Materializing the Query with Facet-Streams

A Hybrid Surface for Collaborative Search on Tabletops

Hans-Christian Jetter, Jens Gerken, Michael Zöllner, Harald Reiterer, Natasa Milic-Frayling
Tabletop for multi-user collaborative product search: support multiple users in searching and agreeing on a product from a product catalog.

Combination of information visualization, multi-touch and tangible interaction.
What is special about collaborative product search? Example: finding a holiday hotel.

- Must support more than **logical AND** of all personal criteria.
- **Iterative exploration** to support **negotiation** and **decision making**.
- Not **keyword search**! Process of **iterative filtering** of a catalog using **faceted metadata*** until result set becomes **small enough to review and decide**. (*Hearst et al. 2002)
- Phases of tightly-coupled **collaboration** and loosely-coupled **parallel work** (Morris et al. 2009).
Visual and tangible query language based on filter/flow* metaphor. (* Young & Shneiderman 1993)

*Filter/flow networks: flexible spatial layout, can be easily decomposed and recombined.

*Externalization ** of the search process to foster collaboration and awareness (aid cognition, provide shared reference, remember traces). (**Hornecker & Buur 2006)
Formulating a single filter criterion.
Design goal: *Fluid Interaction and Low Viscosity.* ("Blackwell & Green 2003")
Design goal: *Parallel, Around-the-table Interaction.*
Study 1 - Collaborative Use

- Goal: Contrasting user behaviour, awareness and strategies during controlled group search tasks. UX questionnaires.
- 72 participants in 24 groups of 3 (between subjects).
- Participants were students from a variety of fields and administrative staff (only 2 computer science students).
Filtering History

Results

Facets
Controlled Group Search Task

- Each participant was assigned a role (e.g. family father) and distinctive personal criteria to search for...

- Instruction:
  Decide on one optimal hotel for ALL group members, BUT make as few personal concessions as possible!

- What they didn’t know: there was no hotel suiting all criteria...
Effectiveness & UX

- Both systems: No group gave up. No group failed to agree.
- Groups’ results with Facet-Streams of equal objective quality as with Web interface (*discussion in the paper*).
- Better subjective UX with Facet-Streams (scale 1:“not true”, 7:“true“)
  - “*fun working with the system*”:
    FS significantly higher (6.69 > 5.69, t(23) = 4.716; p < 0.001).
    *Quotes:* “Nice game!”, “This is so much fun”. At end: “What a pity!”
  - “*the system is very innovative*”:
    FS significantly higher in. (6.38 > 3.61, t(23) = 8.444; p < 0.001).
    *Between-subjects design.*
  - “*the system supported me in solving my task.*”: No significant difference, but high average for both systems in (6.13 > 5.86).
    *Both systems did their job. Fair comparison.*
Increased Awareness using Facet-Streams

1. **Awareness of the system state and search process:**
   - Users knew which facets are already filtered or which criterion is still missing. Users could attribute tokens to their “owners”.
   - **Web Interface:** Much more verbal communication to become aware of system state. Much more verbal “noise”. Users could not attribute ticks in check boxes to their “owners”.

2. **Participants were aware of other participants’ criteria:**
   - Quote: “But you have to think of your children!”.
   - **Web Interface:** No indications for a stronger relation to their roles.

3. **Awareness of others’ interactions:**
   - Mutual support with handling the user interface (e.g. reaching over to help with a control). Collaboration not only on the primary task but also on the secondary task of handling the UI.
   - Some groups got into a kind of “flow” and handled UI very smoothly.
   - **Web Interface:** In one case frequent mistakes during (un)checking values were either not discovered or not communicated to the operator.
Observed Search Strategies

**Facet-Streams:**

- Two different strategies in initial phases of query formulation:
  - Parallel-personal (26/33) vs. Sequential-collaborative (7/33).
  - But then: Many smooth transitions between tightly-coupled collaboration and loosely-coupled parallel work. *(we achieved our design goal)*

- Different “zero hit” strategies:
  - democratic approach: “now everyone looks for some category to soften“.
  - analytical approach: “whose criteria are the cause for zero hits?“

**Web Interface:**

- random or even chaotic sequences of entering criteria
- very early switching to browsing of results (still successful, because of more direct access to results!)
- → future work: better integration of query formulation and browsing in Facet-Streams!
Comprehensibility of Boolean Logic (Study 2)

- Users (n = 7) quickly learned to handle our equivalent to Boolean logic (without being exposed to Boolean symbols, Boolean operators or Boolean terminology).
- Very small error rate (7%) and 6 out of 7 participants could correctly construct a complex query from natural language.
- See details in paper.

Expression 1: 
E AND ((A OR B OR C) AND D)

Expression 2: 
G AND H
Conclusion

- Facet-Streams makes abstract concepts such as “queries”, “facets” and Boolean logic “graspable” (physically & cognitively).
- The visual and tangible representation of queries fostered collaboration, awareness and mutual support during search.
- Facet-Streams turned group search and decision making in a fun experience.
- My personal take home message:
  - Seemingly abstract concepts in IT and computer science (e.g. queries, facets, Boolean logic) can be made much more accessible to novices using new hybrid styles of interaction with multi-touch and tangibles.
  - Collaboration & awareness can greatly facilitate not only the primary task from the application domain, but also the secondary task of mastering the UI itself.
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