationships
- Two key challenges:
  - What new relationships can we leverage (human and machine)?
  - How can we integrate multiple sources of evidence?

Installed User Base Trend

- Technical advances and technical literacy allows us to leverage information seeker intelligence
  - Rather than sole dependence on matching algorithms, focus on flow of representations and actions in situ as people think **with** these new tools and information resources
- Web and TV remotes have legitimized browsing as human-controlled information seeking
- To leverage human intelligence and effort, people must assume responsibilities: beyond the two-word, single query
- Aim at understanding rather than retrieval

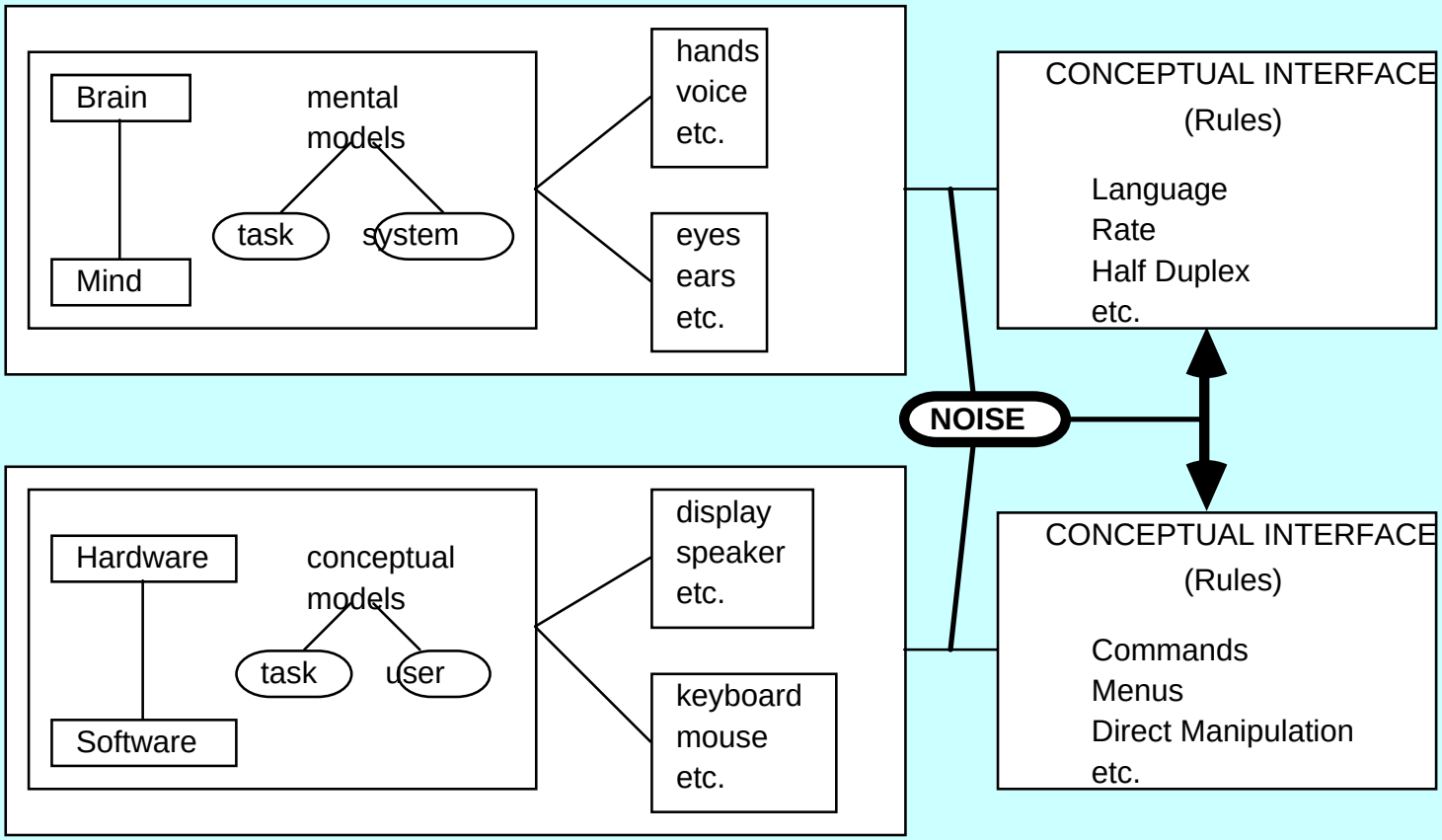
Responses to People Trend

- Adapt techniques to WWW
  - Relevance feedback
  - Query expansion
  - User modeling/profiles, SDI services
- Recommender systems
  - Explicit and implicit models
- Capture everything (e.g., Lifebits)
- User Interfaces
  - Dynamic queries
  - Agile views

An Expanded Model:

Think of IR from the perspective of an active human with information ***needs***, information ***skills***, powerful IR ***resources***, and situated in global and local connected ***communities***, all of which ***evolve*** over time

Human-Computer Communication
Model of HCI



A user-oriented model that has driven R&D. Evaluation based on user time, accuracy, and satisfaction.

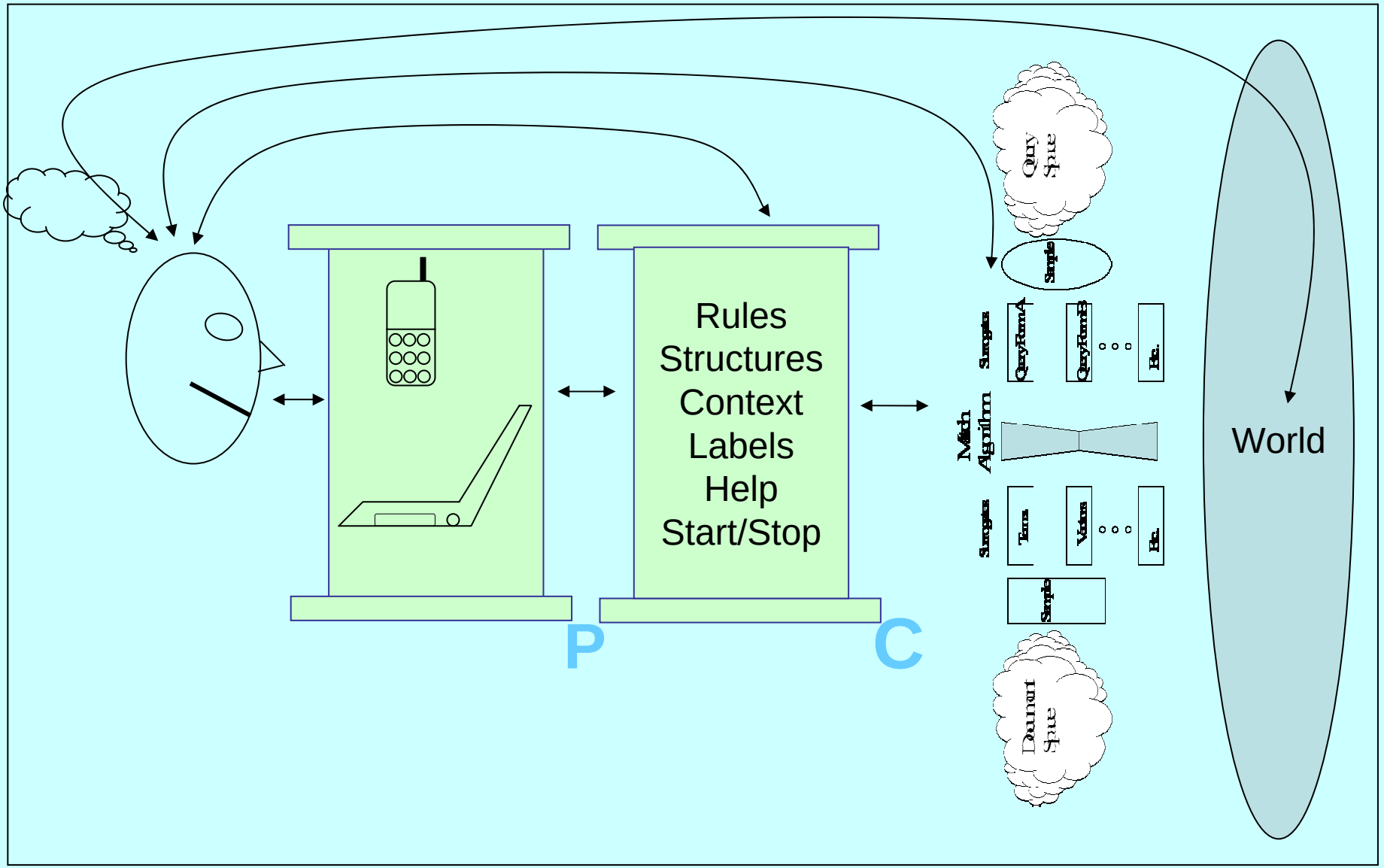
HCI WWW Trends

- First decade of WWW as great equalizer (we all get impoverished, but we admit MANY more people)
- Universal access
- Platform independence (lots of devices)
- Enhanced browsers, specialized browsers
- Interface Servers
- Social awareness (user is not alone)

HCIR

- Trend toward getting people closer to the information they need
  - Closer to the backend
  - Closer to the meaning
- Increasing responsibility as well as control
- More demanding and knowledgeable installed base
- Ubiquity, digital libraries, e-commerce as extended memories and tools (personal and shared)

HCIR: Bringing User Closer to World



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Key Challenges

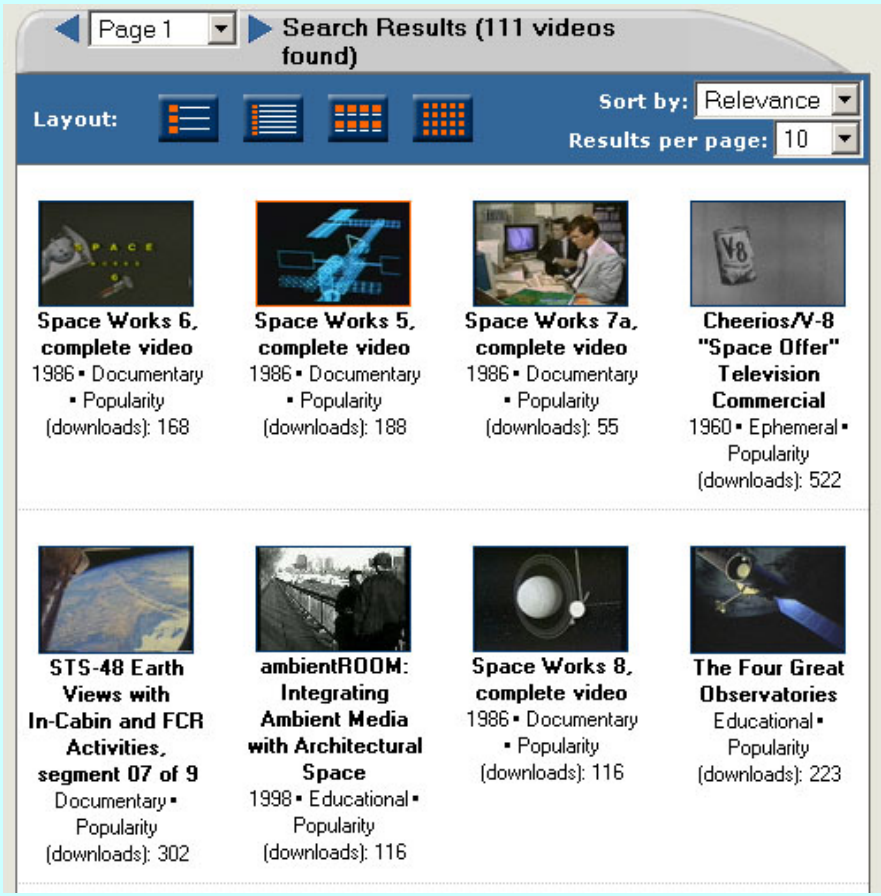
- Linking conceptual interface to system backend
  - metadata generation
  - alternative representations and control mechanisms
- Raising user literacy and involvement
  - Engaging without insulting or annoying
- Moving beyond retrieval to understanding
  - context

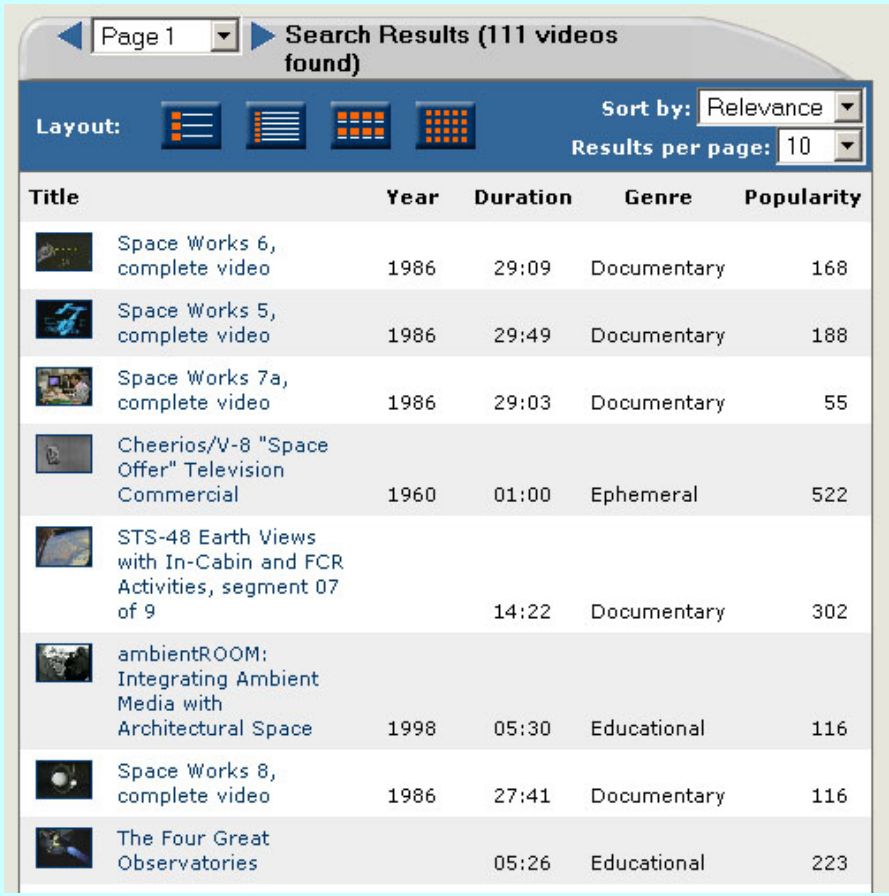
Two examples of getting people involved in continuous decision making and interaction with information resources: dynamic queries and the agile views interaction framework instantiated in Open Video and Relation Browser

Open Video Example
www.open-video.org

- Open access digital library of digital video for education and research
- 2000+ video segments: MPEG1, MPEG-2, MPEG-4, QuickTime
- Multiple visual surrogates
- Agile Views Design Framework
  - Different types of views
    - Overviews, previews, shared views
  - Multiple examples of views
  - Dynamic control mechanisms

Alternative Overviews of Result Sets





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Alternative Previews for a Specific Video Segment

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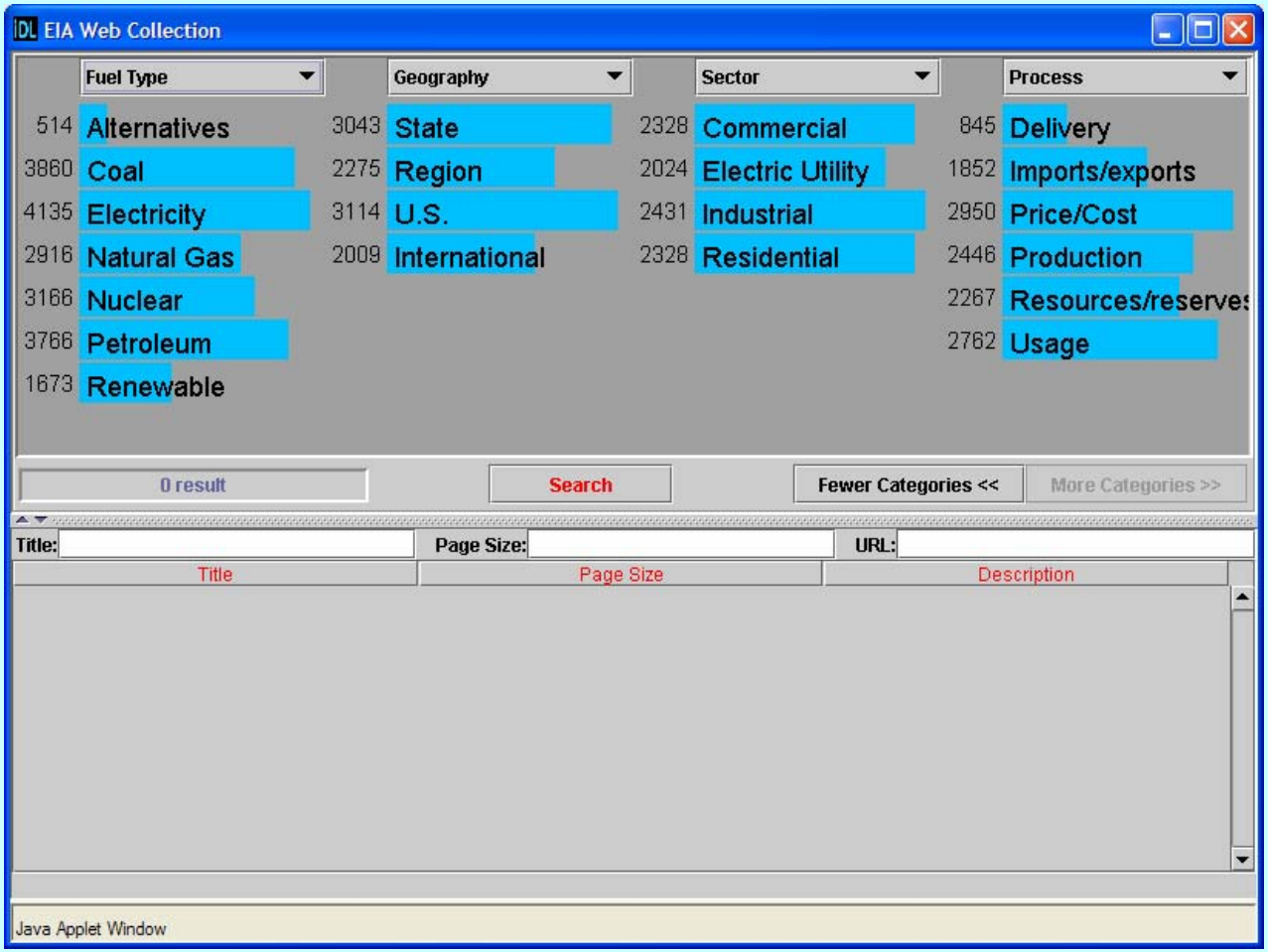
Relation Browser Example
www.idl.ils.unc.edu/rave

- A general purpose dynamic query interface for databases with a small number of facets (~10) and a small number of categories in each facet (~10).
- Easy to look ahead (overviews and previews)
- Couples interactive partitioning/exploration with string query
- Semi-automatic category generation and webpage classification

Relation Browser Start State for Energy Information Admin Website



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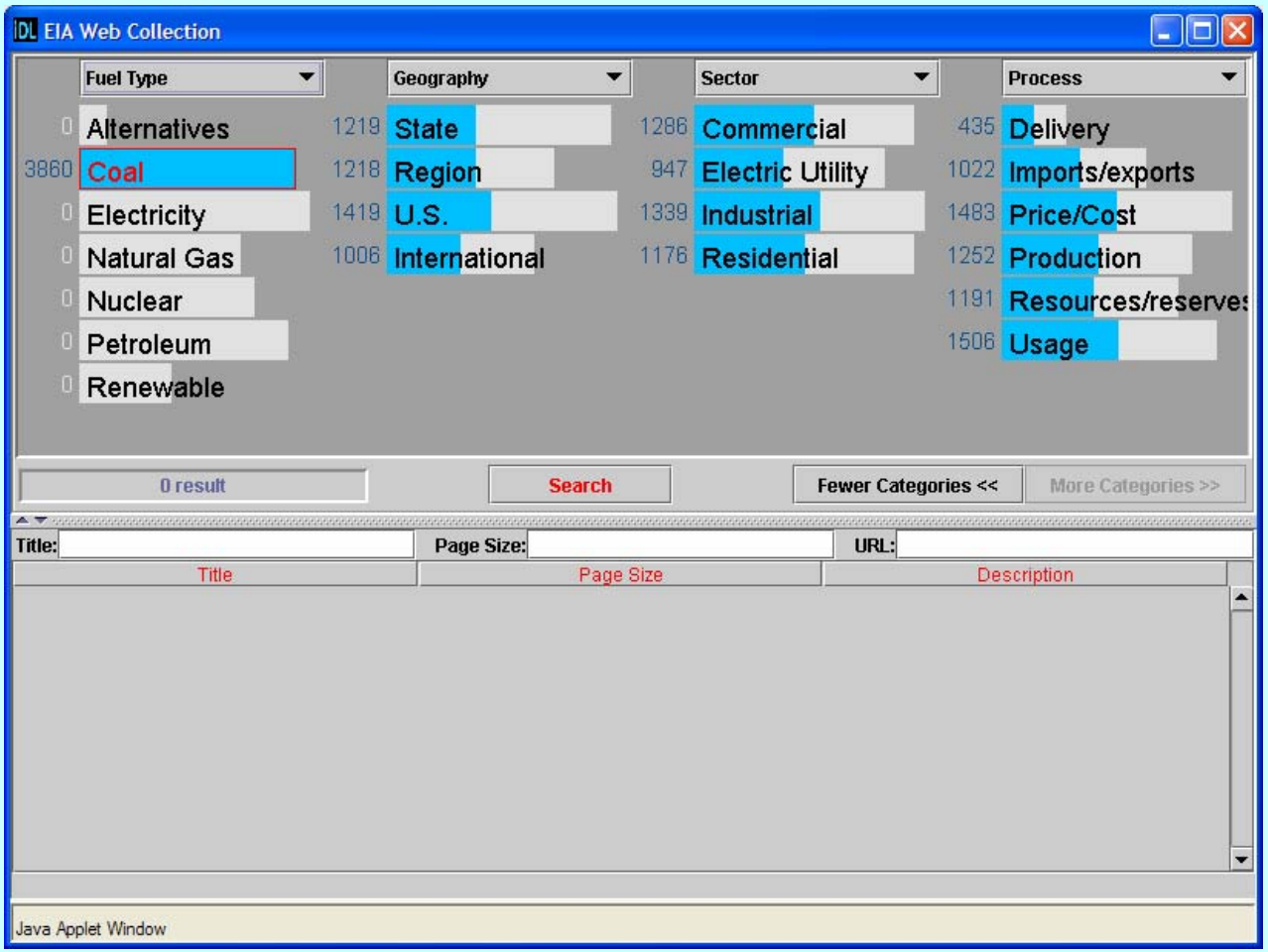
Mousing over “Coal” under the “Fuel type” category reveals the distribution of coal related web pages to other categories



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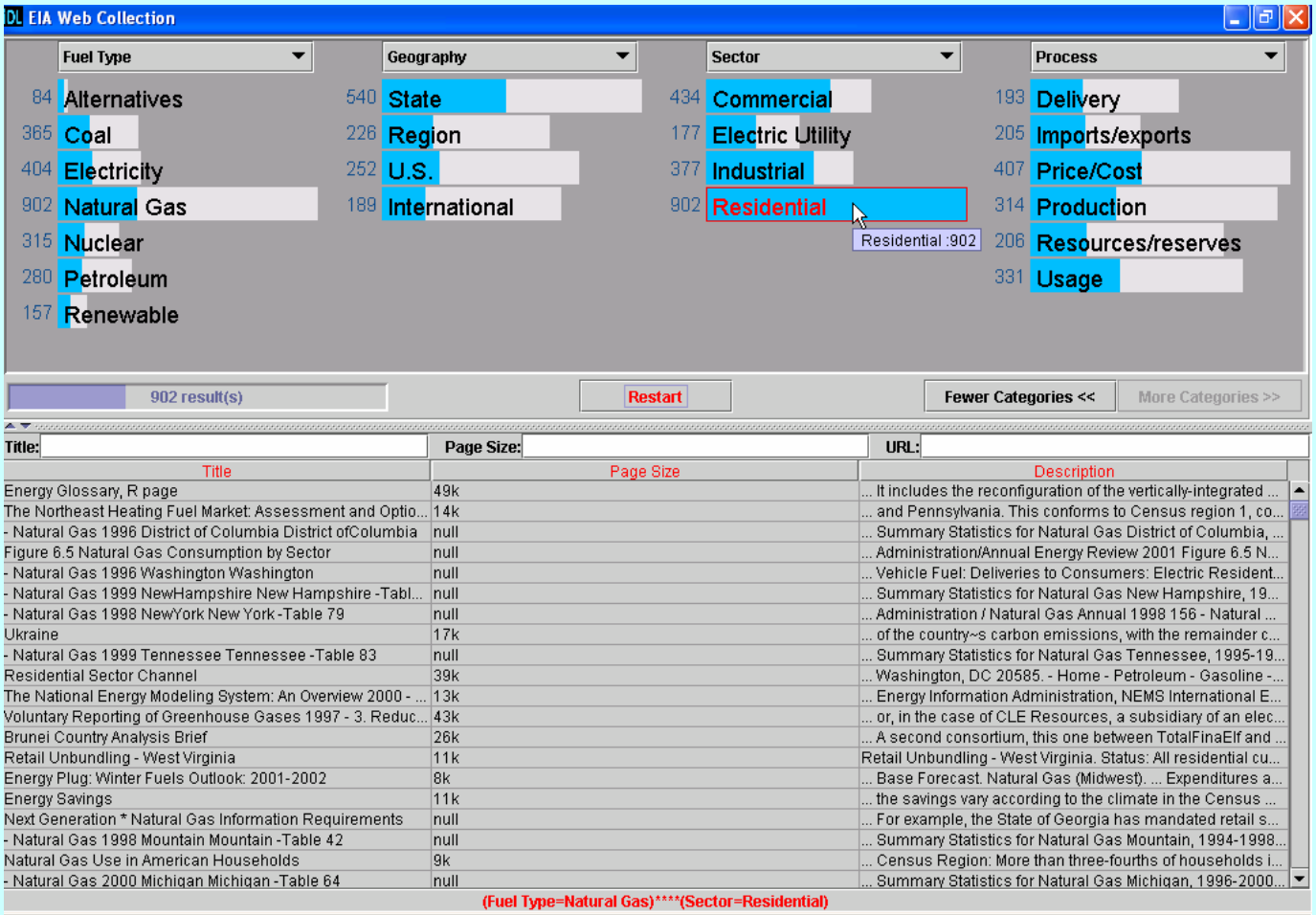
Click on Natural Gas and Mouse over Residential Sector



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RB++ showing ‘hous’ typed in title field

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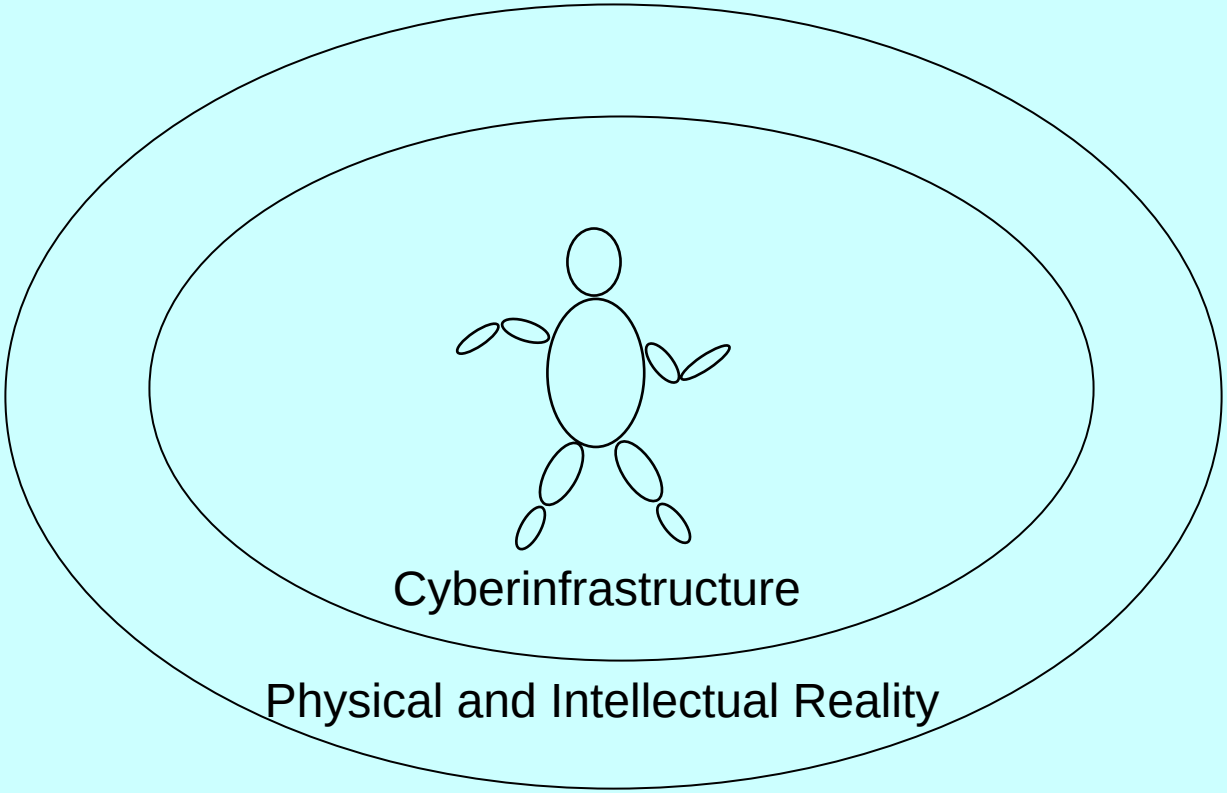
Some Interaction Principles and Caveats in These Examples

- Principles
  - Look ahead without penalty
  - Minimize scrolling and clicking
  - Alternative ways to slice and dice
  - Closely couple search, browse, and examine
  - Continuous engagement—useful attractors
  - Treasures to surface
- Caveats
  - Scalability (getting metadata to client side)
  - Metadata crucial
    - We are working on automatically creating partitions
  - Increasing expectations about useful results (answers!)

Long Term Paradigm: Information Interaction as Core Life Process

Examples represent early ways to get the information seeker more involved in the information seeking process—there is plenty more to do. Like eating we have varying expectations, invest different levels of effort, and use diverse and ubiquitous infrastructures. Key challenge is to span boundaries between cyberinfrastructure and the 'real' world.



Coda

- Our hopes that we can create systems (solutions) that ‘do’ IR for us are unreasonable
- Our expectations that people can find and understand information without thinking and investing effort are unreasonable.
- We aim to develop ‘systems’ that involve people and machines continuously learning and changing together. Google would not work as well next month if there were not a large group of employees tuning the system, adding new spam filters, and crawlers checking out pages and links continuously.

Thank You!

Questions and Discussion
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