Stackables:

Combining Tangibles for Faceted Browsing

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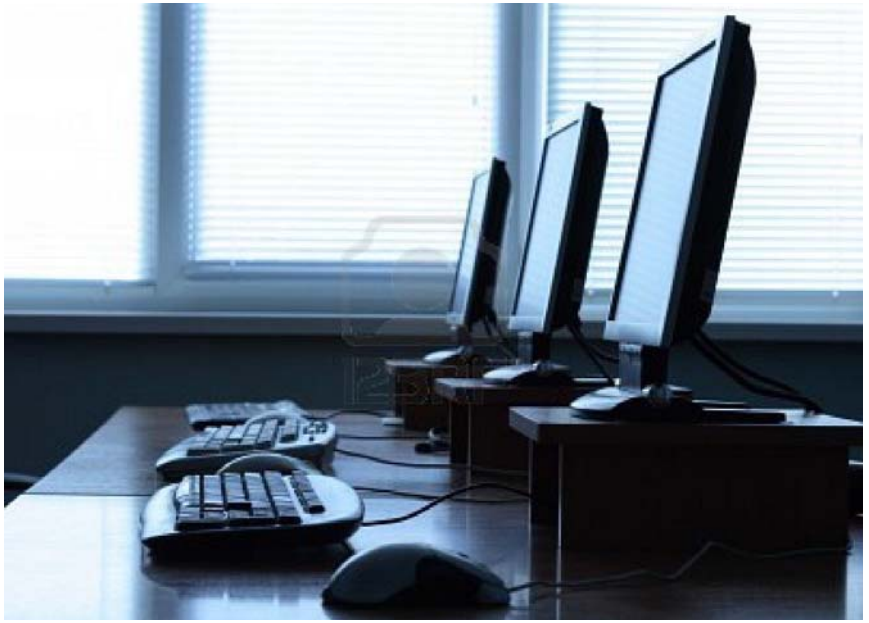
Inria informatics mathematics
Aviz

Motivation

- Decision making
  - Buying computer equipment, choosing books for a library…
  - Need to balance rich set of options
  - Collaborative process in small groups
  - People with varying priorities and skills involved



Motivation

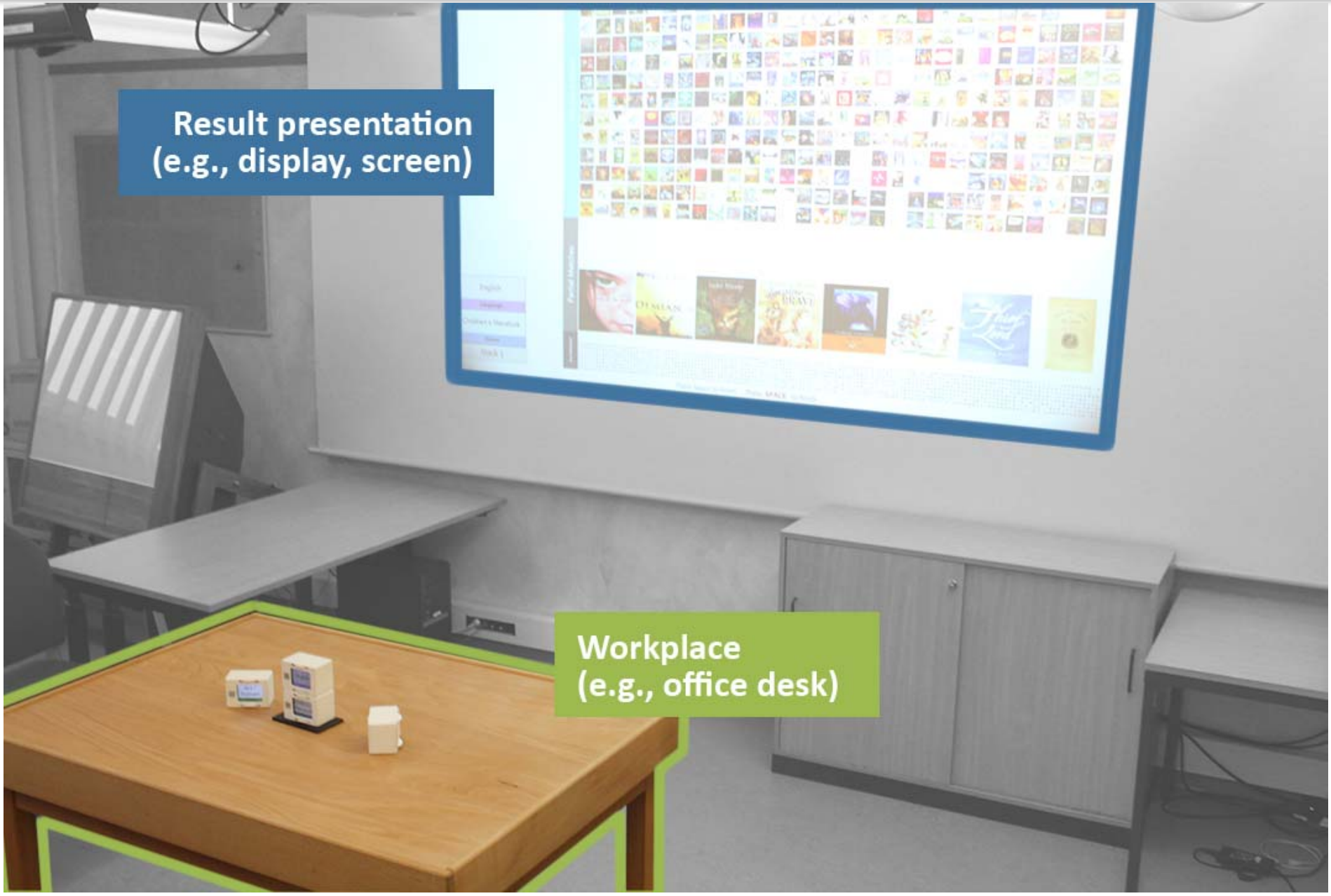
- Faceted Browsing & Search
  - Looking at data from different conceptual dimensions
    - Technical attributes, author, price, ratings, book genre …
  - Incremental refinement by restricting facet values
- Challenges of faceted information seeking UIs
  - Decision makers start with private exploration and selection
  - Need to communicate facets to collaborators
  - Fluidly share, transfer, and manipulate them
  - Work in closely/loosely coupled way

  → individual + collaborative information seeking UIs needed
- Idea: explore tangible interaction

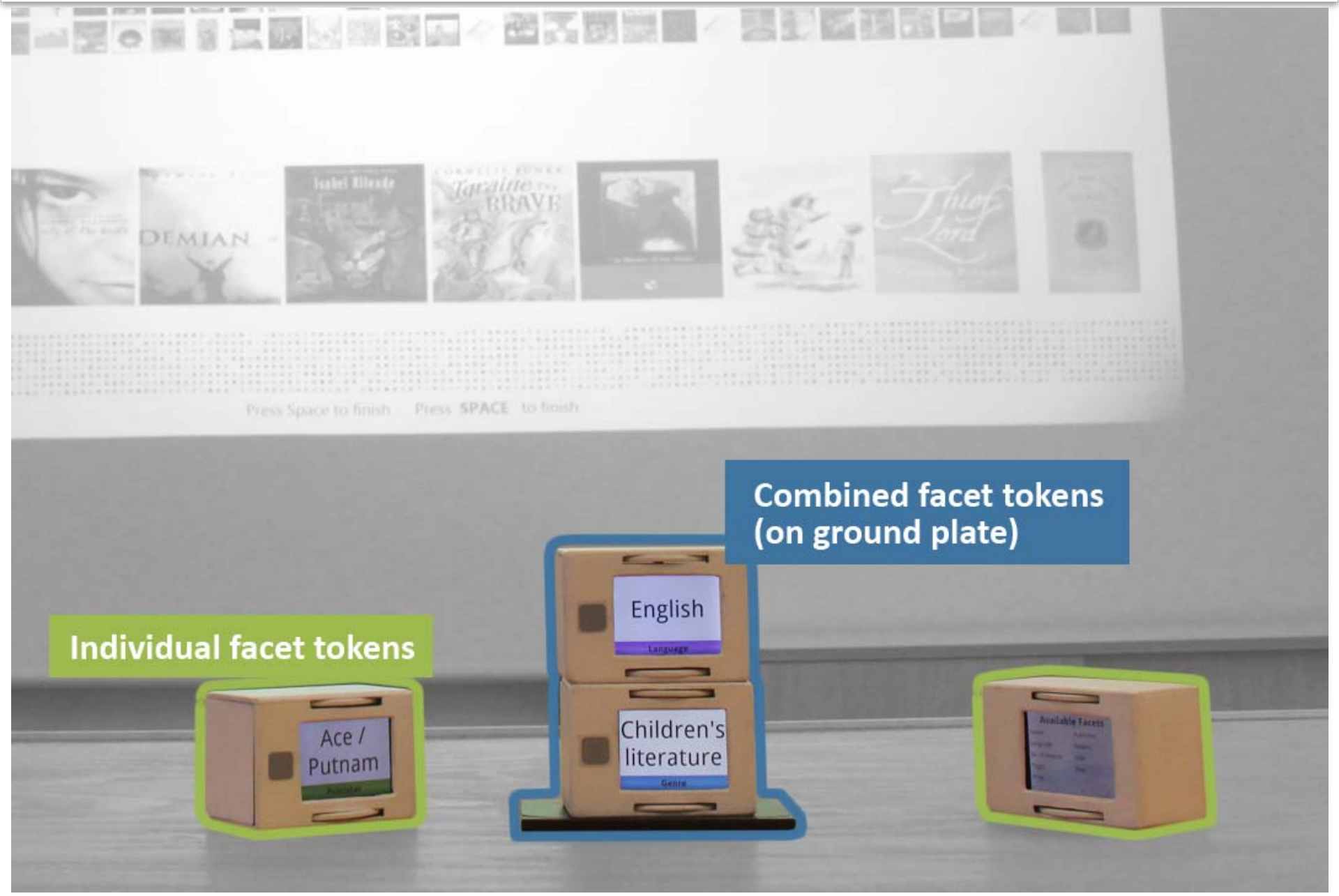
STACKABLES

- Make facets & values graspable
- Physical Widgets with controls for faceted browsing
- Stacking metaphor: build query
- Can be manipulated, shared, transferred
- By individuals and groups
- Used for negotiating results

Our Proposed Solution: Stackables



Our Proposed Solution: Stackables



Our Proposed Solution: Stackables

Related Work: Web-based Faceted Browsing

Features
Clear
- [x] Zoom Lens
- [ ] Image Stabilization (11)
- [ ] High Sensitivity (7)
- [ ] LCD Display (7)
- [ ] Optical Zoom (7)
- [ ] Photography (6)
- [ ] Standard Zoom (6)

› See more...

Brand
- [ ] Nikon (3)
- [ ] Canon (9)
- [ ] Sony (5)
- [ ] Olympus (3)
- [ ] Fuji (3)
- [ ] Kodak (2)
- [ ] Opteka (1)

› See more...

Megapixels
- [ ] 5.9 MP & Under (2)
- [ ] 6 to 7.9 MP (2)
- [ ] 8 to 9.9 MP (2)
- [ ] 10 to 11.9 MP (11)
- [ ] 12 to 13.9 MP (6)
- [ ] 14 to 15 MP (3)
- [ ] 16 to 17 MP (1)

Price
‹ Any Price
$ 25 to $ 400 GO

Optical Zoom
- [ ] 3x to 3.9x (13)
- [ ] 4x to 5.9x (1)
- [ ] 6x to 9.9x (1)
- [ ] 13x & Up (4)

Condition
New (24)
Used (22)
Refurbished (10)

Nikon D3000 10.2MP Digital SLR Camera with 18-55mm f/3.5-5.6G AF-S DX VR Nikkor Zoom Lens
Buy new: ~~$549.95~~ $489.95
18 new from $486.96
42 used from $325.99
In Stock
(284)
See newer model of this item

Canon Digital Rebel XSi 12.2 MP Digital SLR Camera with EF-S 18-55mm f/3.5-5.6 IS Lens - Black
Buy new: $716.00
12 new from $679.00
54 used from $373.50
Only 10 left in stock - order soon.
(779)
See newer model of this item

Sony A390 Digital SLR Camera - Black
Buy new: $449.00
6 new
7 used from $394.98
In Stock
(22)

4.

Canon Digital Rebel XTi 10.1MP Digital SLR Camera with EF-S 18-55mm f/3.5-5.6 Lens (Black)
2 new from $749.00
39 used from $300.00
(676)
See newer model of this item

5.

Olympus E-P2 12.3 MP Micro Four Thirds Interchangeable Lens Digital Camera with 14-42mm f/3.5-5.6 Zuiko Digital Zoom Lens (Electronic View Finder not included)
Buy new: ~~$1,099.99~~ $459.95
7 new from $459.95
6 used from $405.00
Get it by **Thursday, May 24** if you order in the next 7 hours and choose one-day shipping.
Only 1 left in stock - order soon.
(10)
Eligible for **FREE** Super Saver Shipping.

6.

Canon Digital Rebel XT 8MP Digital SLR Camera with EF-S 18-55mm f3.5-5.6 Lens (Black)
2 new from $420.00
21 used from $297.99
(545)
See newer model of this item

7.

Canon Digital Rebel XT 8MP Digital SLR Camera with EF-S 18-55mm f3.5-5.6 Lens (Silver)
6 new from $749.00
35 used from $260.00
(545)

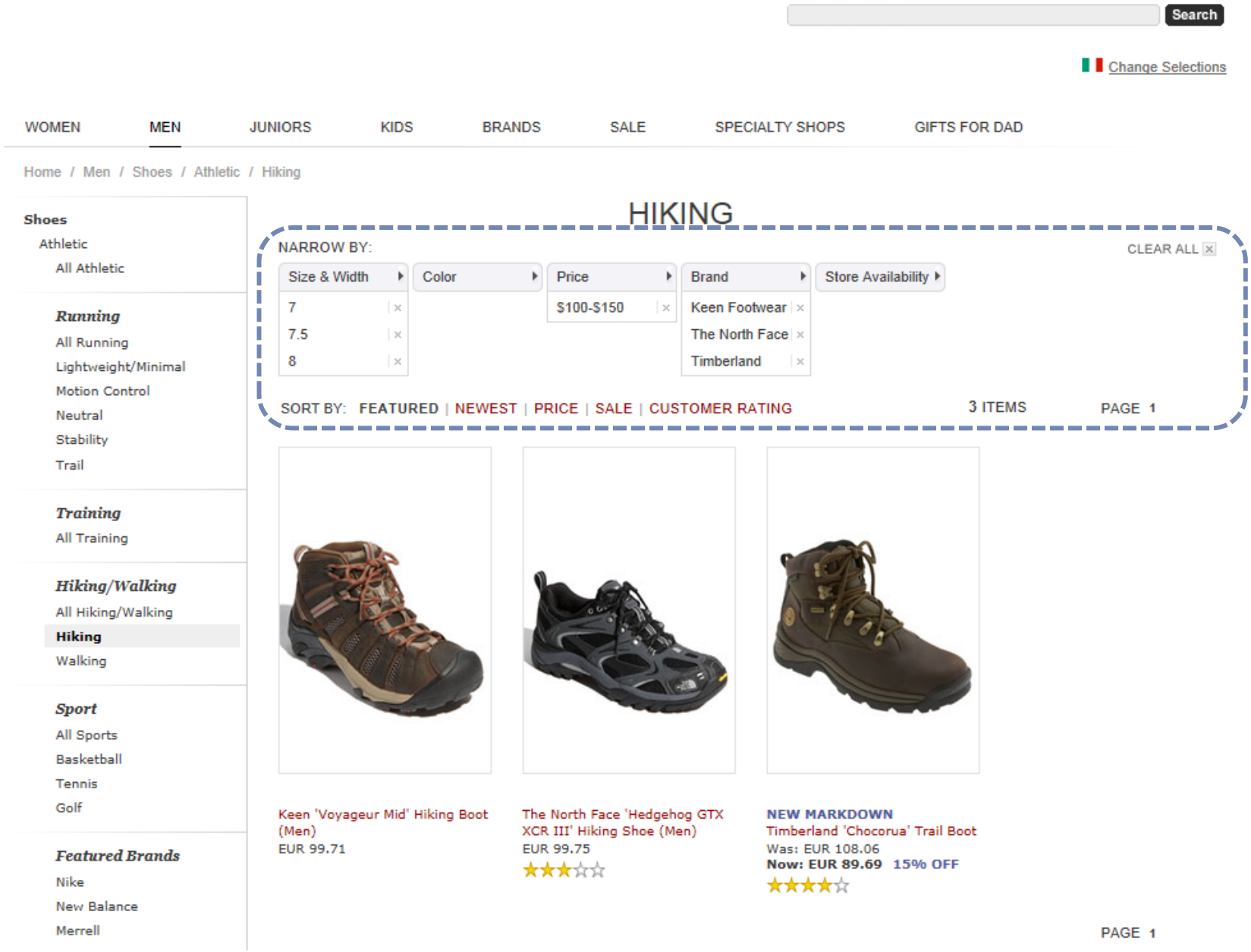
8.

Nikon D60 10.2MP Digital SLR Camera with 18-55mm f/3.5-5.6G AF-S DX VR Nikkor Zoom Lens
Buy new: $1,049.99
6 new from $819.00
39 used from $325.00

9.

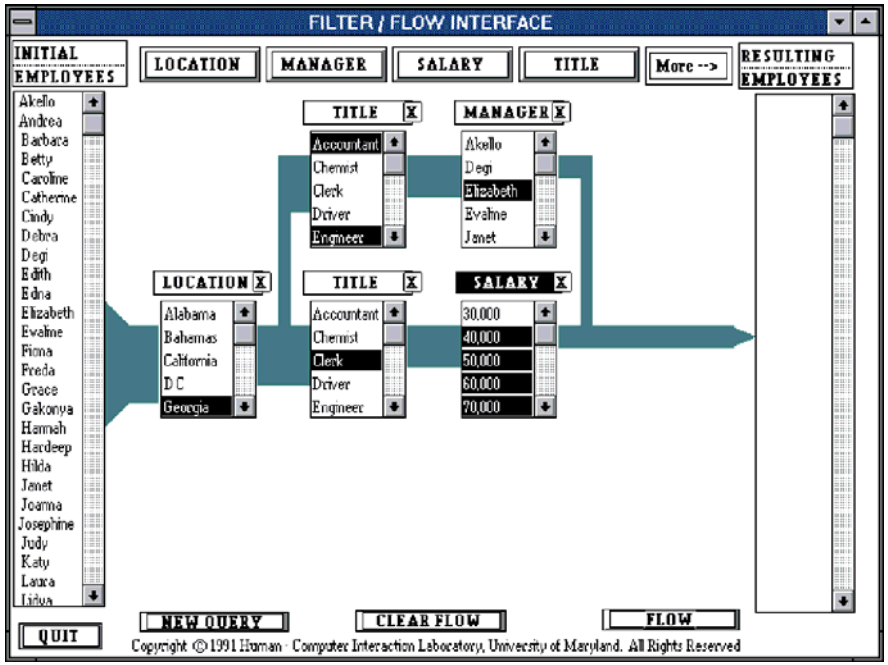
Sony Alpha A230L 10.2 MP Digital SLR Camera with Super SteadyShot INSIDE Image Stabilization and 18-55mm Lens
6 used from $290.00
(34)

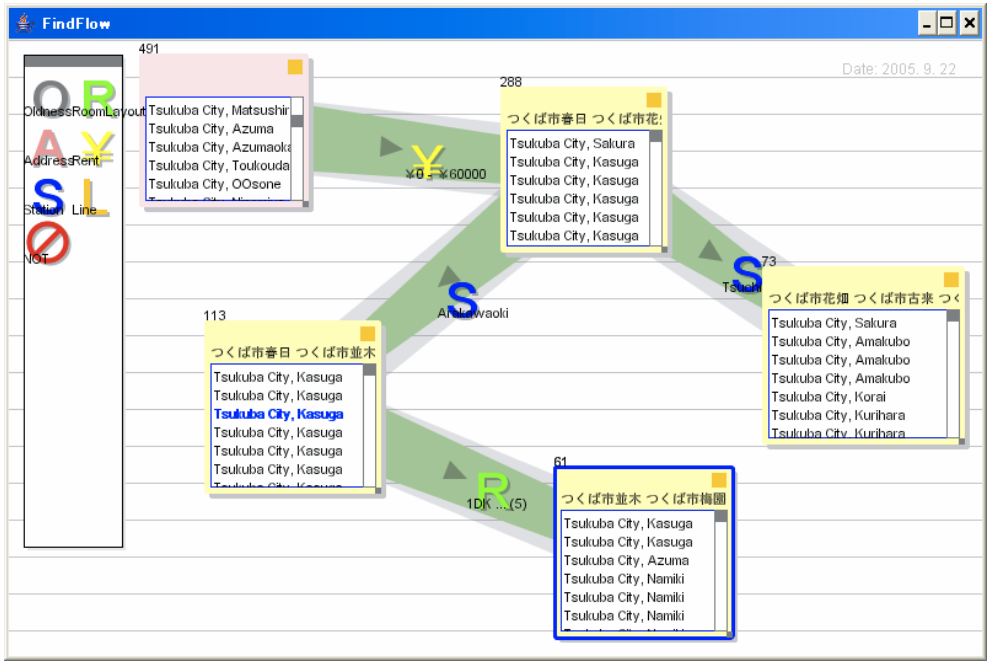
Related Work: Web-based Faceted Browsing



Related Work: GUIs for Faceted Browsing & Search

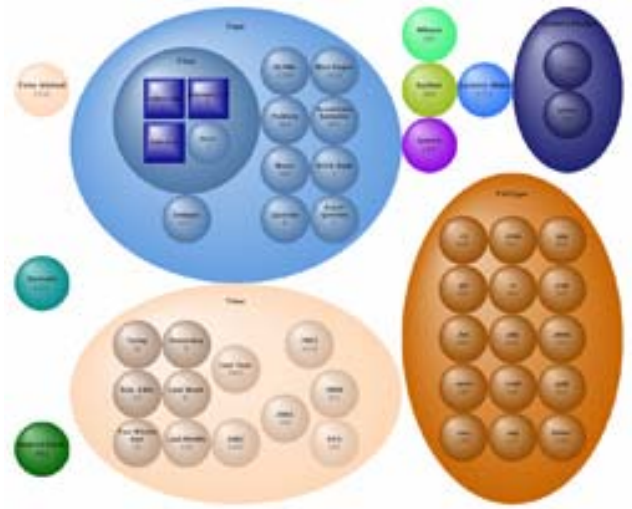
- 20 years of research in interactive query refinement
  - Filter/Flow [Young & Shneiderman 93] facets as water filters
  - …
- FindFlow [Hansaki et al. 06]

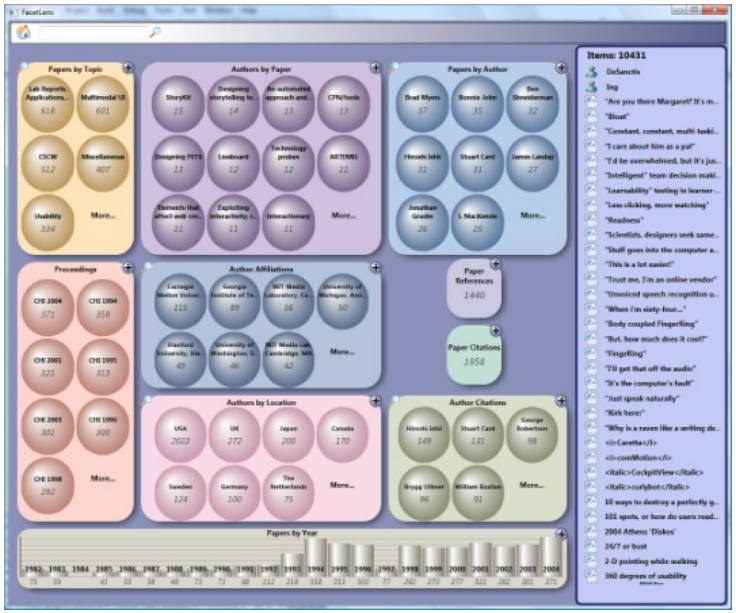




Related Work: GUIs for Faceted Browsing & Search

- Zoomable UIs
  - FacetMap [Smith et al. 2006] →
  - FacetLens [Lee et al. 09] ↘
  - TimeSlice [Zhao et al. 12]
  - FacetZoom ↓
    [Dachselt, Frisch & Weiland 08]



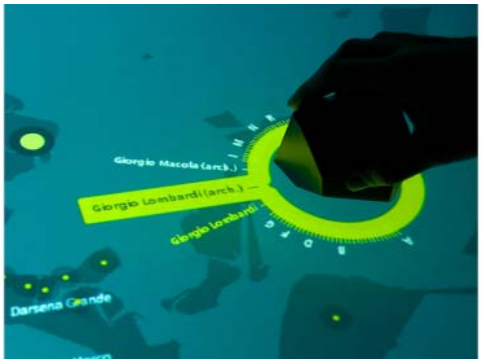


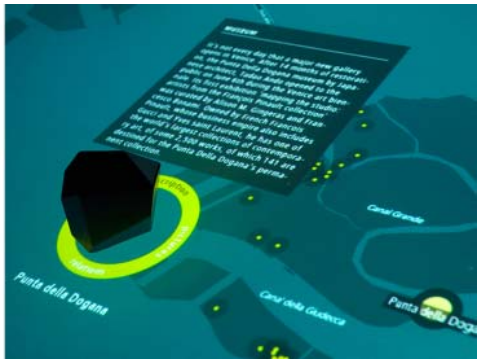
Related Work: Tangibles for Information Seeking

- Navigational Blocks [Camarata et al. 02]
  - Early tangible faceted browsing interface

- Tangible Query Interfaces ↘
  [Ullmer, Ishii & Jacob 03]
  - Physical widgets for attribute control

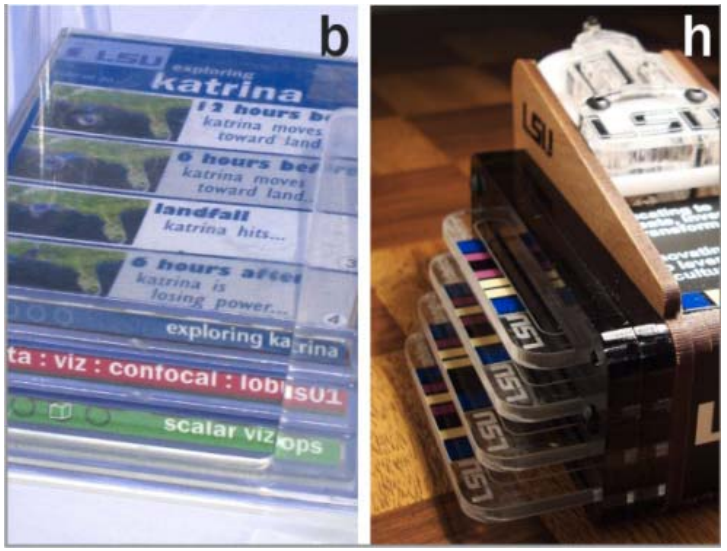
- Venice Unfolding
  - Tangible UI for faceted geo-spatial data
    [Nagel & Heidmann 11]

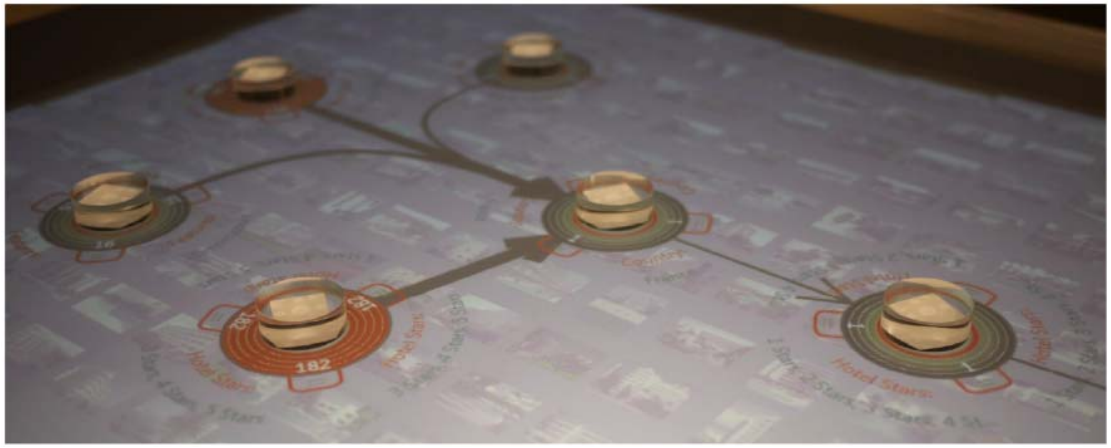




Related Work: Tangibles for Information Seeking

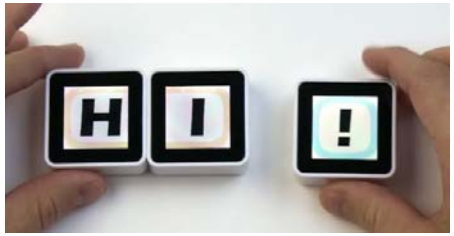
- Cartouche [Ullmer et al. 10] →
  - A generalization of tangible menus
- FacetStream [Jetter et al. 11] ↓
  - Collaborative usage of tangibles

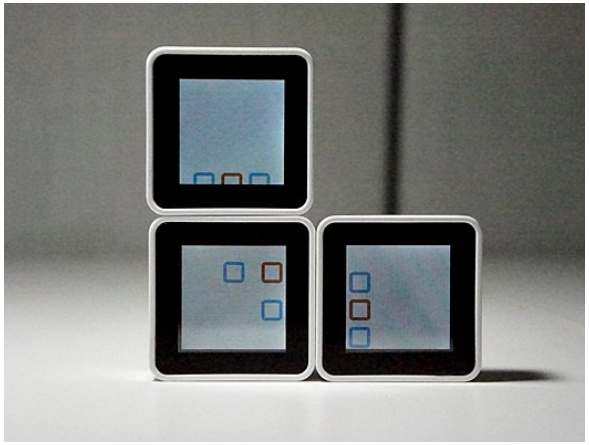




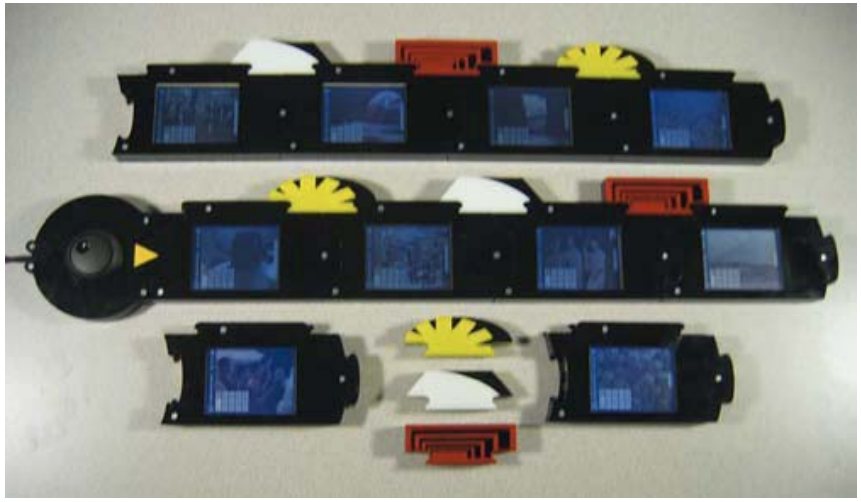
Related Work: Combing and Stacking Tangibles

- Horizontal combination
  - Siftables [Merrill, Kalanithi & Maes 07]
  - Sifteo Cubes (www.sifteo.com)



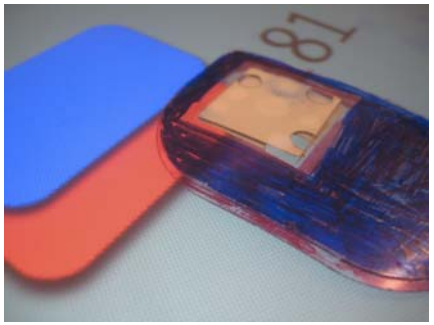


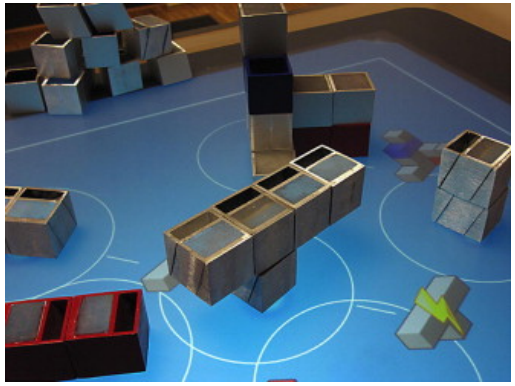
  - Video Editing [Zigelbaum et al. 07]

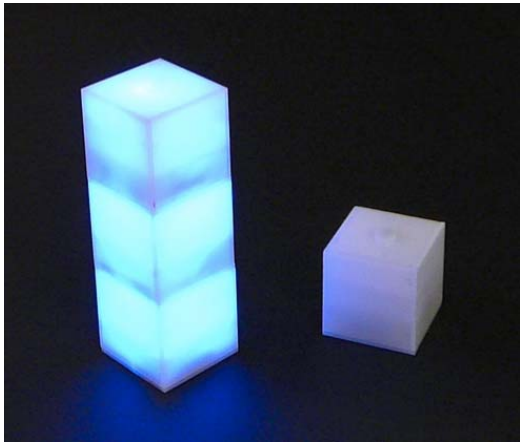


Related Work: Combing and Stacking Tangibles

- Vertical combination
  - Stacks on the Surface → [Bartindale & C. Harrison 09]
  - Lumino [Baudisch, Becker & Rudeck 10] ↘
  - CapStones and ZebraWidgets ↘ [Chan et al. 12]
  - Tangible Programming Bricks ↓ [McNerney 2000]
  - TimeBlocks [Hayashi et al. 12] ↓



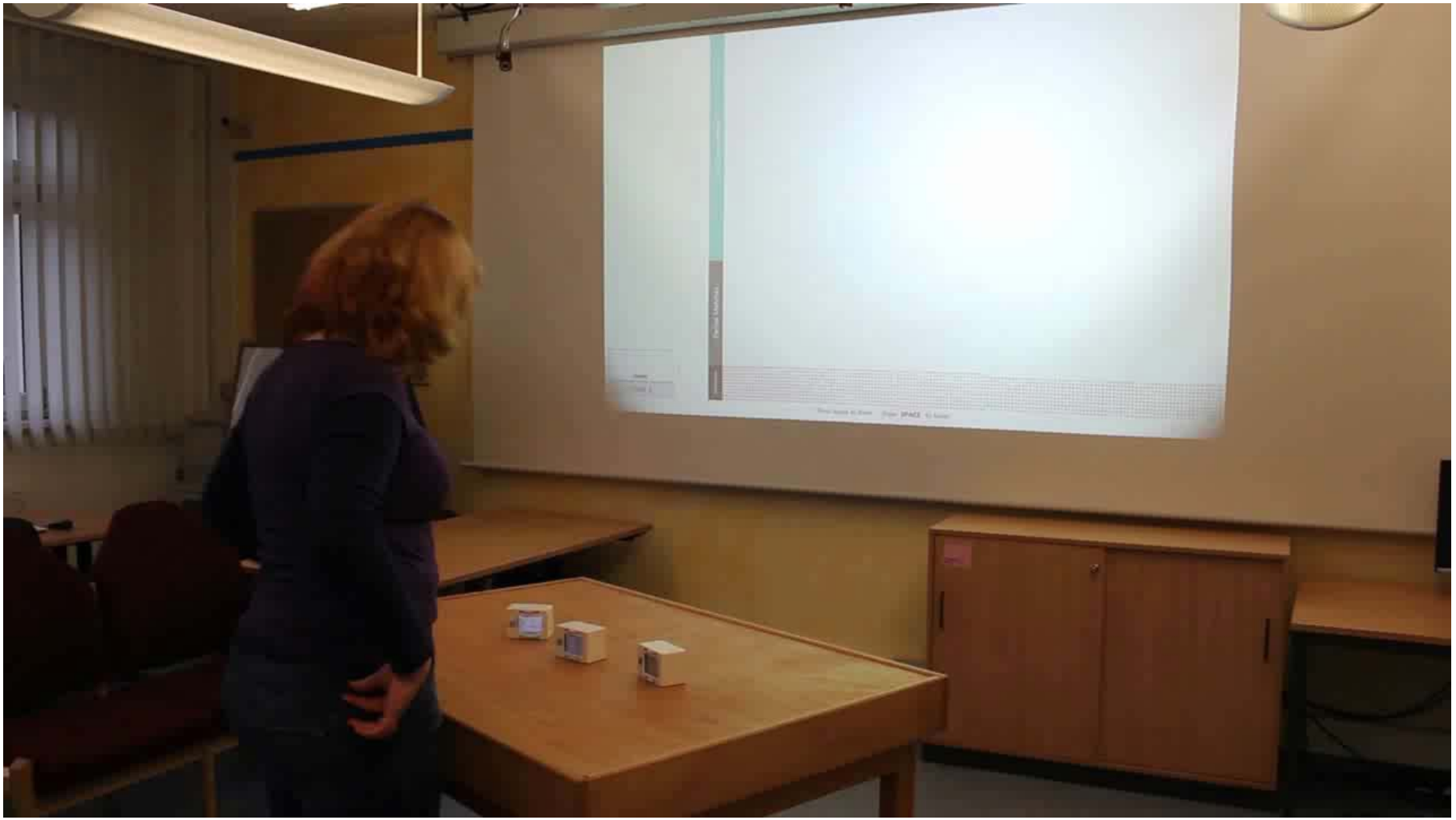




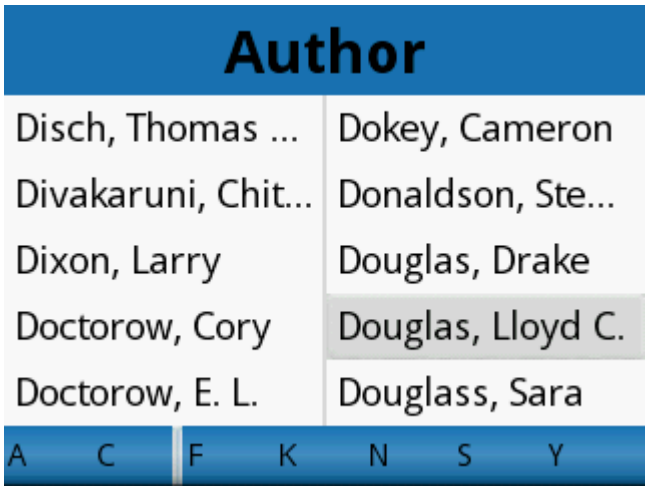
Stackables: Design & Interaction

- Stackable Facet Tokens
  - Main building blocks are stacked to form queries
  - Similar abstract box shape for all facets (numerical + categorical)
  - Facet type can be re-assigned, values adjusted at any time
  - Arbitrary number of facets and facet values
  - Color display + 2 input wheels + touch button

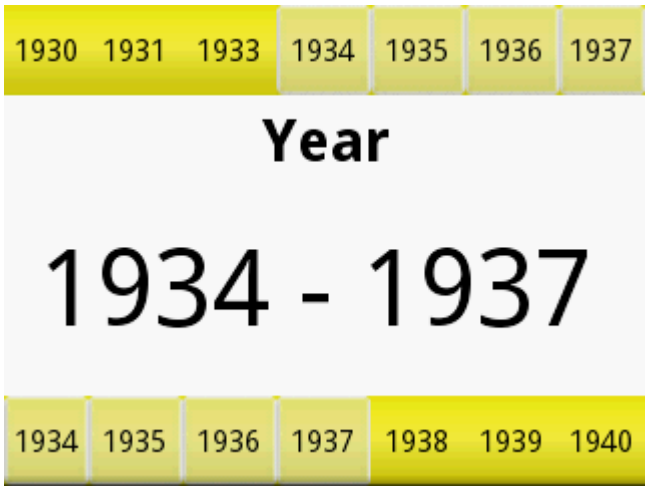
Facet Selection



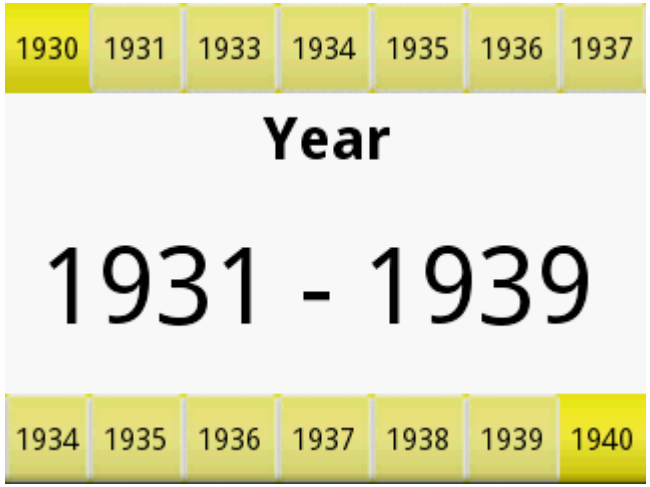
Interface Design: Categorical Facets

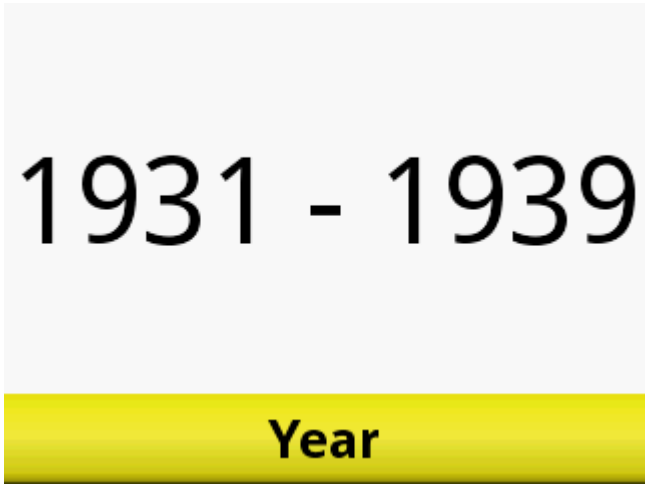


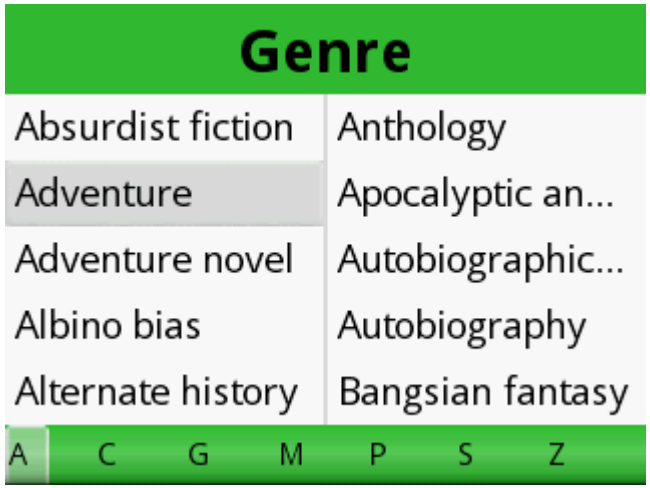
Interface Design: Numerical Facets

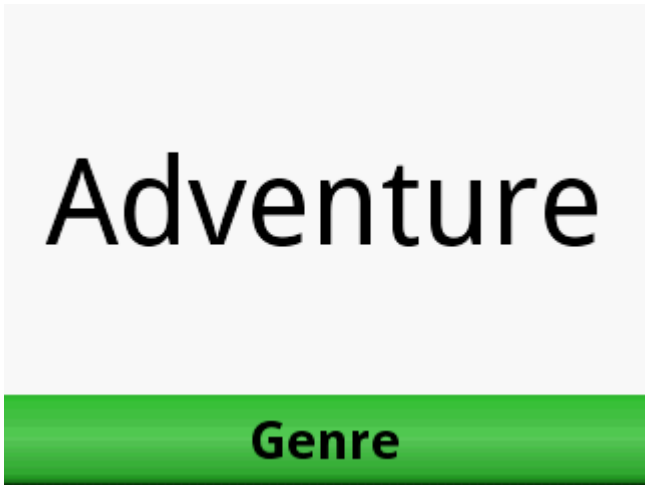


Interface Design: Idle Mode









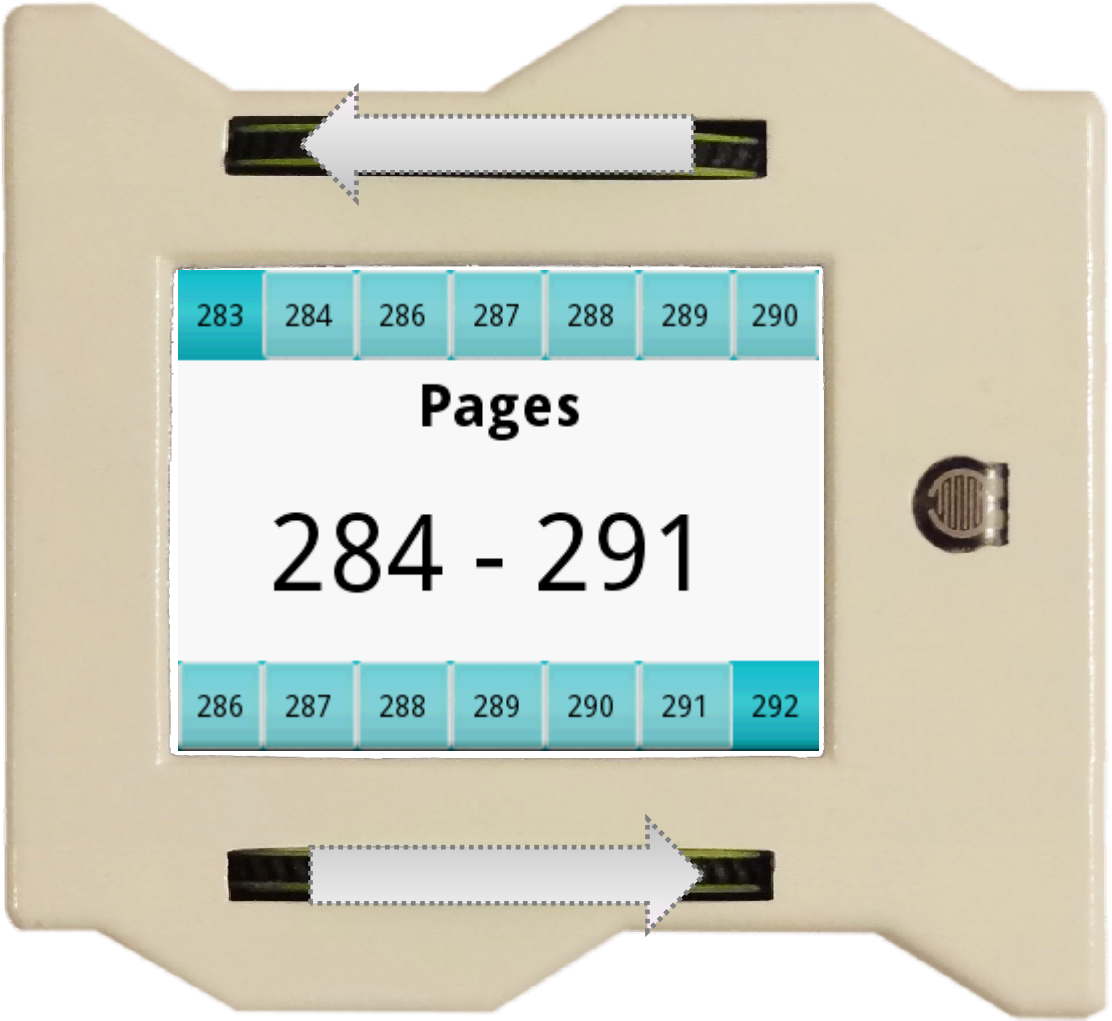
Adjusting Facet Values – Single and Range Selection

Single Facet Value Selection: with Upper Wheel

Single Facet Value Selection: with Lower Wheel

Value Range Selection: Categorical Values

Value Range Selection: Numerical Values



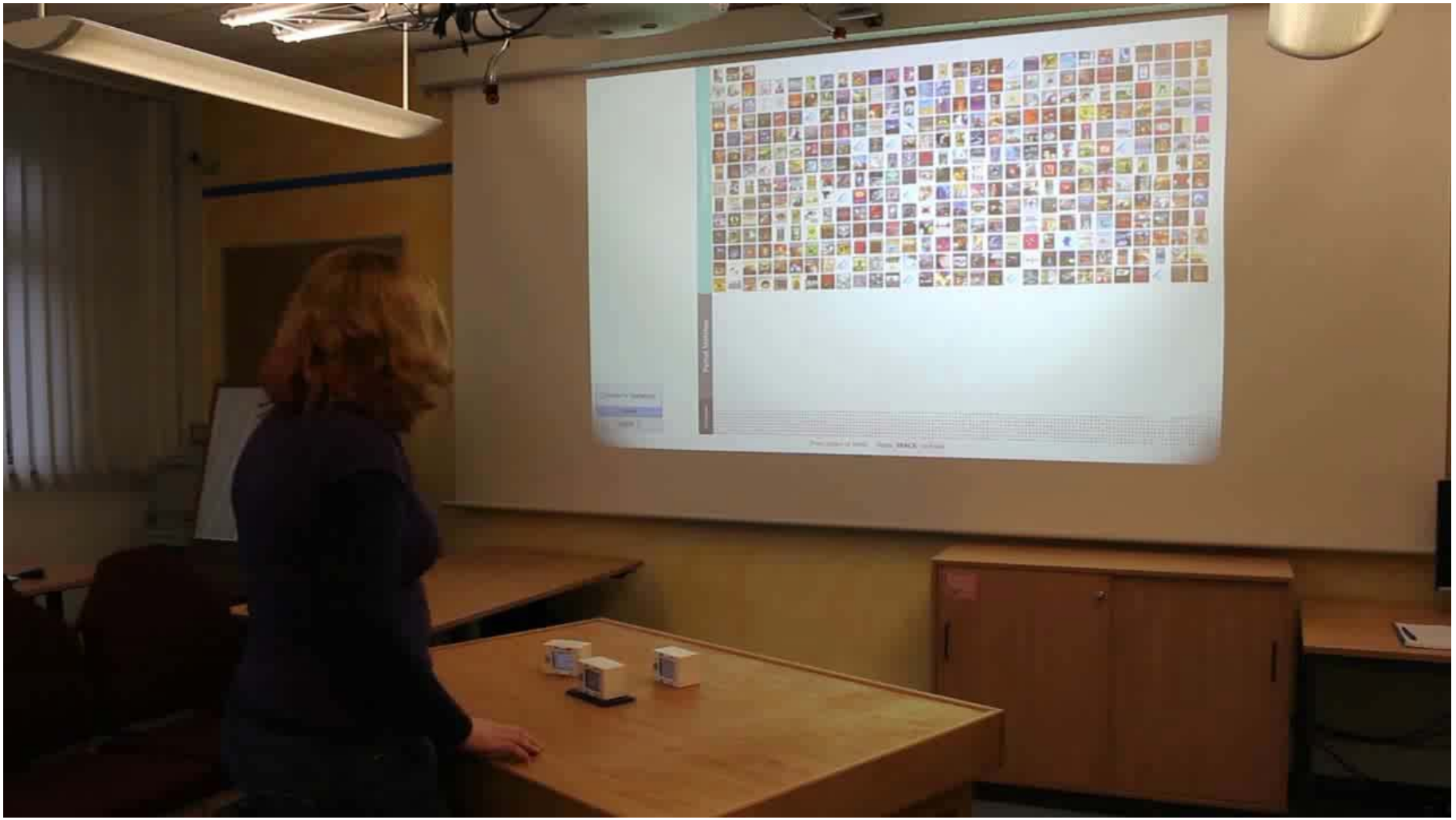
Value Range Selection: Numerical Values

Issuing a Query: Stacking facets (AND)

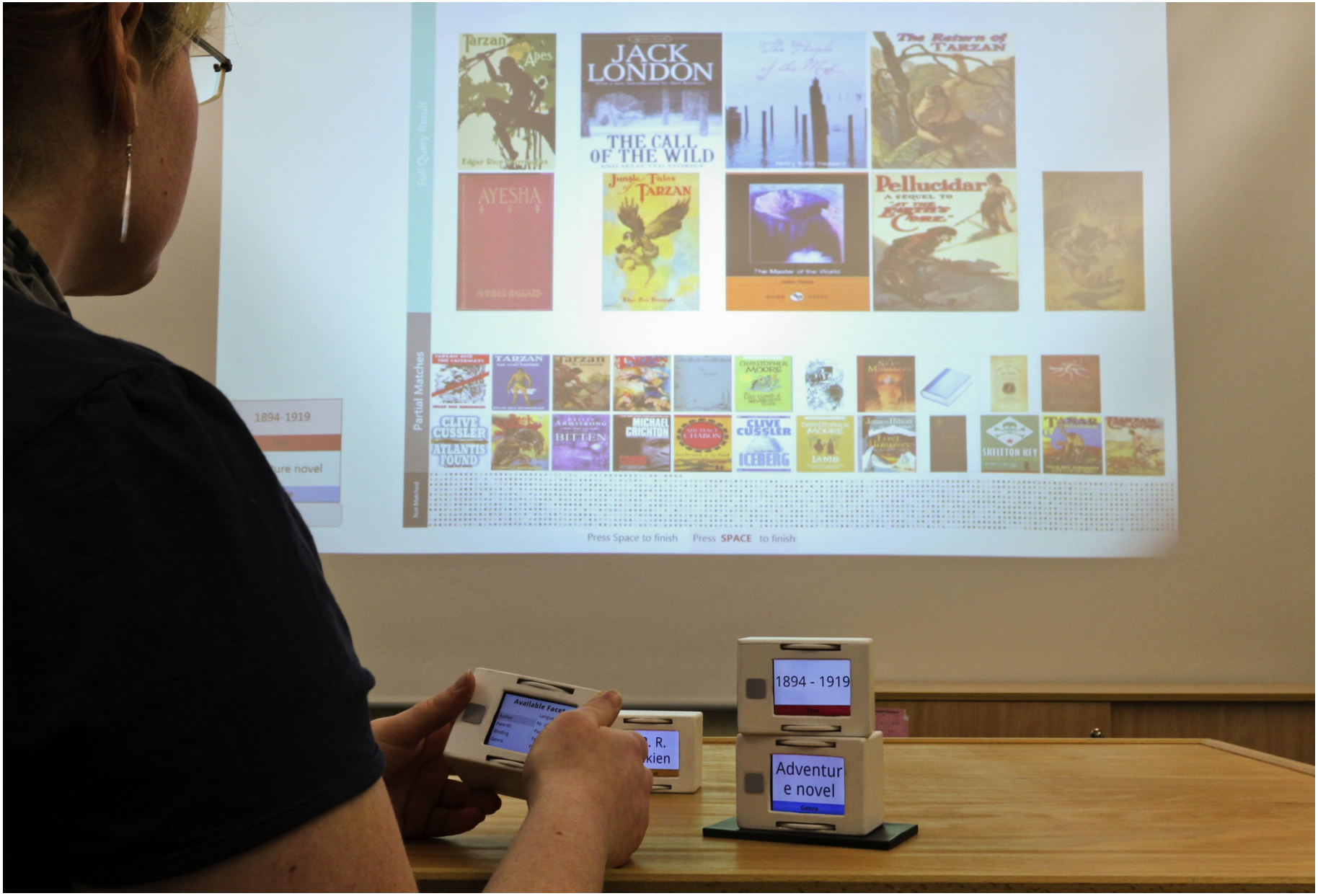
Dynamic Change of Facet Value Availability

Issuing a Query: Stacking facets (Negation)

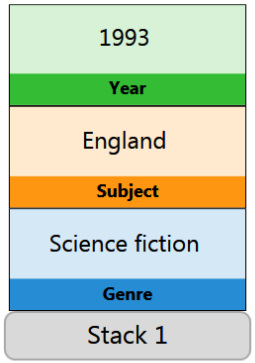
Issuing a Query: Stacking facets

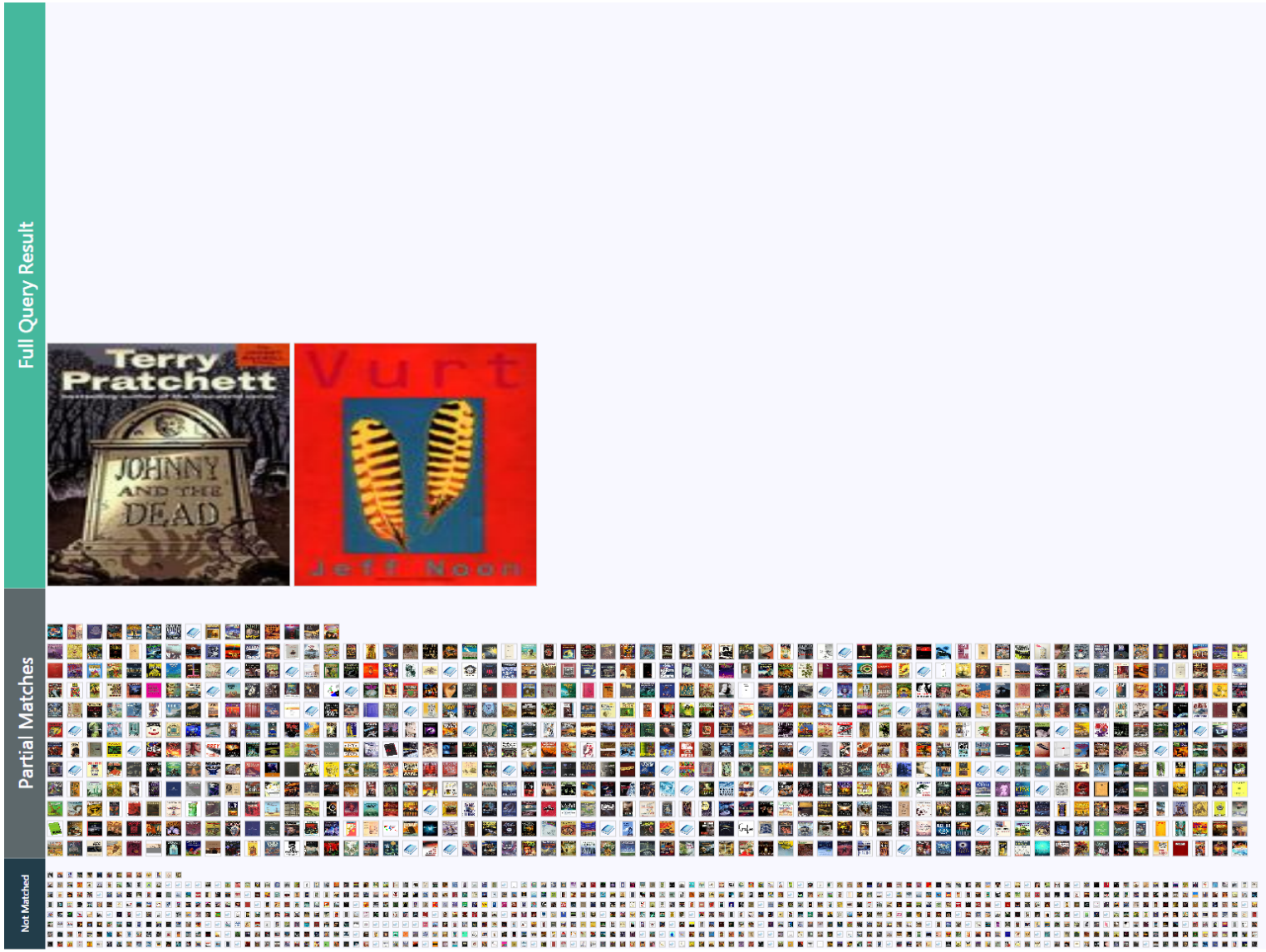


Result Visualization on a Distant Display

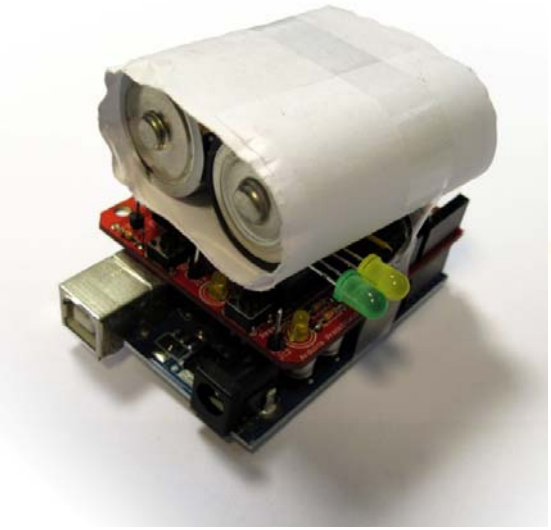


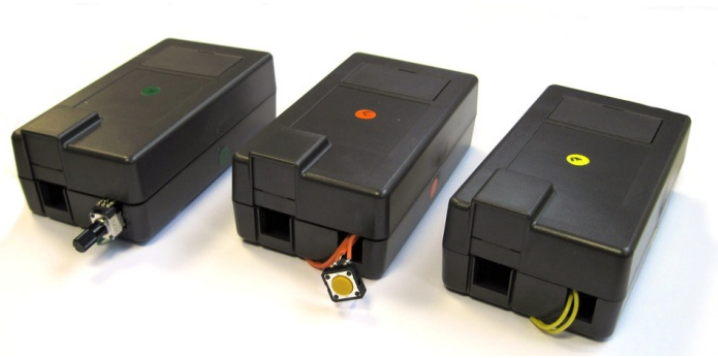
The Visualization Application

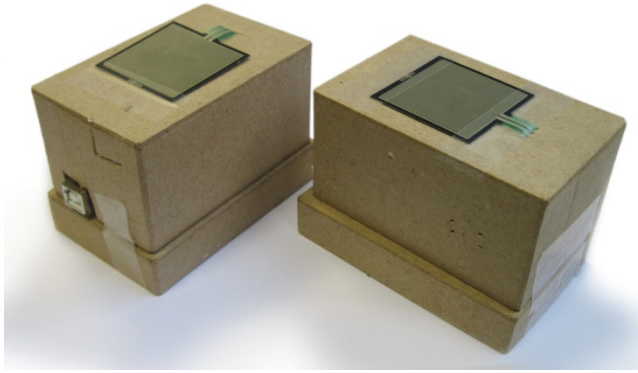




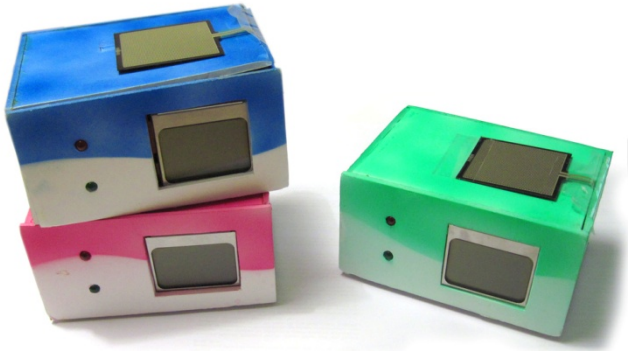
Iterative Design Process & Technical Realization



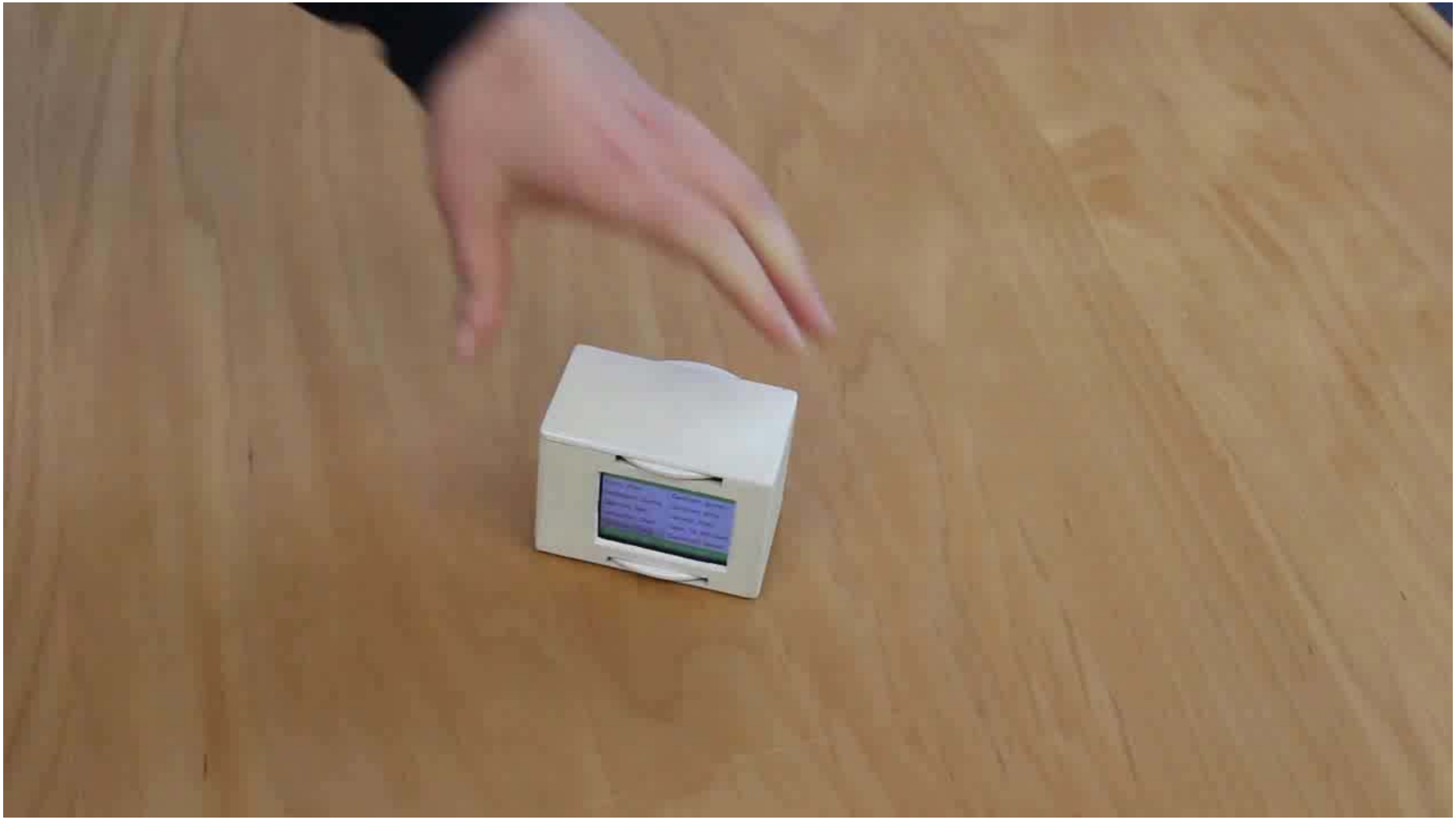




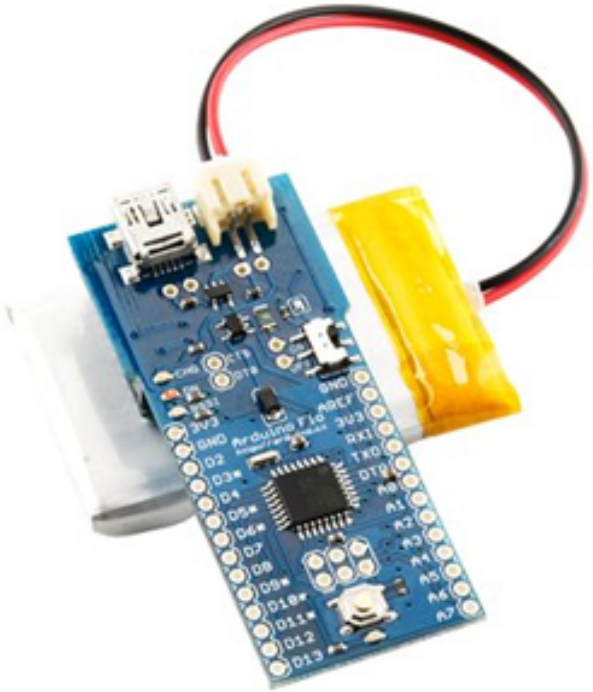
Usability study → paper

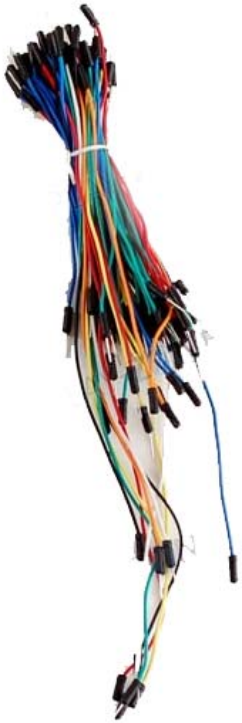


Penultimate Design



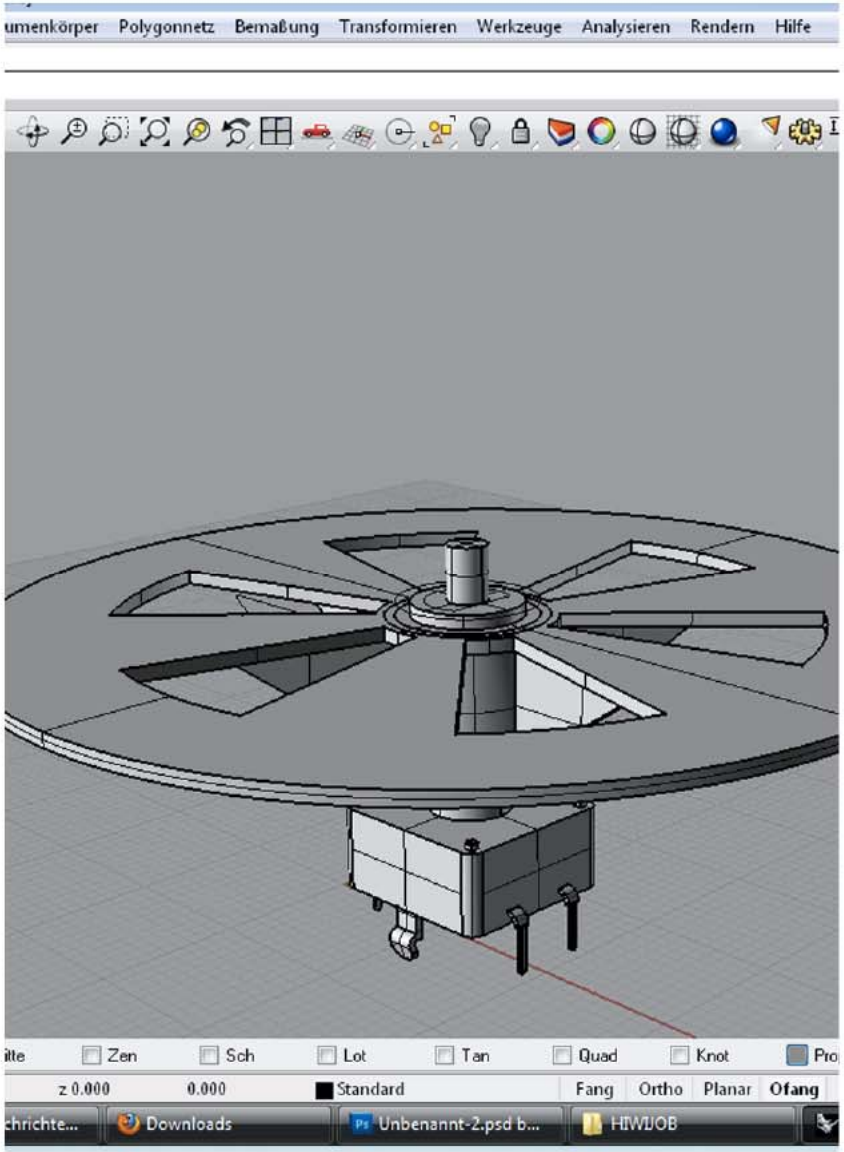
Electronics Inside

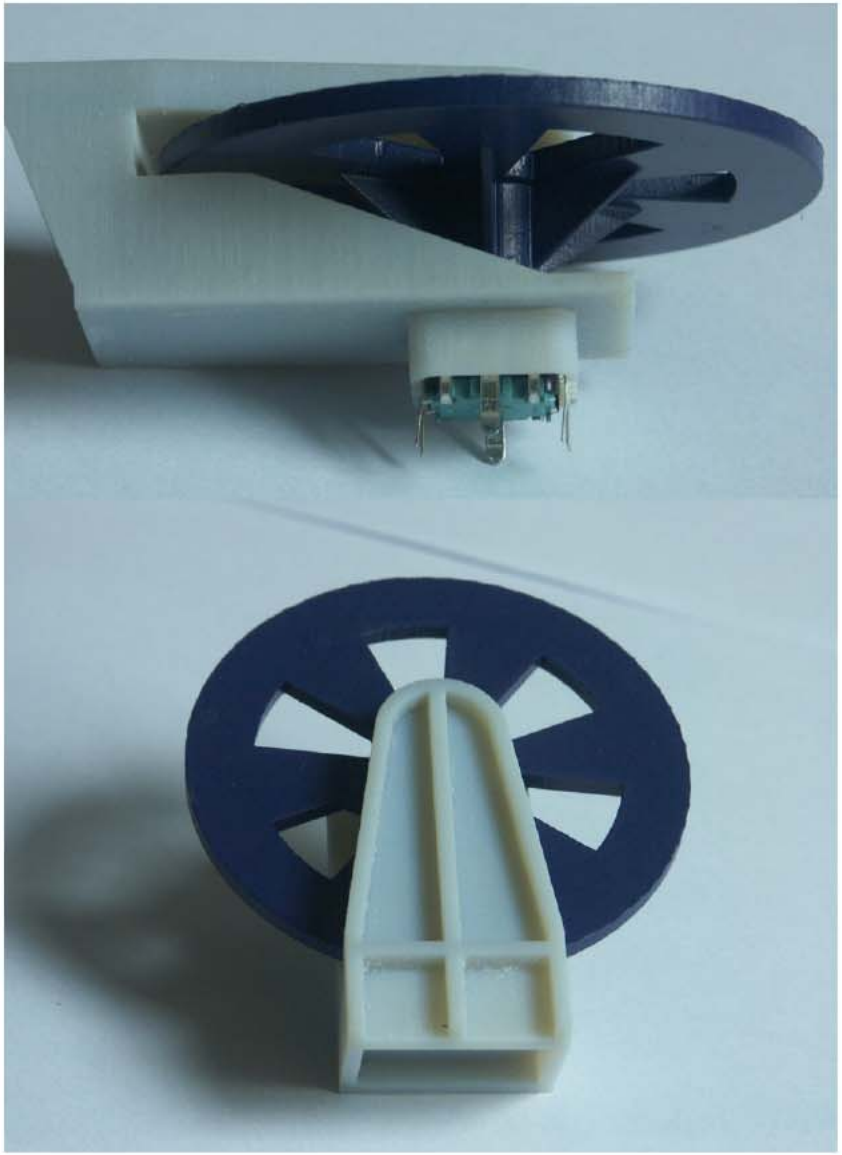




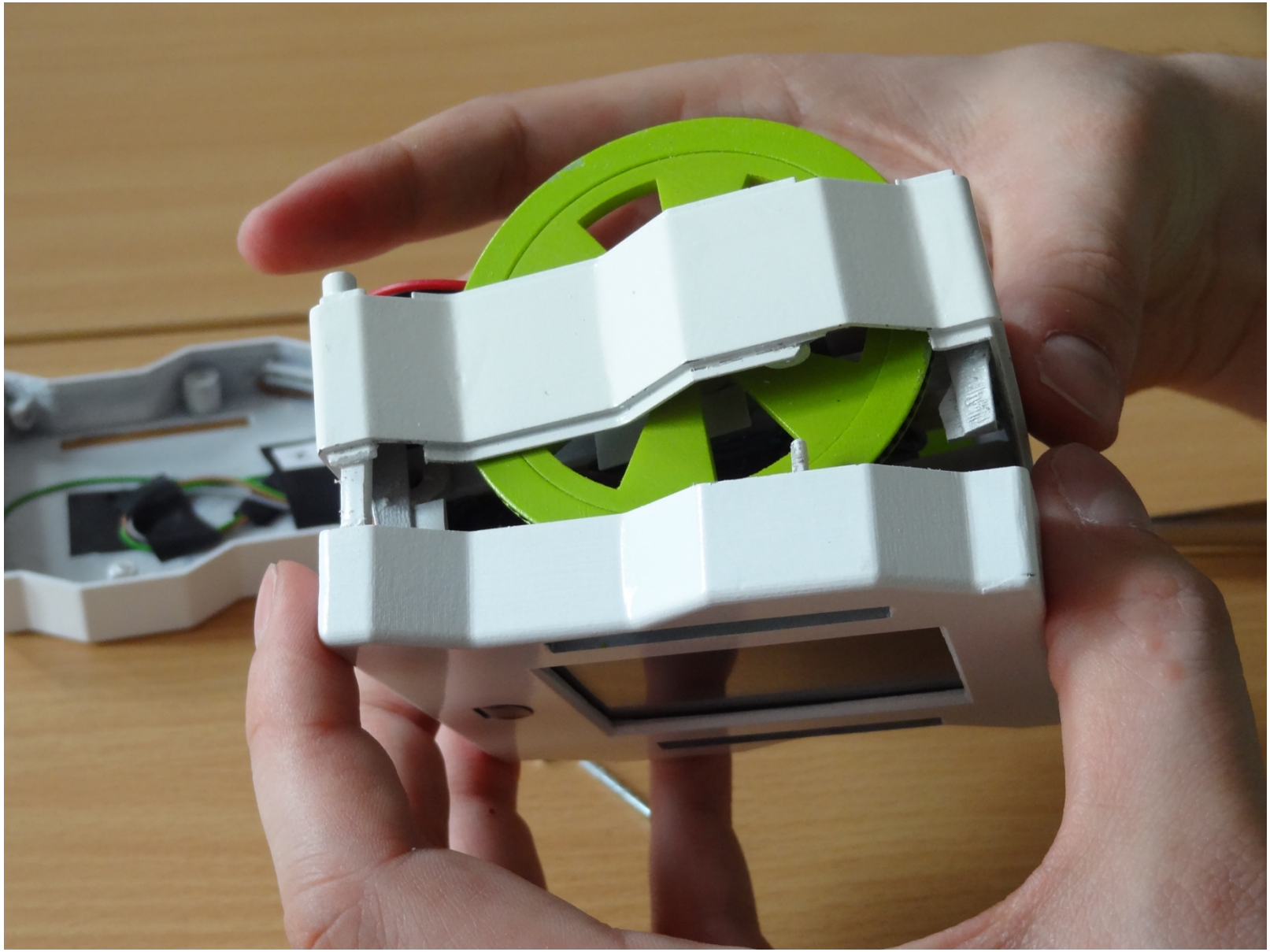
Developing the Improved Design

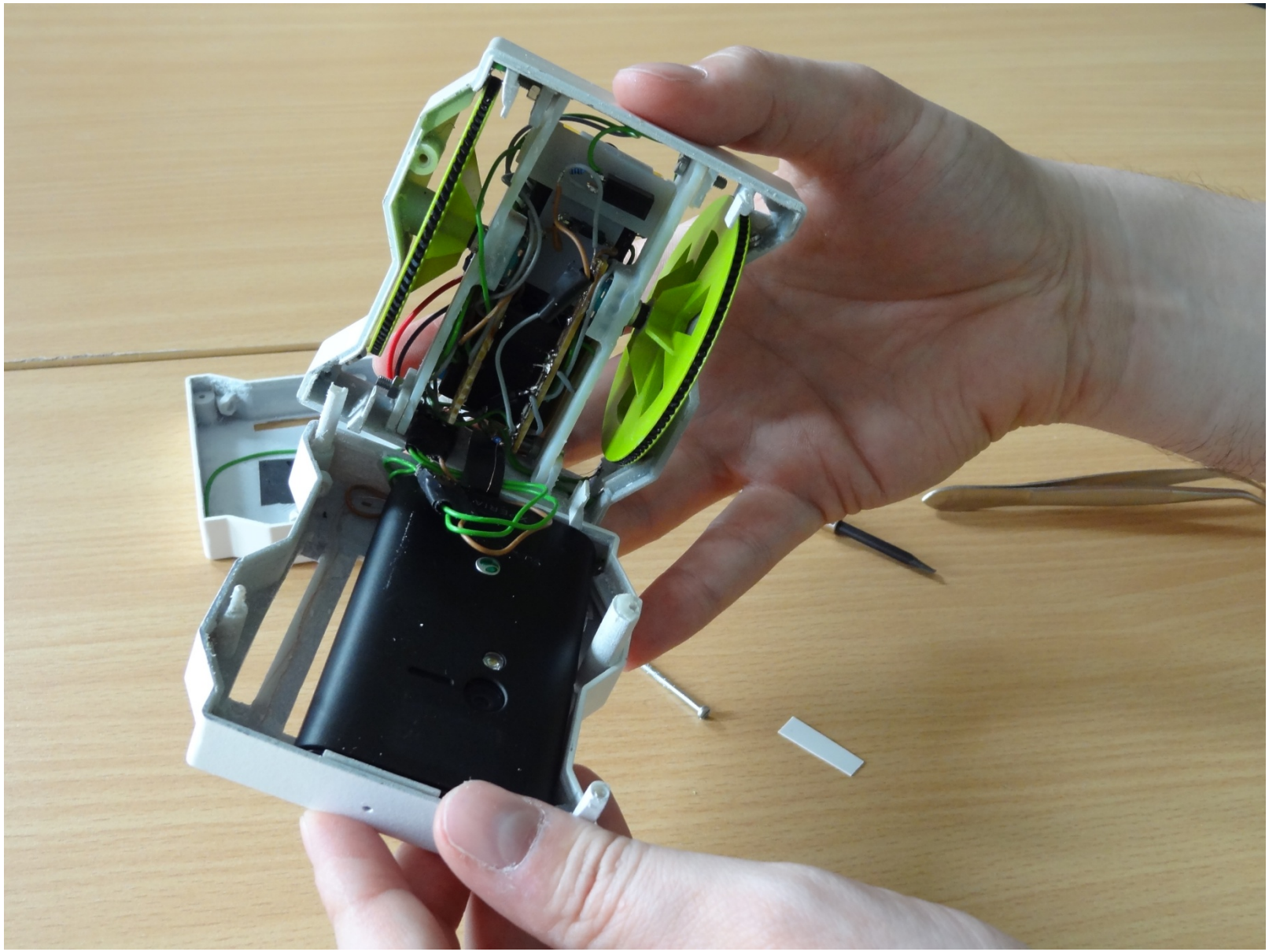
Developing the Improved Design

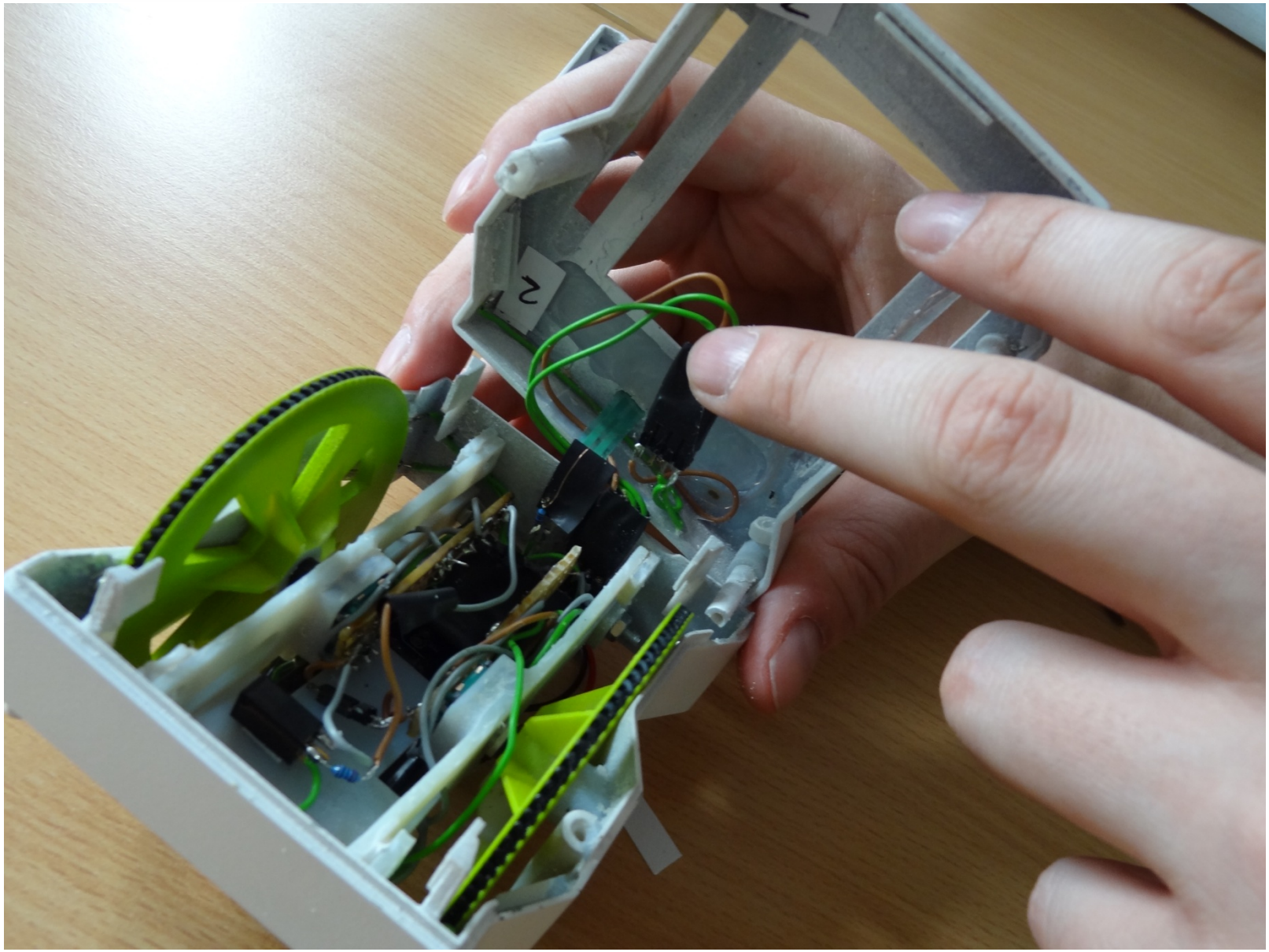


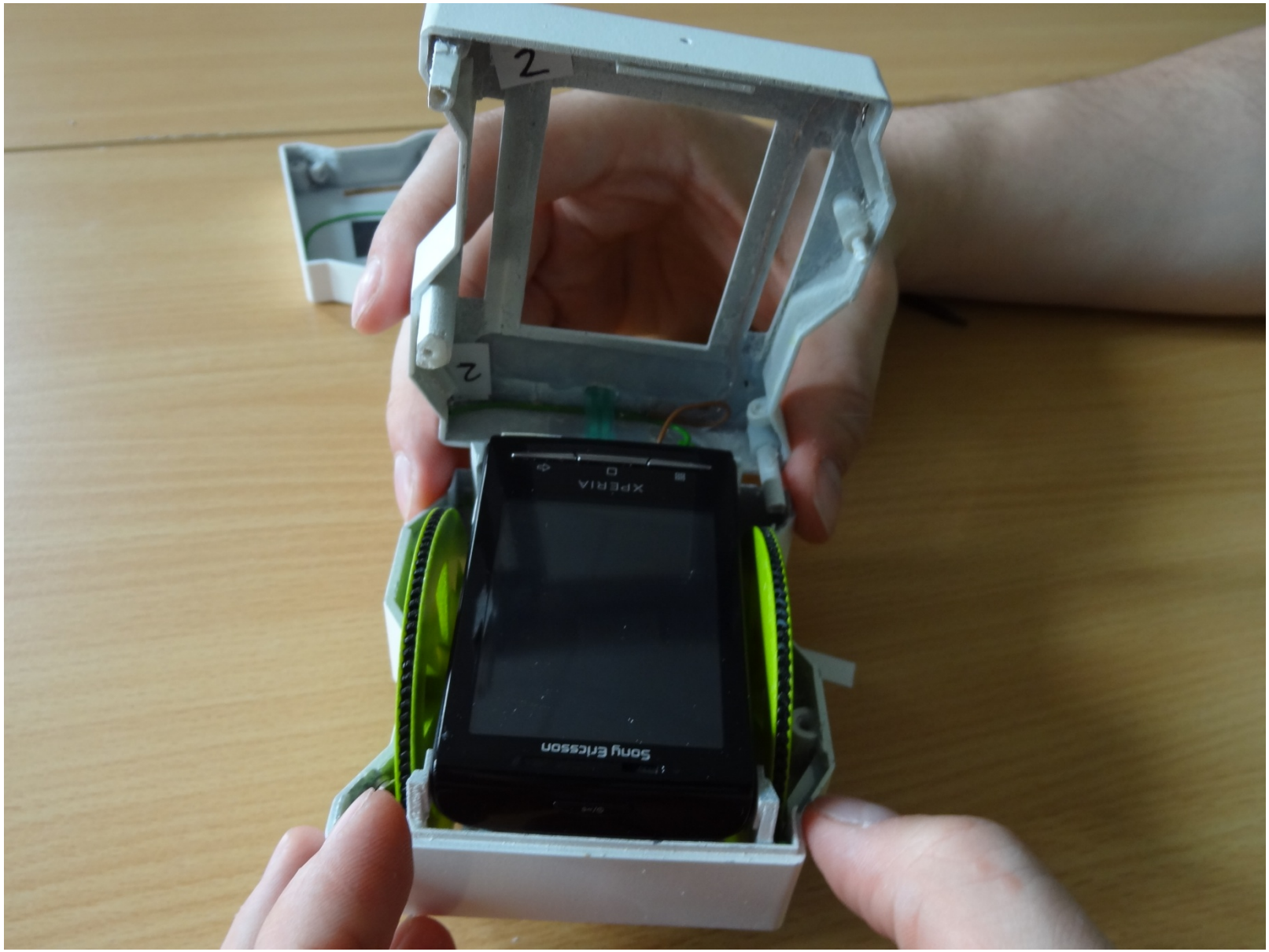


Stackables: Latest Version








2
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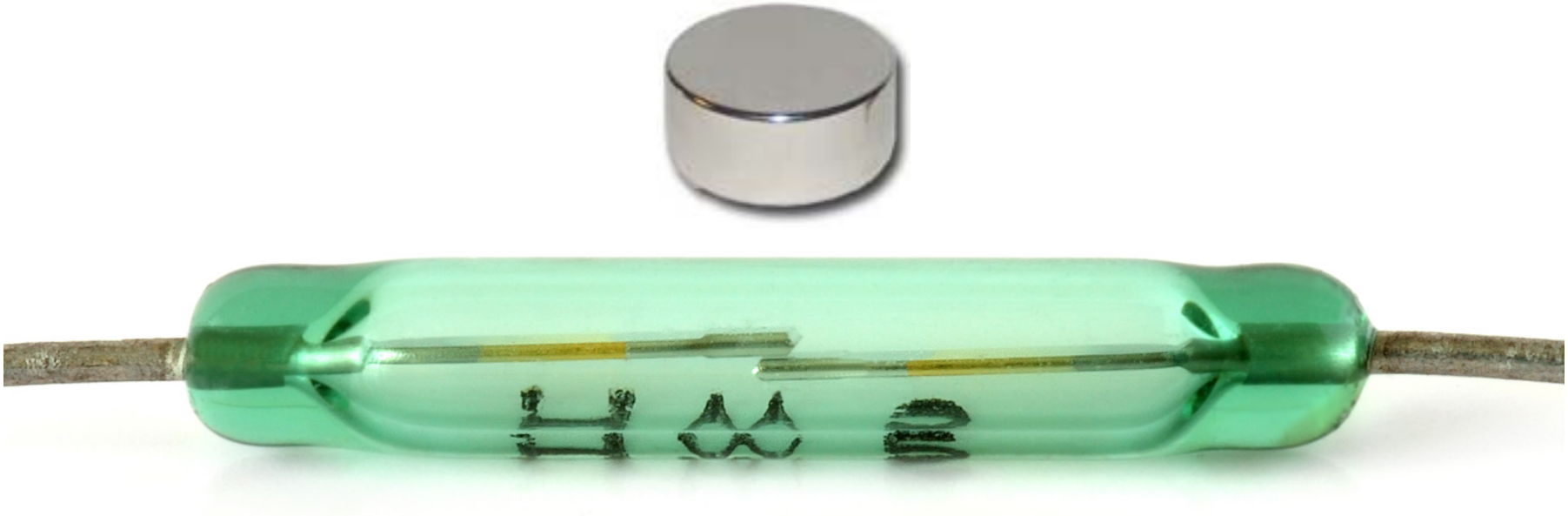
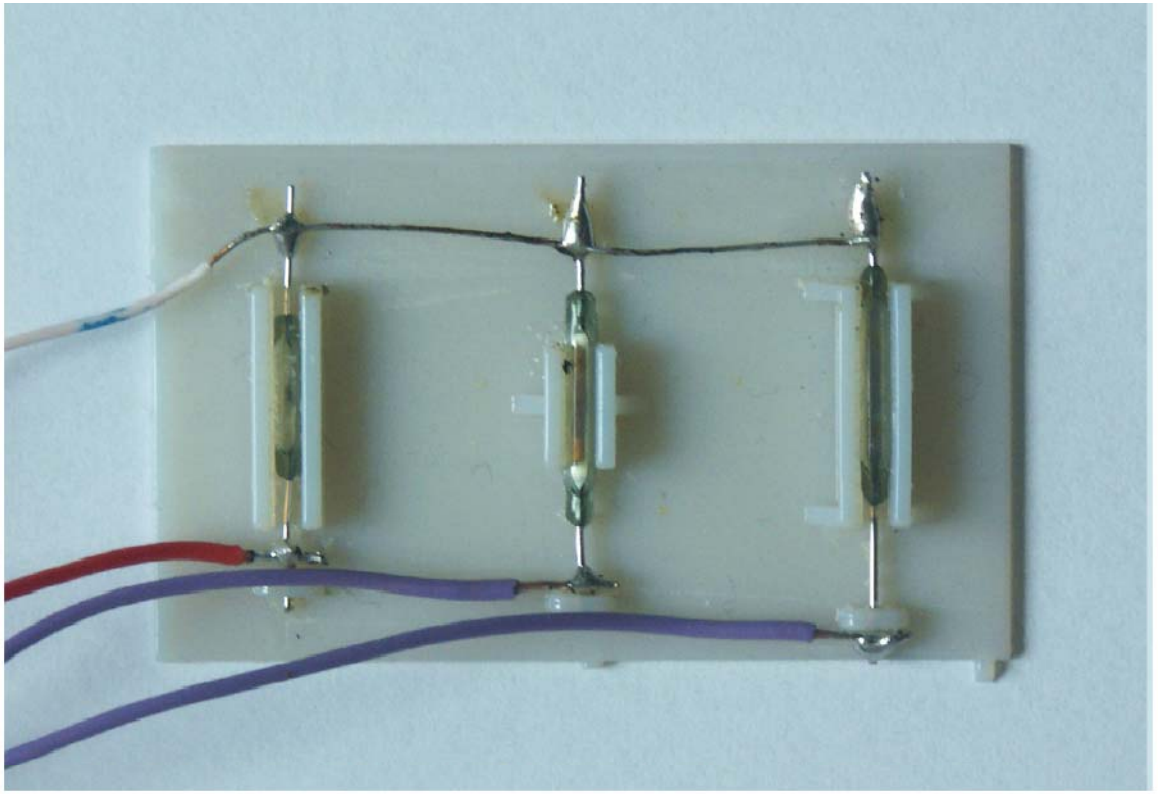
XPERIA
Sony Ericsson

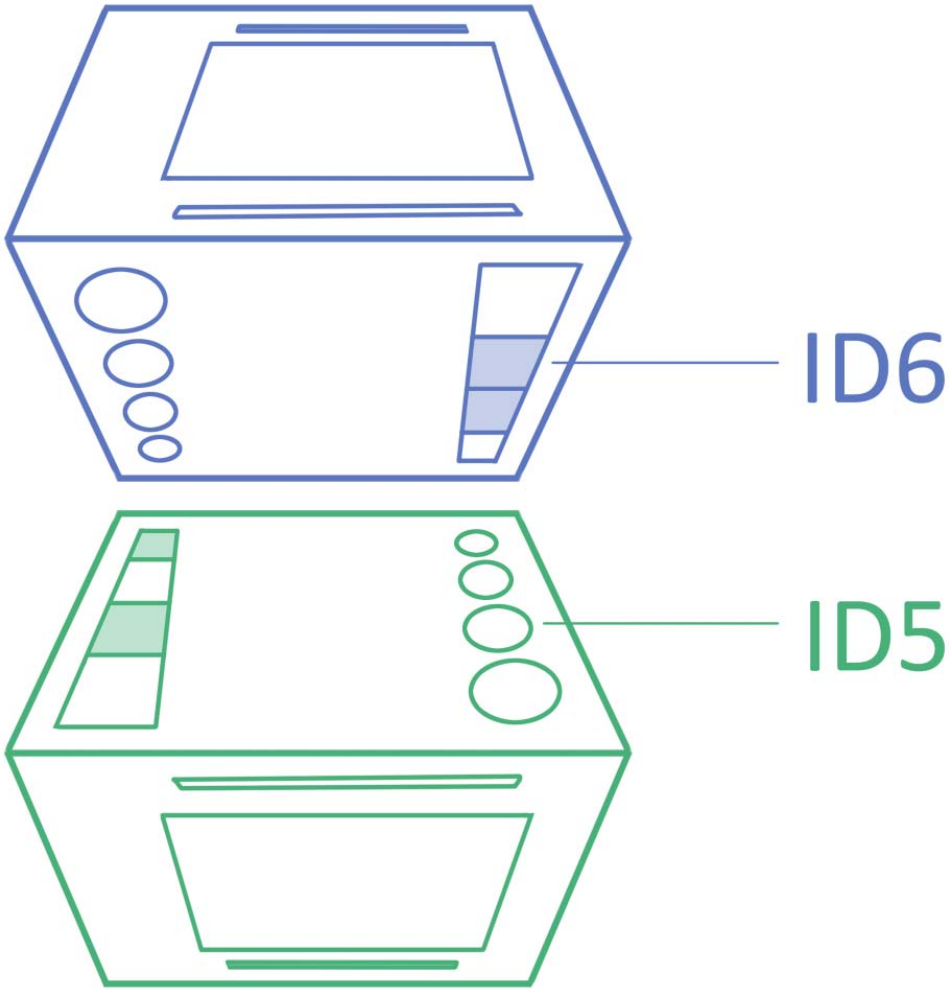
Stacking Recognition: Reed Switches & Magnets



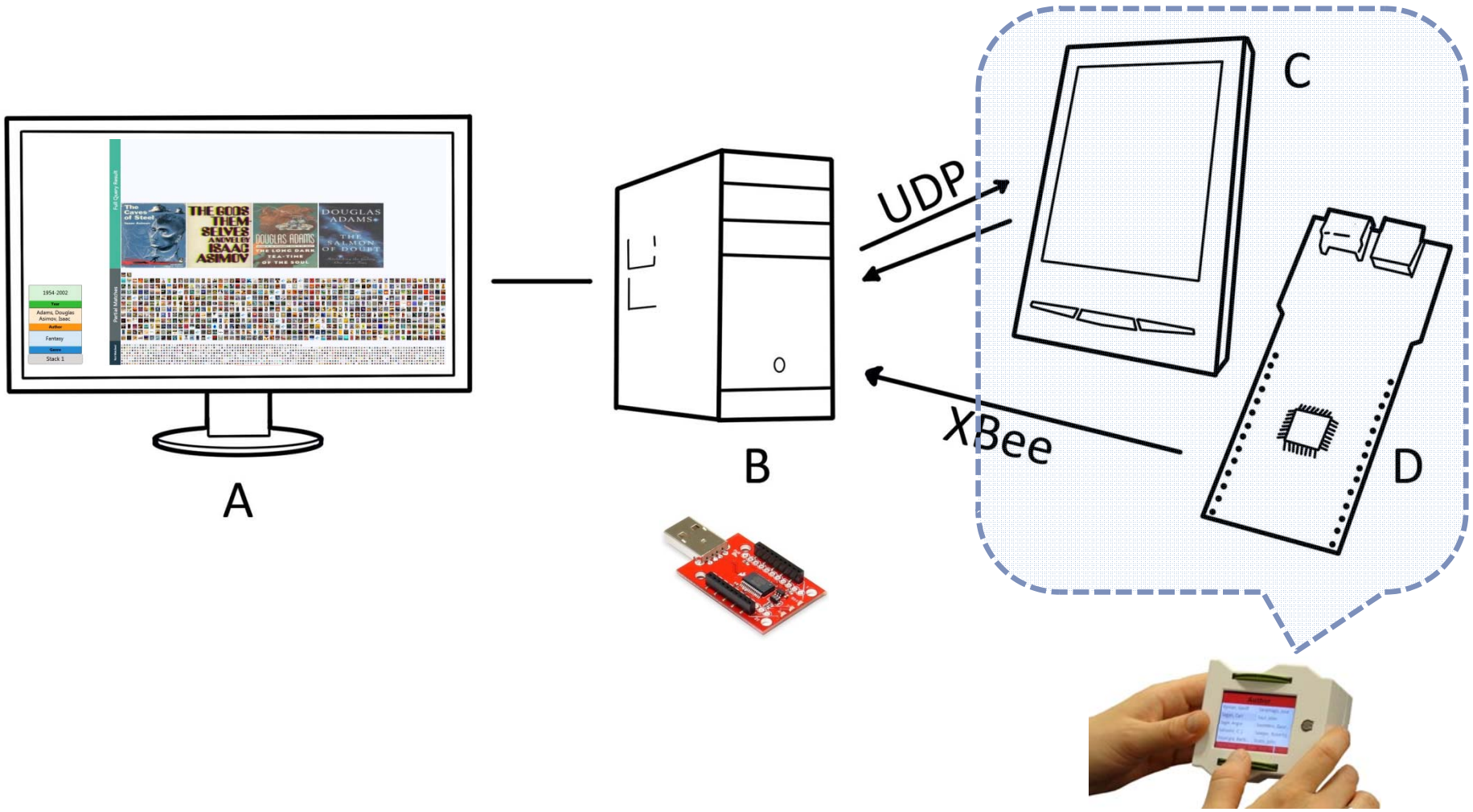
Stacking Recognition: Reed Switches & Magnets



Stacking Recognition: 4 Switches + 4 Magnets / each Side

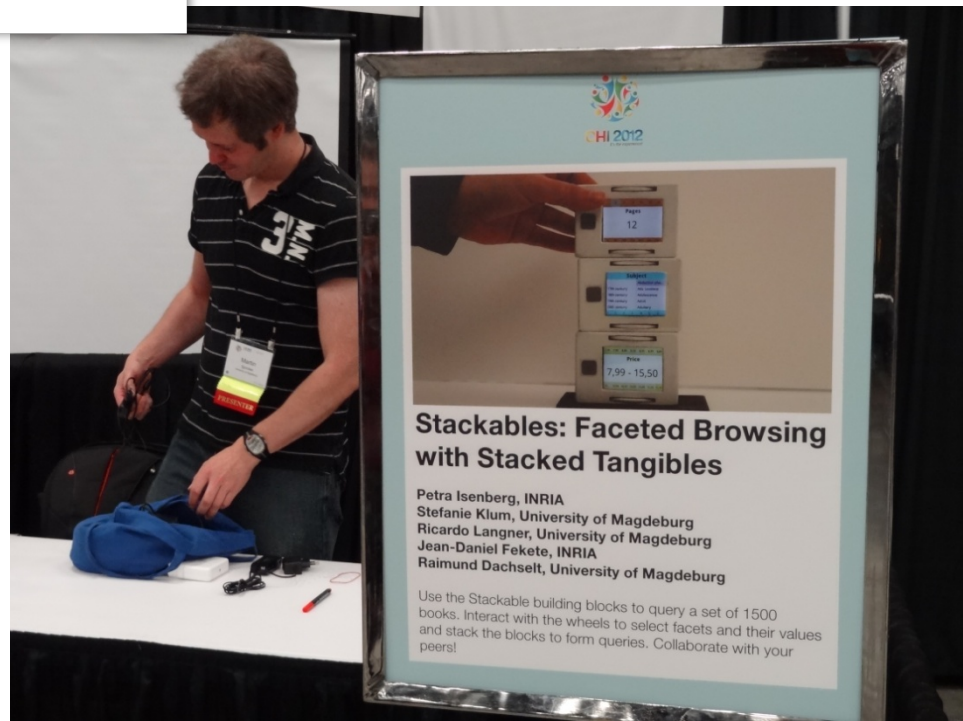


Communication



Some power is also needed…

Stackables @ CHI 2012 it's the experience! as Interactivity



Interactivity @

Conclusion: Contributions

STACKABLES

- Tangible solution for faceted information seeking
  - Tangibles for representing & adjusting arbitrary facets & values
  - Can be manipulated, shared, transferred
- Visualize queries in a physical form by vertical stacking
  - Physical manifestation of result of information seeking process
  - Minimized footprint, several towers for multiple queries
- Individual and parallel interactions in a co-located setting
  - Negotiation of results
- Technical solution with potential for generalization

Conclusion

- Limitations
  - Size still too large, stack sizes limited
  - Display angle, focus switch
  - Technically complex
- Future Work
  - Further look into collaboration issues
  - Tackling the visualization challenges
  - Generalization for other types of applications (e.g. games)

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STACKABLES.

THANK YOU!

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