

pART bench: A Hybrid Search Tool for Floor Plans in Architecture

Web Application for Tablets and Tabletops

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Abstract

Architectural databases often contain thousands of different floor plans which have either been collected from historical designs or, more recently, auto-generated by suitable algorithms. Searching for a floor plan that fits specific requirements in such a database involves setting a large number of parameters, such as lighting levels, room types and many more. We present pART bench,

a hybrid tabletop/tablet tool which allows the use of intuitive touch commands and tangible objects to quickly adjust search parameters, view resulting floor plans and iteratively refine the search. We report on a requirements analysis with practicing architects, on the design process, and describe our prototypical implementation of the system on a tablet and a PixelSense tabletop device.

Implementation

We take into consideration tablets (starting from 7" screen size) as well as large screen devices, including tabletops. To allow the user to perform actions on very small screens we introduce different zoom levels of interaction.

On the other hand, large devices such as tabletops provide not only a larger workspace, but also offer the possibility of using tangibles in a decent

size as an additional interaction modality. Each tangible represents one of the 8 implemented parameters (e.g. room size and daylight factor) or an interaction type (e.g. copy and create).

Our main goal was to interlace the tangible mode with the primary set of actions to provide an additional level of comfort, speed, as well as novelty during the work process.

Formative Evaluation and Paper Prototype Tests

The participants in our user study were allocated to one of two groups according to their architectural expertise: (1) students of architecture in Bachelor's and Master's degree programs, who were found to be more likely to query in a creative way, to explore and learn about possible design solutions; (2) professional researchers in architecture (either professors or advanced Ph.D. students, most of whom were also practicing architects, at least part-time), who were found

to query more often task-based (i.e., directly for floor plans with specific parameters).

14 students completed an online questionnaire and five experts were invited to semi-structured open interviews. The main topics discussed were commonly used floor plan sources, frequency of use of touch devices, various ideas of how tangible interfaces might be used during floor plan retrieval, and, of course, details of the architects' work process. According to our study, architects

prefer working at desktop computers or on touch devices, as such hardware is already accessible; they were, however, very open to the idea of using tangibles for further interaction if their use would speed up the search process for floor plans or would simply improve the user experience.

For the paper prototype test, we found 5 participants of both classes of expertise who evaluated our first system and interaction ideas. The result was satisfying.

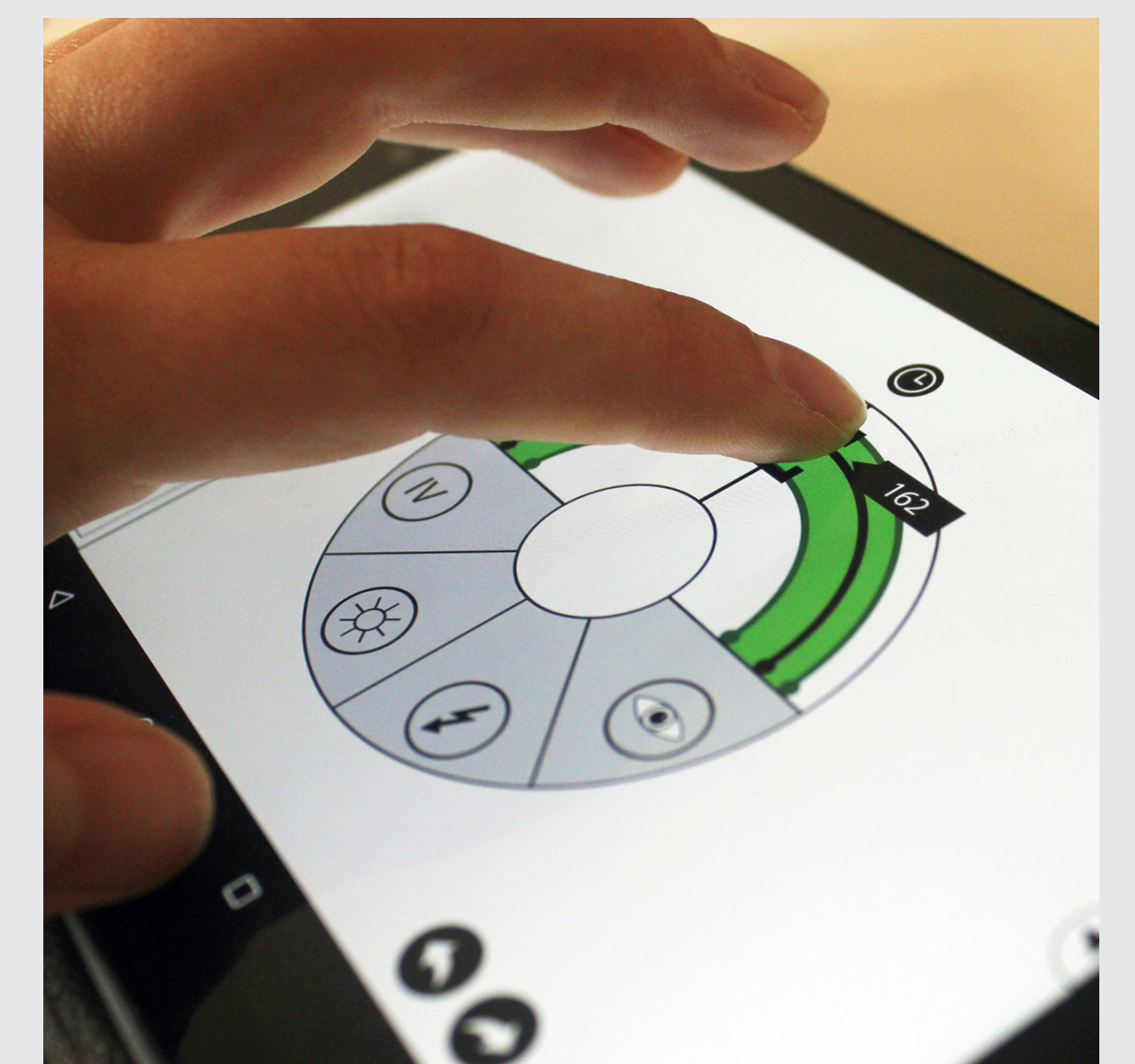


Figure 1: First mockup on a 7" tablet.

Tangibles and their Interaction Metaphors

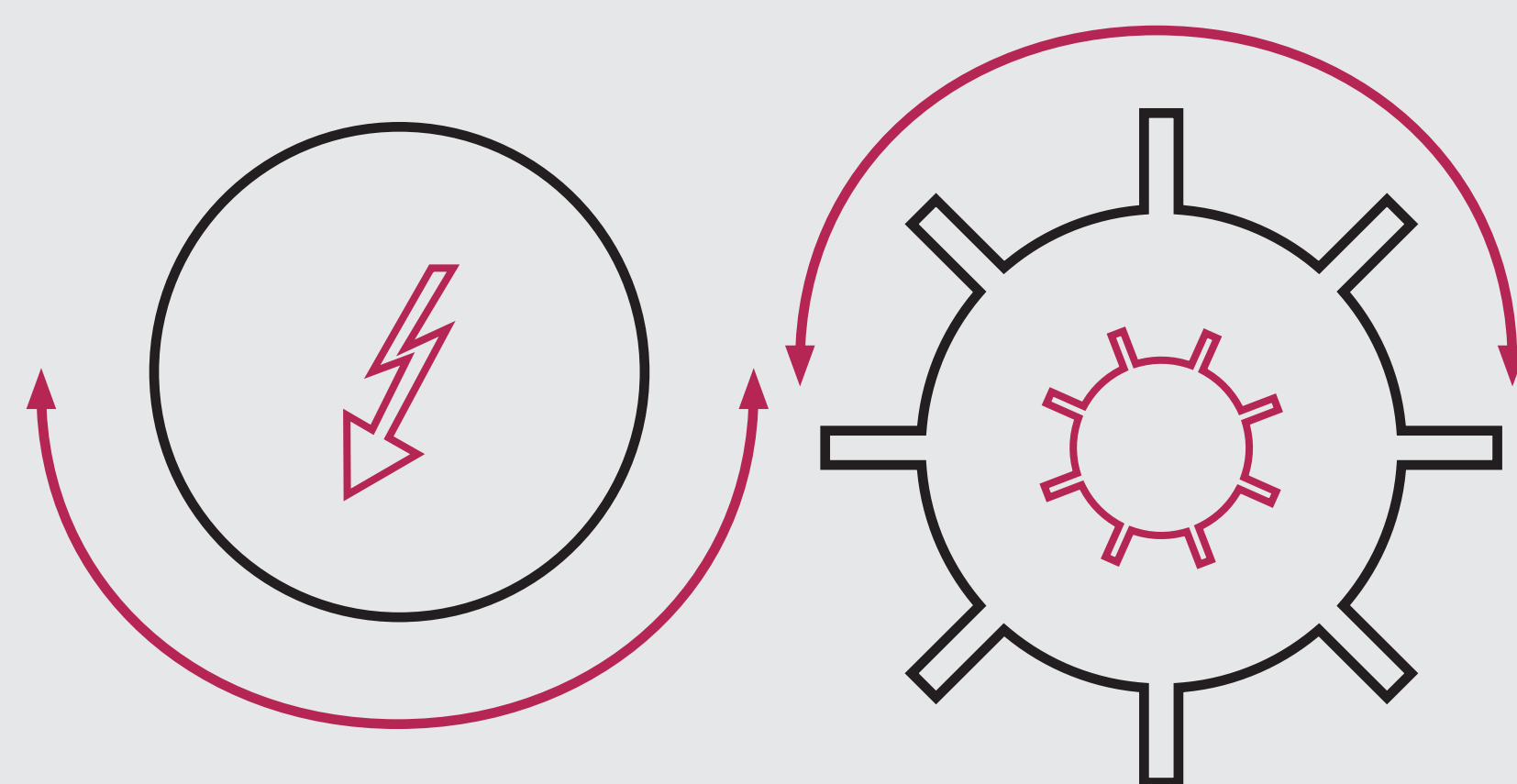


Figure 2: Generic (left, energy) and figural shaped (right, daylight factor) tangibles for modifying discrete parameters. The value adjustment is done by rotating the tangible in both directions.

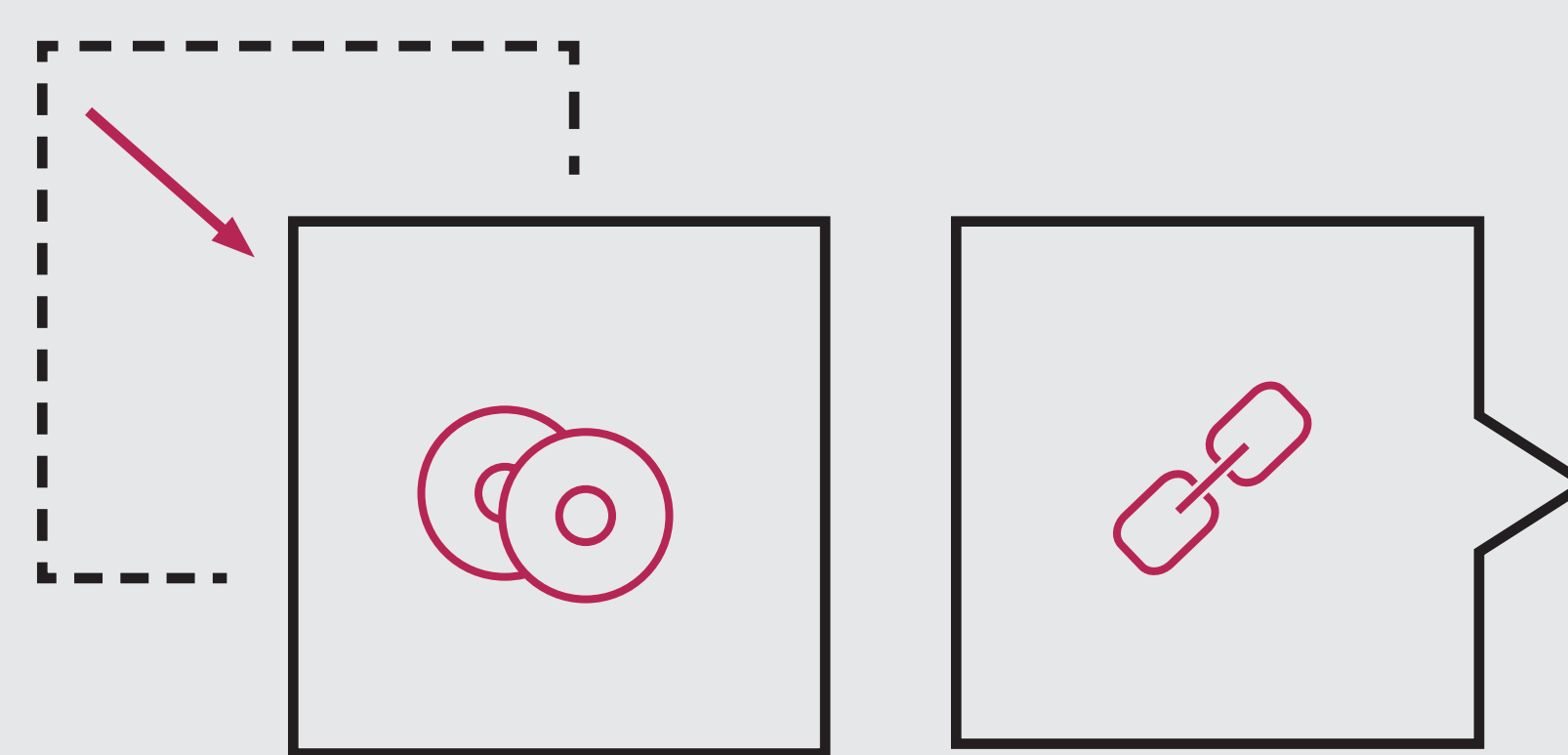


Figure 3: Generic shaped tangibles for creation, selection and copying of pies (left); connection building and connection type definition (list type) (right). The similar shape affords the same interaction metaphor (stamp).

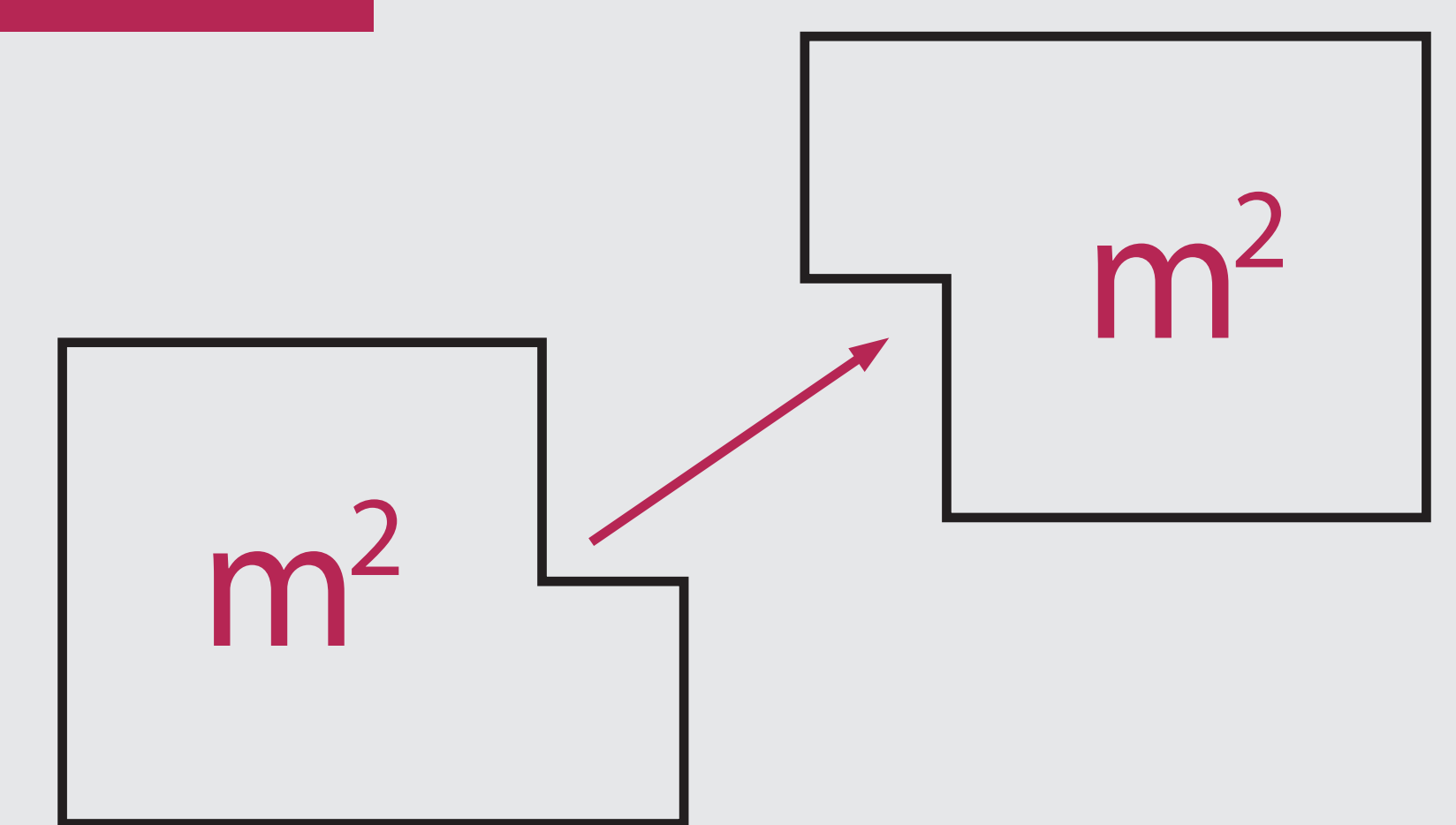


Figure 4: Pair of square meter tangibles. Setting the parameter is done by pulling the tangibles apart or pushing them closer to each other. This resembles the natural gesture of people showing an area.



Figure 5: A set of wooden tangible prototypes.

Conclusion

The pie model gives the user the possibility to search for specific floor plans with concrete geometries through an abstract graphical representation. The touch component offers search mobility between devices with varying sizes. The tangible component

extends the touch interactions through physical, figural and analogous representations of the most important query components. We plan to evaluate our prototypical implementation with the architects who participated in the initial study.