

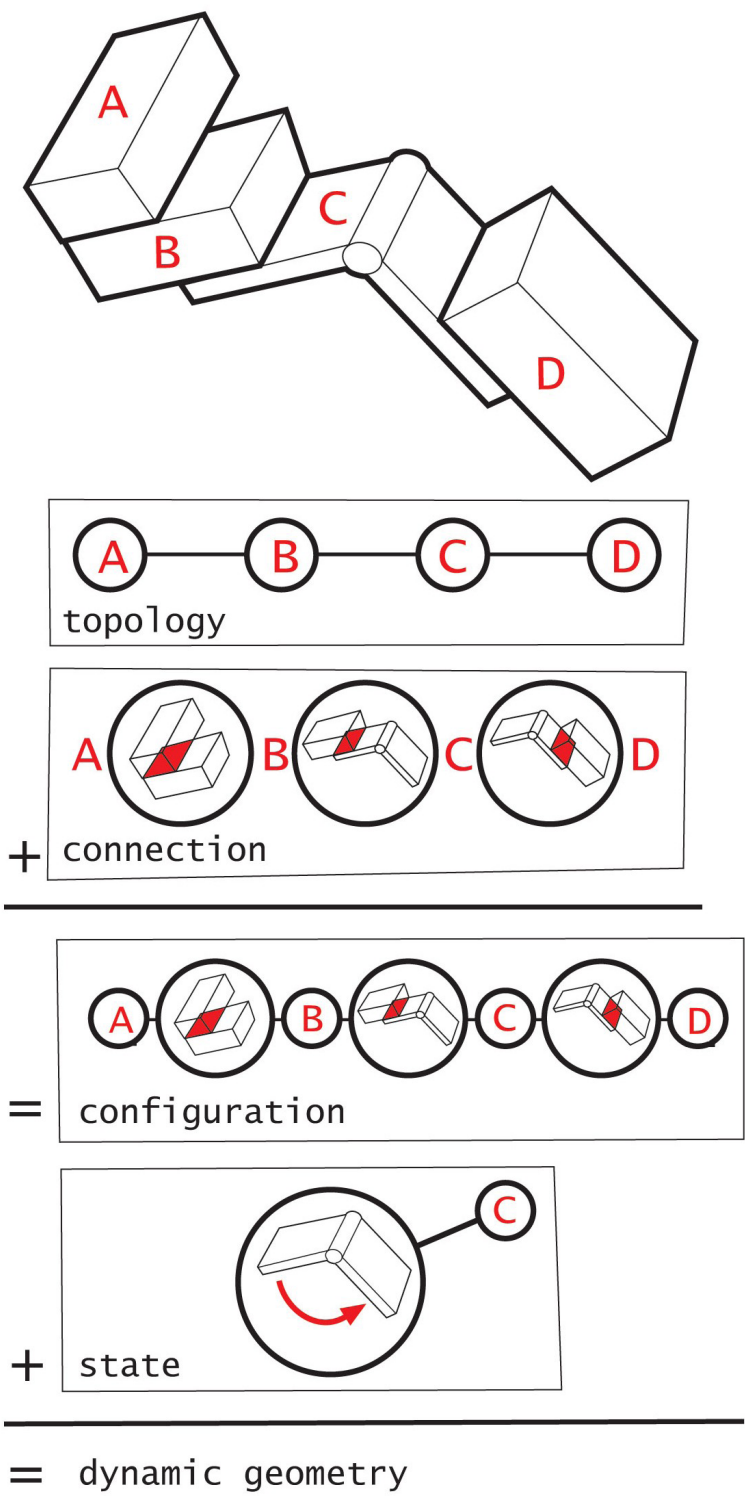
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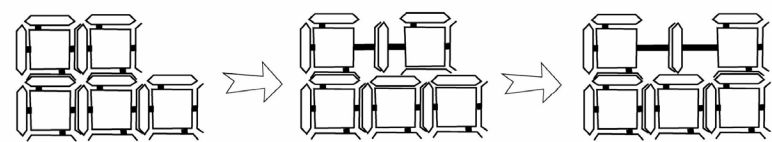
A Computationally Enhanced Construction Kit
for Building Rich 3D Interfaces

Michael Weller, Eric Schweikardt, Sora Key, Markus Eng

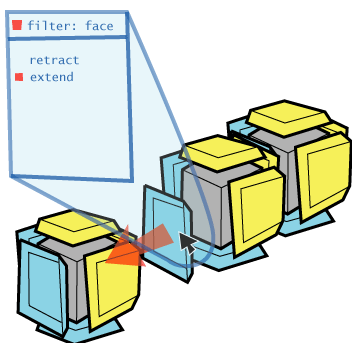
As children many of us played with construction kits such as wood blocks, Tinkertoys, Lego or Meccano. These kits allow us to create a 3D sketch of a physical form. By embedding electronics in construction kits we can enable a computer to respond to manipulations of the pieces. With a little imagination these 3D construction kit sketches can be mapped to a problem space to create a richer and more intuitive interaction than assigning meaning to mouse clicks and key combinations.

Low cost microcontrollers, sensors, and wireless communication now enables the mass production of these computationally enhanced construction kits. Our project aims to exploit the complementary benefits of creating and working with physical interfaces built with computationally enhanced construction kits to create more powerful and compelling environments for learning and design.





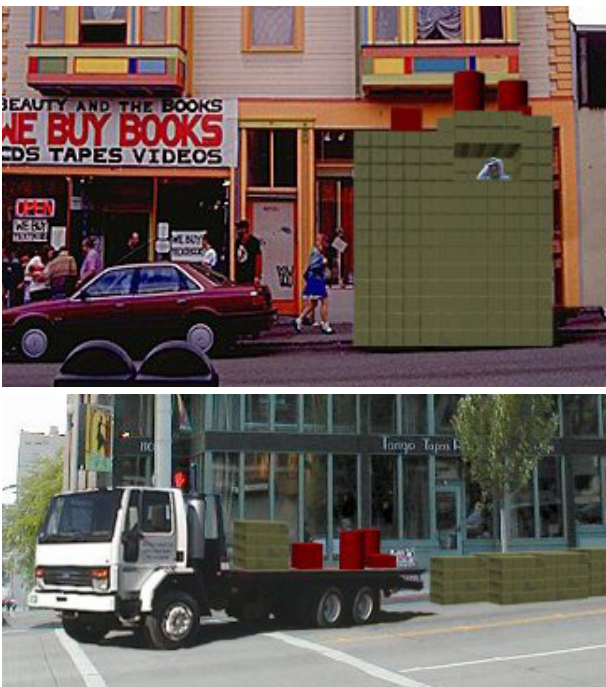
The name espresso blocks refers to the goal that a block structure could serve different functions throughout the day, for example an espresso stand, and office and a bedroom.



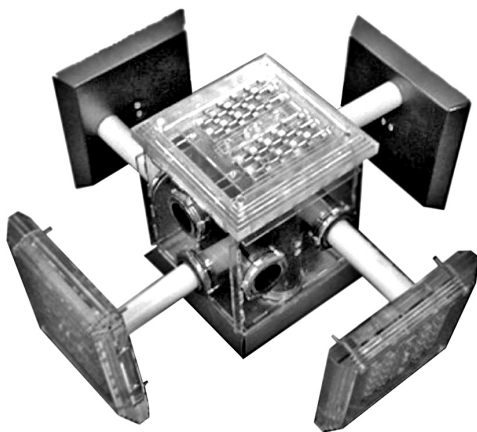
Espresso Blocks

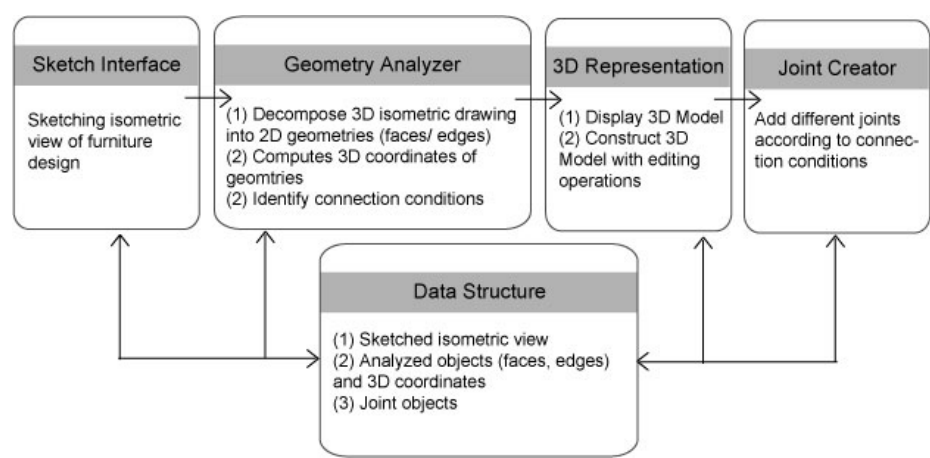
*A new paradigm
for the built environment*

Michael Weller



Espresso Blocks are robotic modules on the scale of a brick or concrete masonry unit that can work together to stack themselves to generate furnishings and structures. They support a new building typology, an architecture composed of machines that could reconfigure themselves throughout the day as desired. The ability to quickly change the configuration of the structure would obviate the current need to have a separate space for each activity. The reference implementation for this new technology is the live/work espresso stand, a structure composed of Espresso Blocks that configures itself into an espresso stand during the day and a bedroom at night. These architectural machines would make more efficient use of limited urban space and accommodate the nomadic nature of modern life, quickly generating spaces to fill shifting needs, and then quietly slipping away as demand wanes.

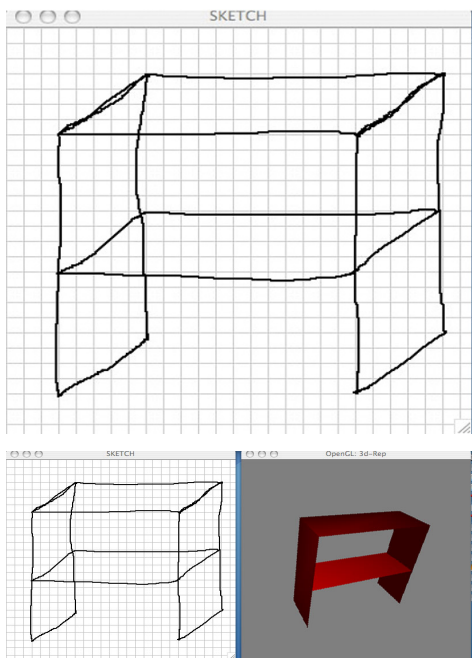




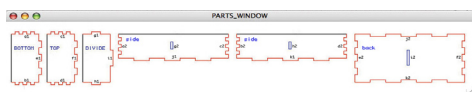
Furniture Factory

From Sketches to Fabrication

Yeonjoo Oh



The Furniture Factory is a computationally enhanced craft program to help novice designers construct physical models using rapid prototyping and manufacturing machines. It provides a sketch design interface that a designer can use to draw furniture in 3-D. The design is displayed in an isometric viewing window where the designer can edit it. The program decomposes the 3-D model into flat panels and displays them in the parts window. Furniture Factory adds joints where one panel connects to another according to connection conditions. These added joints enable designers to construct the physical model easily and quickly. The program generates HPGL code to cut the furniture parts on a laser cutter. Designers construct their model furniture by assembling the cut parts.



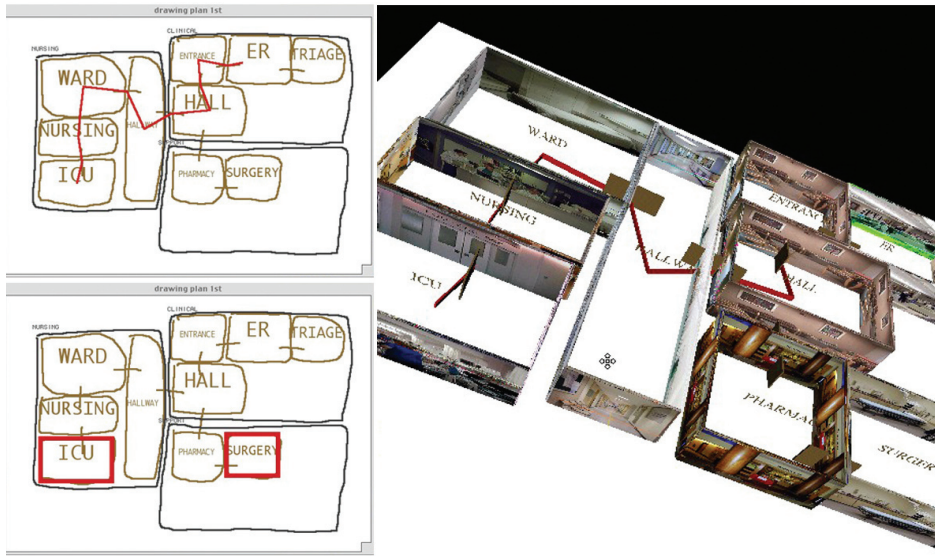
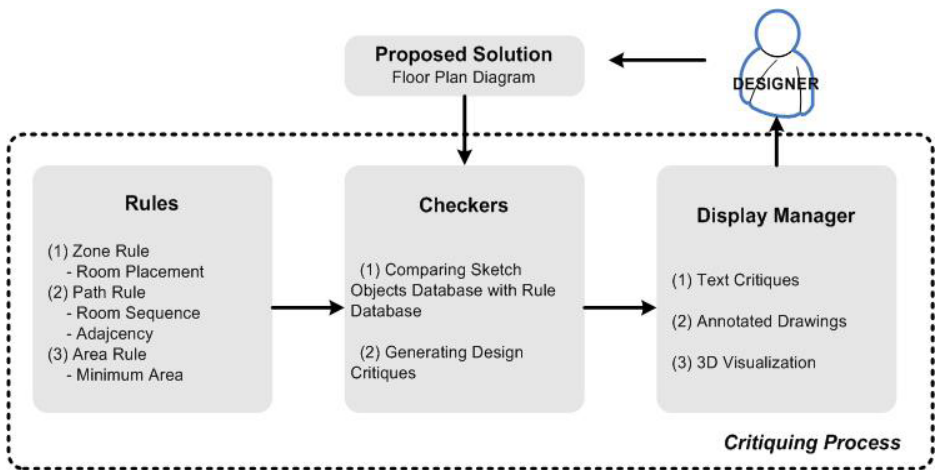
Furniture Factory contributes to the field of personal fabrication by providing sketching interfaces and intelligent design support. Through developing personal fabrication technology we hope to gain insight into creative processes and learning. Striking the balance between preserving simplicity while supporting creativity is a challenging goal for this research. Furniture Factory is an instance of a more general approach to personal fabrication that features three capabilities: (1) sketching input and recognition, (2) inference, interpretation and design decision support, (3) transformation and preparation for machine fabrication of parts.



Design Evaluator

Critiquing Freehand Sketches

Yeonjoo Oh



The Design Evaluator is a sketch system that attempts to reason about the design at hand and provide useful feedback in the form of criticism and advice. To give the designer critiques, the system stores domain knowledge as predicates. When the sketched diagram fails to satisfy the predicates, the system brings these concerns to the attention of the designer. Different design domains call for different methods of displaying critiques. For architecture floor plans this system uses text critiques, sketch annotation and 3D models. For web page layout, it uses text critiques, sketch annotation, and example web pages.

We highlight one feature of sketch-based critiquing: the ability to provide annotation or critique directly on the work – the sketch itself. In both floor plans and web pages, in addition to providing text critiques and other forms of feedback, the Design Evaluator annotates the designer's sketch. It is important to offer a critical response that is directly linked to the sketch representation. This enables the designer to remain focused on the sketch representation s/he is making. At the same time, it is helpful to offer design critique in various formats. Communicating design information in only one mode can be problematic: the combination of displaying graphical critiques with text critiques is likely to be more effective than selecting a single method.