Interactive Intent Modeling: Information Discovery Beyond Search

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Information Seeking Research

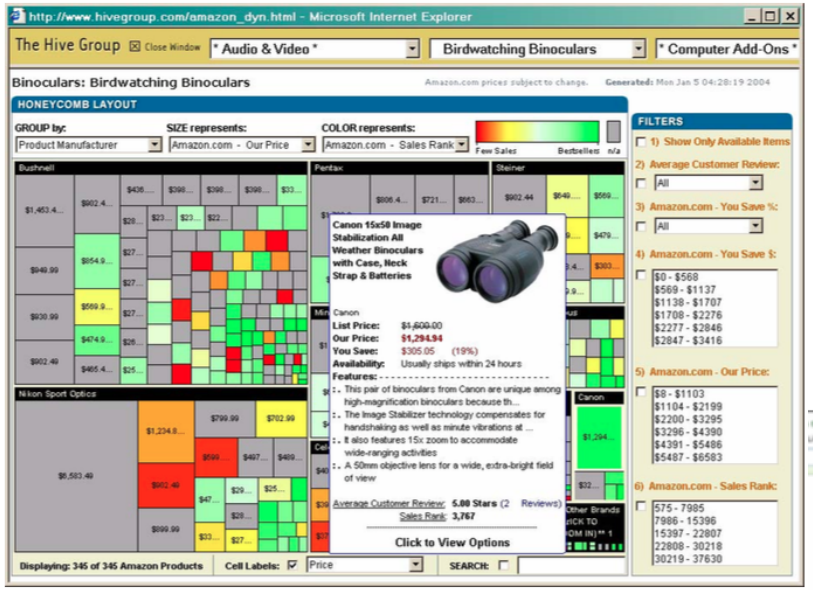
Two study subjects in Furnas et al.[13] favored the same search term with a probability smaller than 0.2, which was shown to lead to 80%–90% failure rates in many common search situations.

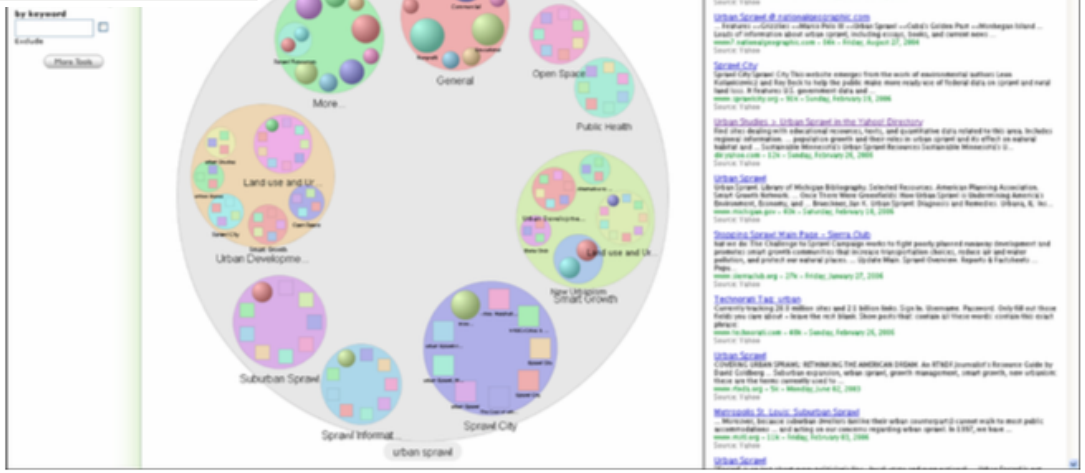
Moreover, users are learning the search vocabulary as they make sense of the information space during the search process.

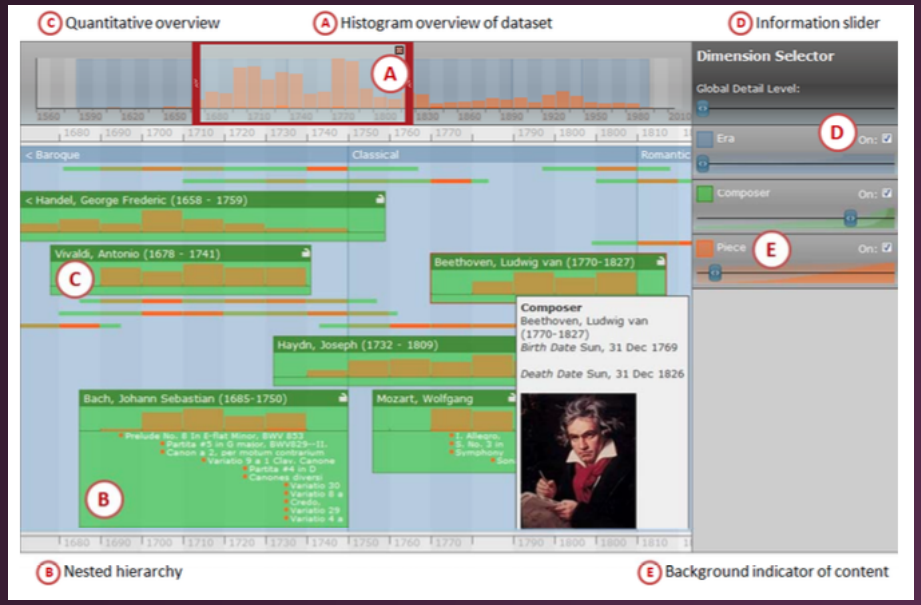
Vocabulary Mismatch Problem

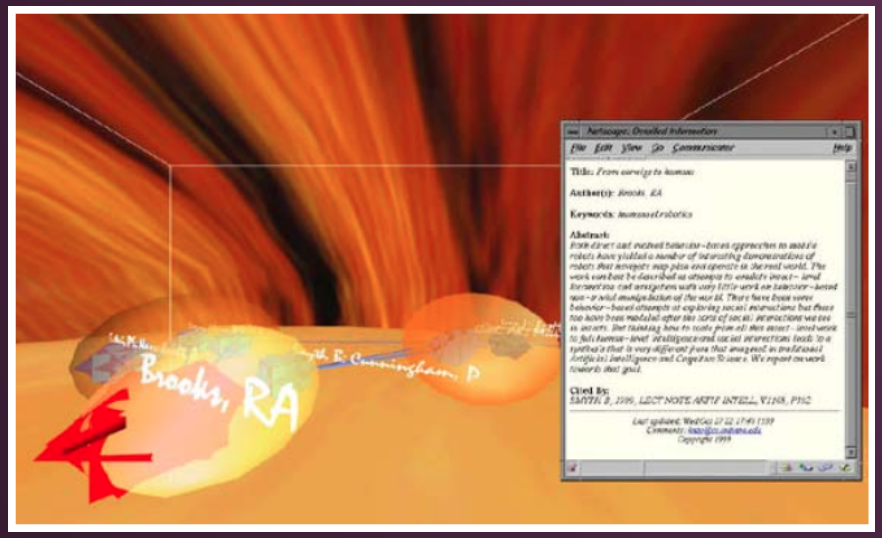
The problem refers to human communication behavior in which the humans writing the documents to be retrieved and the humans searching for them are likely to use very different vocabularies to encode and decode their intended meaning.

Other Interactive Search UIs

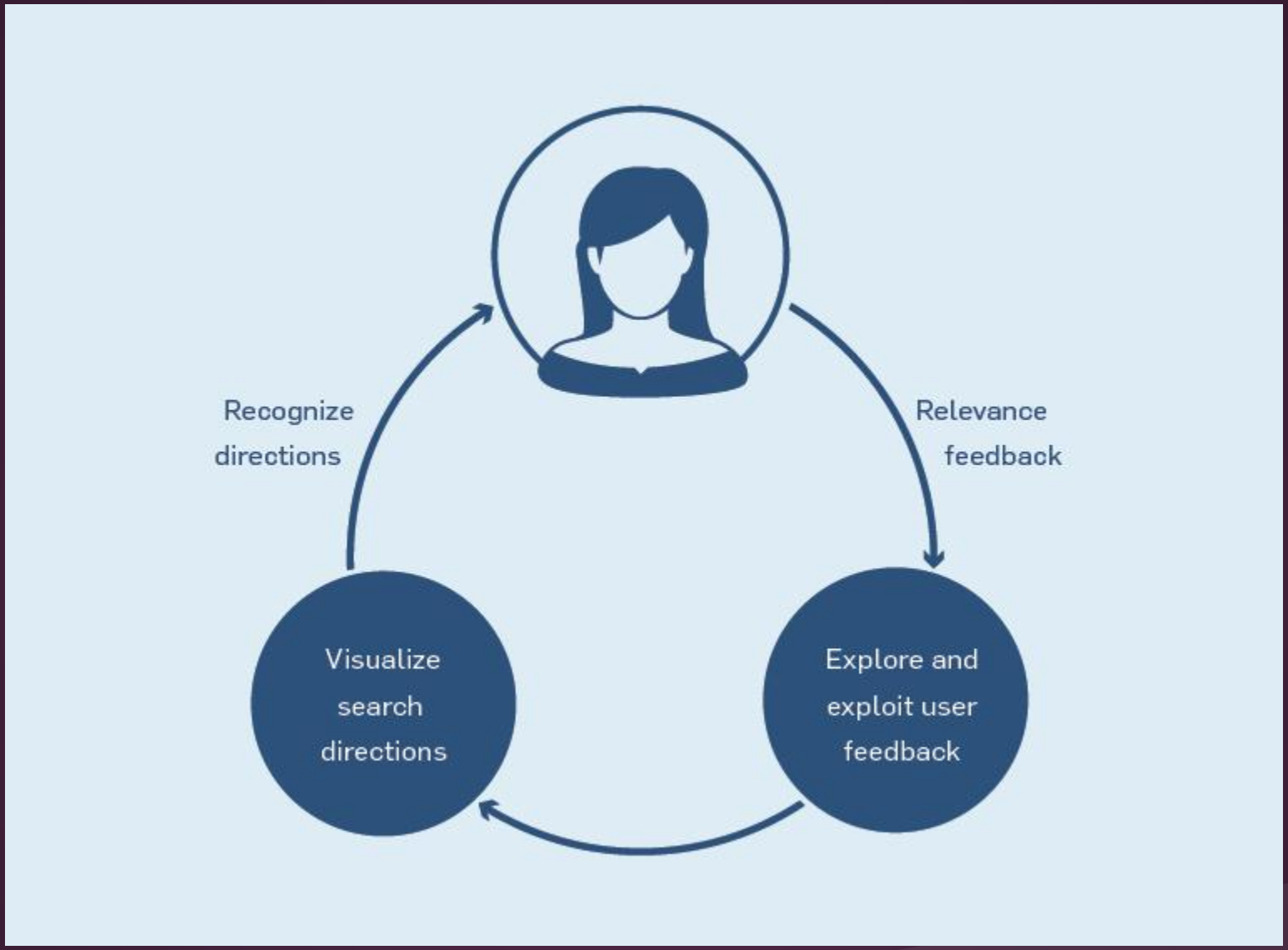




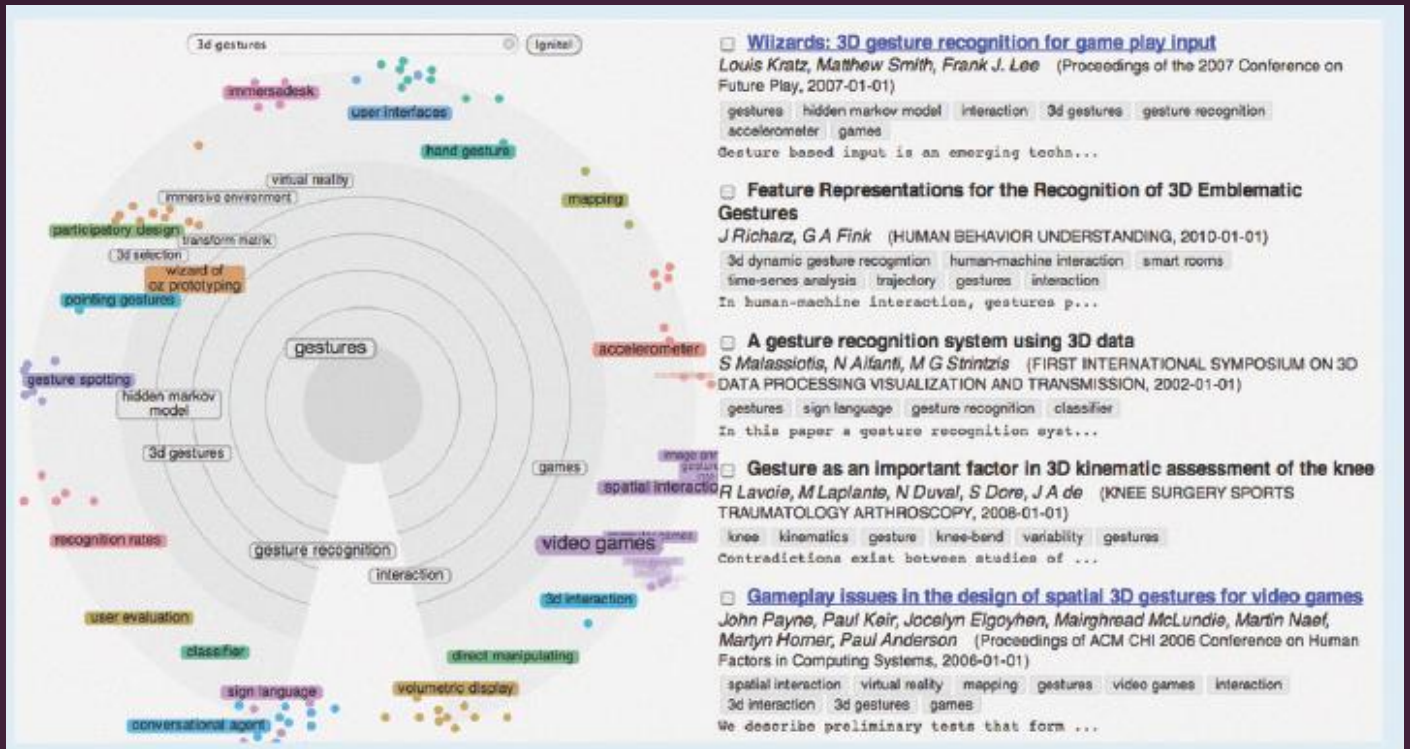




Problem: do not take user feedback…

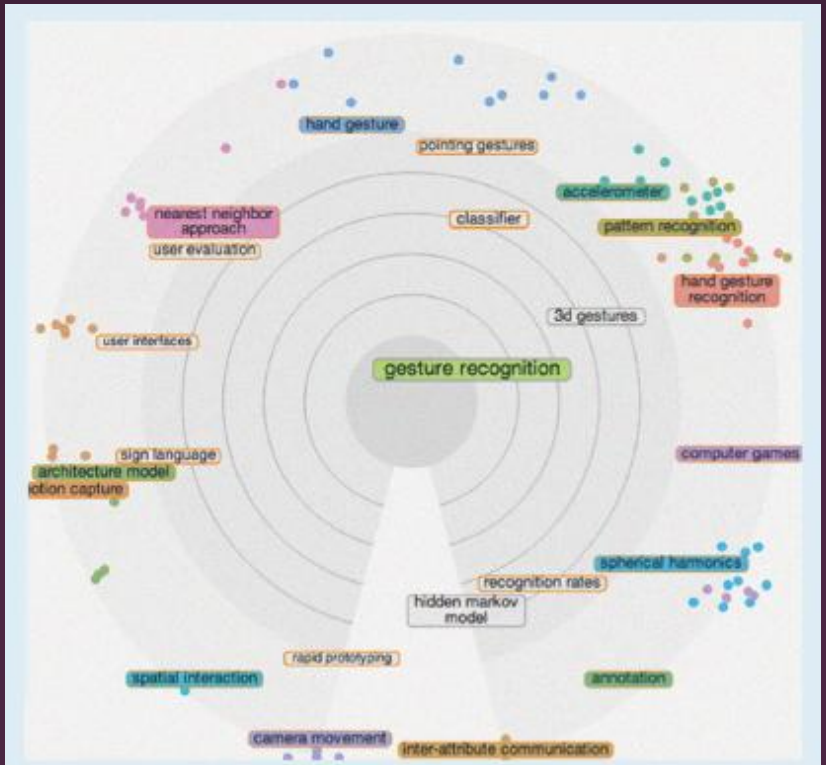


Visualization and Adaptation



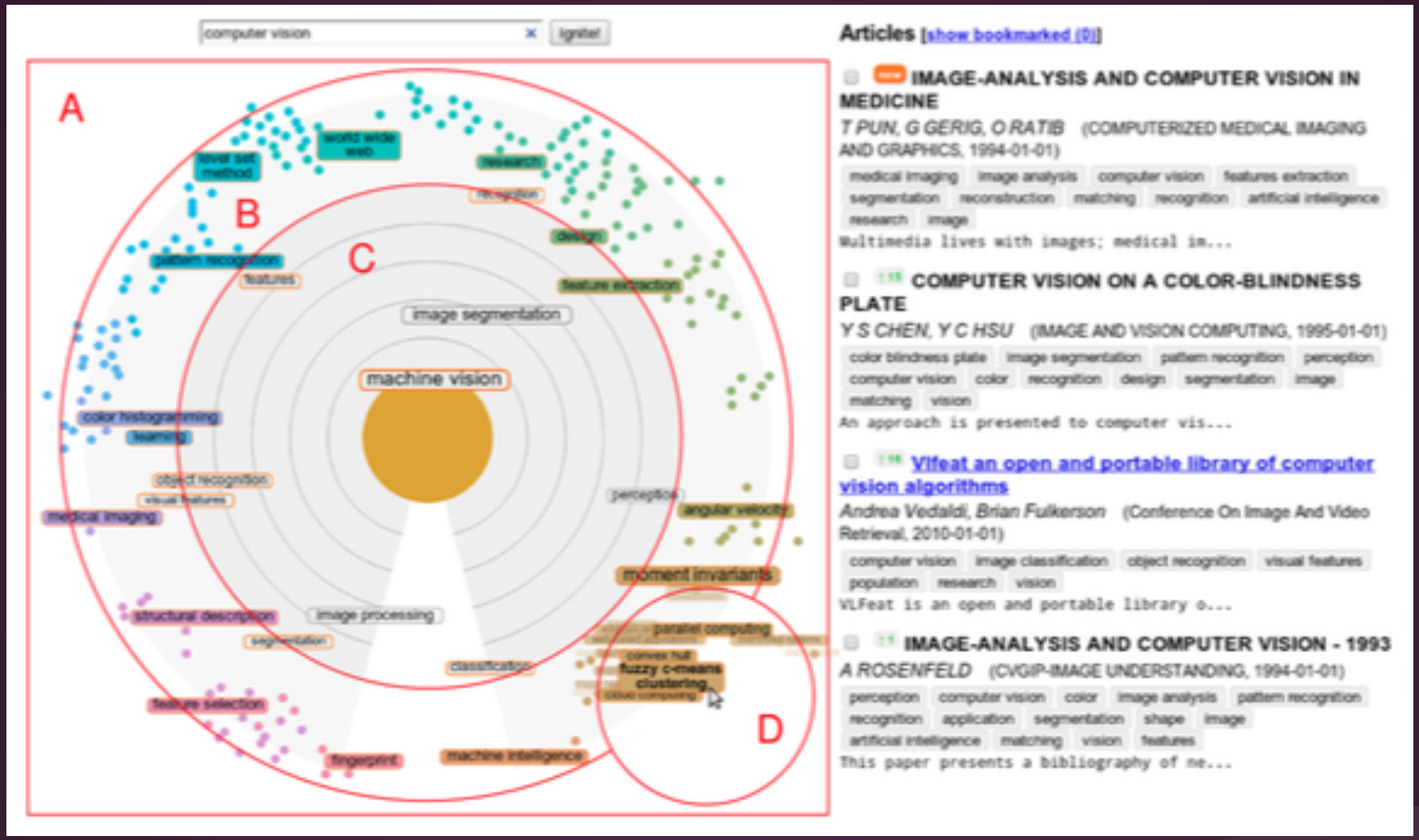
(a) The user issues the query "3D gestures," and the system visualizes an intent model on the radar screen consisting of potentially interesting intent as keywords and a ranked document list. The estimated intents, for which the results on the right side have been retrieved, are visualized for the user (inner darker-gray area). The angular distance corresponds to similarity of intent and the radial distance from the center to relevance. Predicted potential future intents, which help users orient themselves on the radar, is visualized in the outer (lighter-gray) area. The user provides positive feedback by dragging keywords closer to the center of the radar and negative feedback by dragging them further away. Multiple keywords can be dragged in each iteration. Online learning methods make it possible for the system to respond in less than one second.

The user is visualized with an estimate of his or her present search intents

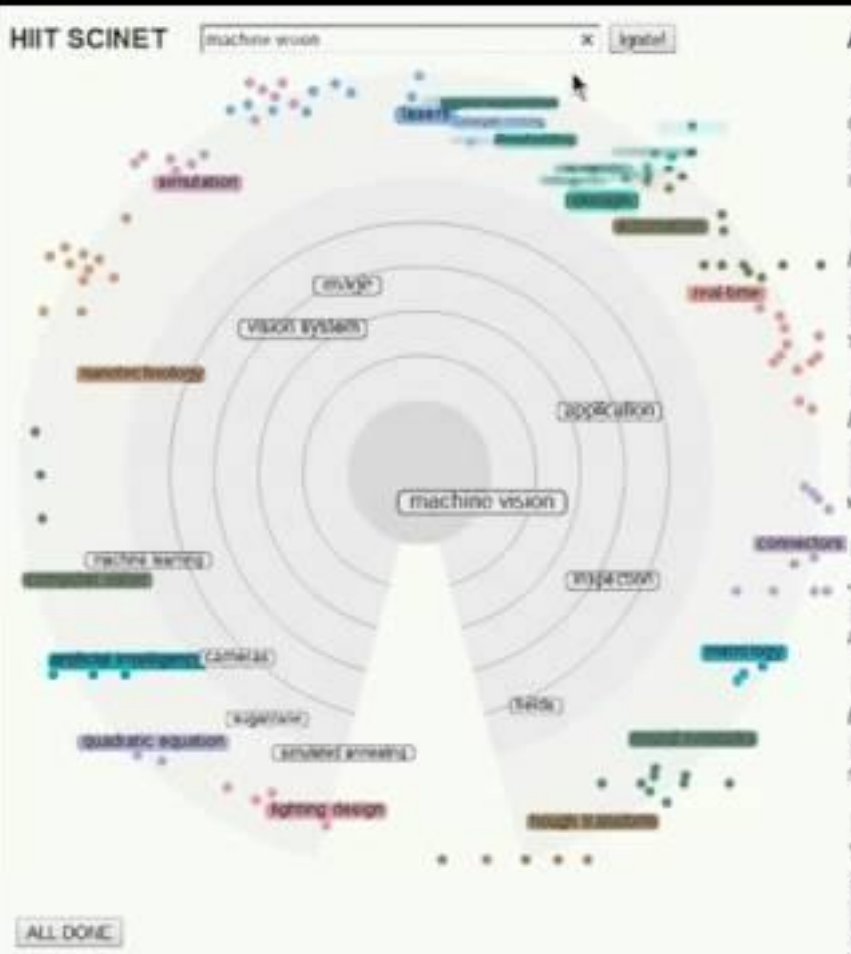


(b) The user has increased the relevance of "gesture recognition" by dragging the corresponding keywords to the center of the radar screen. The system then visualizes new estimated relevant intents as a set of keywords (such as "pattern recognition," "pointing gestures," "recognition rates," "nearest neighbor approaches," and "hidden Markov models").

the user has selected "gesture recognition" and is offered further options to continue the exploration to more specific topics and more general topics



Balance between the amount of information shown and comprehensibility



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Interactive Visualization of Search Intent & Direction

Users have trouble expressing their needs as written queries and are likely to start their search with imprecise queries.

It is usually easier for humans to recognize something they see than describe it from scratch.

Interactive Visualization of Search Intent & Direction

While relevance feedback is useful, in most cases users do not in fact use feedback mechanisms.

This observation is related to two other cognitive science findings:

- easier to recognize smaller units than more complex ones
- easier for them to make sense of information relative to a reference point than in isolation

Interactive Visualization of Search Intent & Direction

A visualization should not contain only information already familiar to the user:

- good for recognition but
- leads to the intent model getting stuck in a "context bubble."

Instead, unknown intents must be offered to the user, so that they may learn about new information based on the relation to the familiar information.

Balancing Exploration & Exploitation

Exploit -

Users must be able to focus on a specific location in the information space.

Explore -

Users must be able to broaden their search through more general areas.

Avoids “anchoring” in conditions of uncertainty

Online learning

Online learning methods are able to update models one observation at a time so future predictions can be made immediately when feedback is received.

Also able to handle limited/imperfect feedback; as the models are probabilistic, they quantify uncertainty related to the estimates, using it to determine the optimal alternative choices to be visualized for users.

From Effectiveness to Task Performance

To get a complete picture of performance, two aspects of IR systems should be measured simultaneously:

- IR system effectiveness, given a complete description of an information need
- Human task performance, given the system's interaction modes.

From Effectiveness to Task Performance

The SciNet system was recently studied in task-based experiments in which users were given 30 minutes to solve research tasks using IR systems operating on a database of more than 50 million scholarly articles.

Quantified separately:

- The quality of retrieved information
- Adoption of the visualization
- Feedback mechanisms

From Effectiveness to Task Performance

Found:

- Interactive search intent modeling significantly improved users task performance.
- Task outcomes graded more highly by experts.
- The search user interface enhanced interaction without compromising task execution time.
- Interactive intent modeling increased recall of novel information without losing precision.

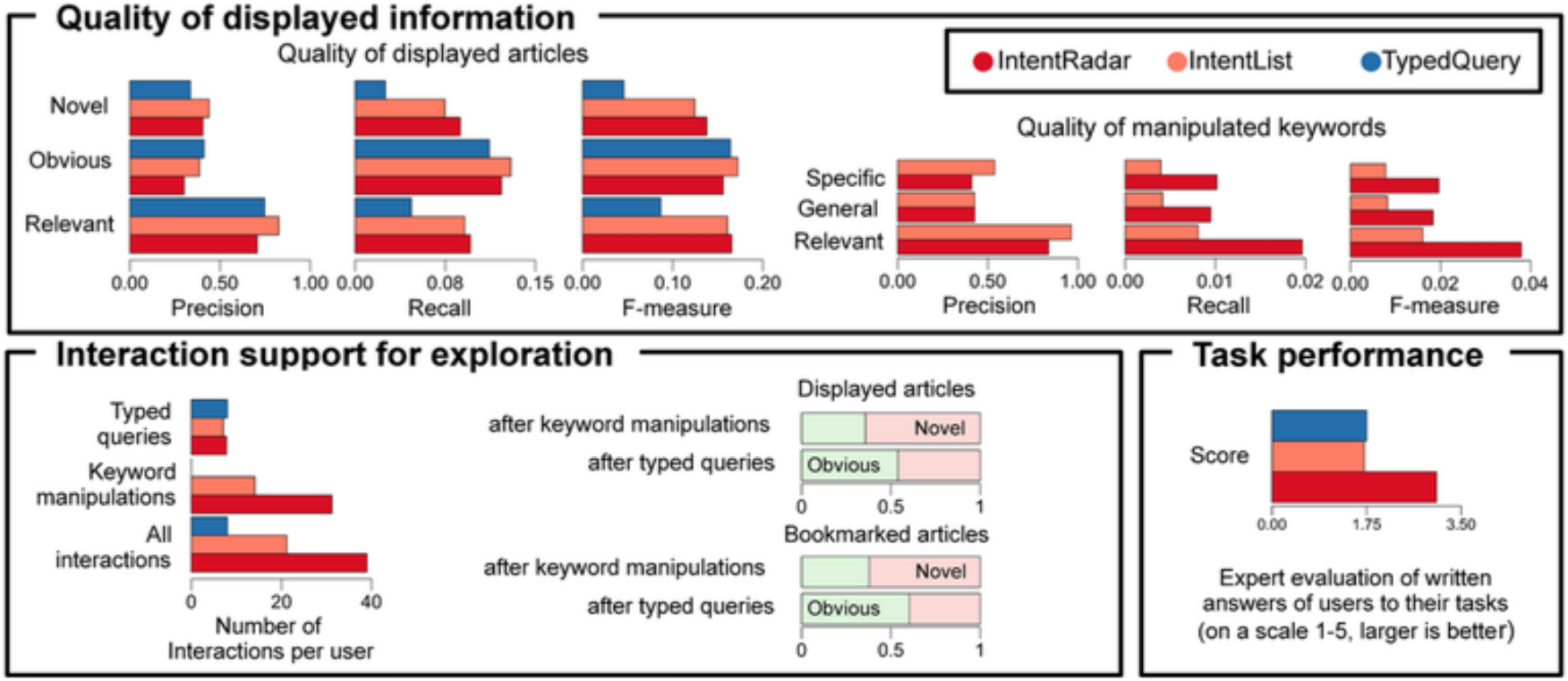

Figure 2: Results of the user experiments divided according to the evaluation aspects: Quality of displayed information, Interaction support for exploration, and Task performance.

What do these mean again?

Making Intent Modeling Ubiquitous

Wearable user interfaces including
Electro-encephalography (EEG) or
Augmented Reality on head-mounted displays

Users' implicit and explicit reactions to visualized content can reveal their intent and help improve the user intent model

(a) Suitable information the user can recognize and act upon can be visualized on a display as augmented reality.[2] While the user visits a poster session at a conference, the IR system suggests information by augmentations on the data glasses. The system can then, based on implicit and explicit interactions, iterate the intent model and propose new information.

(b) An experiment involving term-relevance prediction from brain signals via EEG to automatically detect the relevance of textual information directly from brain signals. Wearable EEG and other techniques can be used for implicit relevance feedback to improve prediction of the intent model to complement or substitute explicit relevance judgments.[11]

Discussion

Helpful for everyday searches?

What are the drawbacks?

What is more important in search?