



Stackables: Faceted Browsing with Stacked Tangibles

Petra Isenberg, Stefanie Klum, Ricardo Langner, Jean-Daniel Fekete,
Raimund Dachsel

► To cite this version:

Petra Isenberg, Stefanie Klum, Ricardo Langner, Jean-Daniel Fekete, Raimund Dachsel. Stackables: Faceted Browsing with Stacked Tangibles. Conference on Human Factors in Computing Systems (CHI Interactivity), May 2012, New York, NY, United States. pp.1083–1086. hal-00691449

HAL Id: hal-00691449

<https://inria.hal.science/hal-00691449>

Submitted on 26 Apr 2012

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Stackables: Faceted Browsing with Stacked Tangibles

Petra Isenberg

Team AVIZ
INRIA
petra.isenberg@inria.fr

Stefanie Klum

UISE Group
University of Magdeburg
stefanie.klum@steelis.net

Ricardo Langner

UISE Group
University of Magdeburg
rlangner@ovgu.de

Jean-Daniel Fekete

Team AVIZ
INRIA
jean-daniel.fekete@inria.fr

Raimund Dachzelt

UISE Group
University of Magdeburg
dachzelt@acm.org

Abstract

We demonstrate *Stackables*, tangible widgets designed for individual *and* collaborative faceted browsing. In contrast, current interfaces for browsing and search in large data spaces largely focus on supporting either individual *or* collaborative activities. Each stackable facet token represents search parameters that can be shared amongst collaborators, modified, and stored. We show how individuals or multiple people can interact with Stackables and combine them to formulate queries on realistic datasets. We have successfully used and evaluated Stackables in a user study with a dataset of over 1500 books and 12 facets with ranges of thousands of facet values.

Keywords

Tangible UIs; faceted browsing & search; collaboration

ACM Classification Keywords

H.5.2 [User Interfaces]: Input devices and strategies.

Introduction

Imagine a medium-sized business has to decide on the purchase of computer equipment for its employees. The decision on what to purchase can have profound impact on employee productivity and business profitability and choices on options and specifications are therefore not easy to make. Typically, decision makers from several departments with varying priorities and skills are involved



Figure 1: Three Stackables combined in a query stack.



Figure 2: Stackables are small tangibles for faceted browsing that can be used alone or together with others.

in the selection process. Faceted browsing can help decision makers: they can consider data from different conceptual dimensions and incrementally refine a dataset by restricting facet values such as price, technical attributes, or ratings (e.g., [4, 7]).

The scenario above poses a number of challenges to regular faceted information seeking interfaces: (a) The decision makers will likely begin with a private search and later have to share and discuss their results as well as facet values which led to them. (b) During a decision meeting, the shared use of an information seeking interface can help to advance the discussion and clarify options. Such an interface needs to be easily set up and to allow participants to fluidly share, transfer, and manipulate facet values while working in a closely or loosely coupled fashion [5].

Stackables were designed to address these challenges: to bridge the gap between individual and collaborative work phases, be useful in meetings, and for sharing results from search activities in large data sets. Each Stackable tangible physically represents search parameters that can be shared amongst collaborators, modified during an information seeking process, and stored and transferred.

Stackables: Design

Several benefits of tangible interfaces made them a promising option to tackle the mentioned challenges: Tangibles allow parallel interactions in a co-located setting (cf. [6]), tangible facet representations visualize queries in a physical form (cf. [8]), and allow direct input for all participants. Finally, tangible query representations are a form of physical manifestation of the result of an information seeking *process* that can be stored and re-accessed for further work in other settings.

We designed our stackable tangibles to support:

- R1** realistic datasets (large number of facets & values),
- R2** faceted browsing principles, simple boolean queries,
- R3** separation of search input and result output (no tabletop needed, just regular meeting spaces),
- R4** use in both individual and collaborative work phases.

Stackables consist of two main components: facet tokens and ground plates (see Fig. 1).

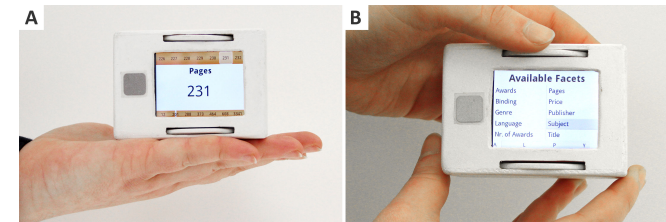


Figure 3: Stackables size related to a female hand (A) and when held between two hands (B, available facets in a book dataset are shown).

Tokens Facet tokens as the main building blocks are stacked (cf. [3]) to form queries. A token can represent any numeric or categorical facet in our dataset and can be assigned and re-assigned on the fly. Thus, each Stackable is generic and contains information about all facets and their values. All tokens share a similar abstract box shape that can be easily stacked. The token's box is held in a neutral white to further emphasize its versatility in facet choice (R1). Facet type is not encoded permanently on the box to allow for reuse. Instead, a color-display on the front shows facet data. Two turnable wheels at the top and bottom (accessible from the front and the back) allow for selection of facets and facet values. The display and wheels are positioned off-center so that the up-direction of a token is readily visible. This also gives room for a button-like area on the left, e.g. used for selection (see Fig. 3).

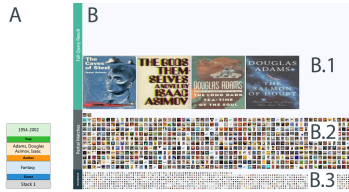


Figure 5: Result representation of a query with three Stackables in a single stack (A). B.1 shows the cover of all books matching all selected facets values in the stack, B.2 shows partial matches, and B.3 all books matching no selected facet value.



Figure 6: Assembly of the components of Stackables in a wooden box.

by the participating Stackables (Fig. 5, A) and a representation of the results of the queries (Fig. 5, B). The result representation shows three categories of results (B.1-B.3): perfect matches which satisfy all participating queries (all formed stacks), result showing partial matches (items matched by only some stacks or parts of a stack), and all unmatched items. While participating users interact with the tangibles and reorder the stacks, the visualization updates immediately to show new results and near matches. This behavior allows people to actively explore a dataset and adjust queries on the fly.

Realization and Evaluation

During the development of Stackables, we built a series of five prototypes of different hardware, materials, and stacking solutions. The latest Stackable tokens consist of two main components: a mobile phone with dedicated software to display facets and their values and a small Arduino FIO micro-controller of the open source Arduino project (cf. Fig. 6). Our preferred stacking solution uses reed switches or NFC tags. It, thus, differs from previous solutions which required the presence of a digital tabletop display [3]. Interactions with the latest prototype were evaluated with 12 participants. The results validated the interaction concept, showed that our requirements were well translated into design, but also exposed areas for improvement we are currently incorporating.

Conclusion

Making information seeking both more efficient and simple is an important research endeavor. We developed Stackables as a new tangible solution for faceted browsing and search and make three main contributions: we a) explore the feasibility of vertical stacking for query construction, b) provide a flexible interaction concept for large datasets with many facets and facet values, and c)

constructed Stackables to be usable in face-to-face meetings and for individual use. We are currently working on extending our set of Stackable tokens for a usage scenario involving small groups of 2–4 participants.

References

- [1] C. Ahlberg and B. Shneiderman. The alphaslider: a compact and rapid selector. In *Proc. of CHI*, 365–371, New York, NY, USA, 1994. ACM.
- [2] P. G. Anick, J. D. Brennan, R. A. Flynn, R. R. Hanssen, B. Alvey, and J. M. Robbins. A direct manipulation interface for boolean information retrieval via natural language query. In *Proc. SIGIR*, 135–150. ACM, 1990.
- [3] P. Baudisch, T. Becker, and F. Rudeck. Lumino: Tangible blocks for tabletop computers based on glass fiber bundles. In *Proc. of CHI*, 1165–1174, USA, 2010. ACM.
- [4] R. Dachsel, M. Frisch, and M. Weiland. Facetzoom: A continuous multi-scale widget for navigating hierarchical metadata. In *Proc. of CHI*, 1353–1356, USA, 2008. ACM.
- [5] P. Isenberg, D. Fisher, M. Ringel Morris, K. Inkpen, and M. Czerwinski. An Exploratory Study of Co-located Collaborative Visual Analytics around a Tabletop Display. In *Proc. of VAST*, 179–186. IEEE, 2010.
- [6] H.-C. Jetter, J. Gerken, M. Zöllner, H. Reiterer, and N. Milic-Frayling. Materializing the query with facet-streams: A hybrid surface for collaborative search on tabletops. In *Proc. of CHI*, 3013–3022, USA, 2011. ACM.
- [7] B. Lee, G. Smith, G. G. Robertson, M. Czerwinski, and D. S. Tan. Facetlens: Exposing trends and relationships to support sensemaking within faceted datasets. In *Proc. of CHI*, 1293–1302, USA, 2009. ACM.
- [8] B. Ullmer, H. Ishii, and R. J. K. Jacob. Tangible query interfaces: Physically constrained tokens for manipulating database queries. In *Proc. of Interact*, 279–286, Netherlands, 2003. IOS Press.
- [9] D. Young and B. Shneiderman. A graphical filter/flow representation of boolean queries: A prototype implementation and evaluation. *Journal of the American Society for Information Science and Technology*, 44:327–339, 1993.