What are shape-networks?

A shape-network decomposes a configuration like a floor plan or elevation and transforms it into a network enabling precise comparative and quantitative analysis. Shape-network analysis of spatial patterns works because it taps into the underlying intuitive or cognitive way that everyday space is actually perceived and used.

Until about three decades ago, there were no tools that could tap into this form of tacitly experienced space. Developments in communications modeling, discrete geometry (low-dimensional Euclidean geometry) and complexity theory along with research in anthropology, human cognitive development and behavioral economics have provided new tools that have been adapted for looking at complex human spatial patterns.

Primitive space Shape networks to analyze and model the effectiveness of spatial layouts go beneath typical geometric approaches of spatial measurement by identifying elements of primitive space. Primitive space is the everyday space formed by physical features of the natural and built environment. It is the space shaped by walls, doors, curb cuts, countertops, partitions, columns. arcades and so on that is perceived tacitly and experienced subjectively.

Primitive space operationalizes prospect and refuge. The human capability to recognize and prefer places and spaces that, as a consequence of their perceived shape, offer opportunity and security has been developed as prospect and refuge theory.

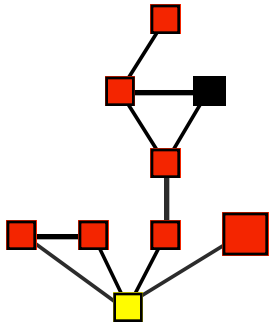
Prospect - the unimpeded opportunity to see, and refuge - an opportunity to hide, are concepts related to evolutionary psychology and aesthetics.

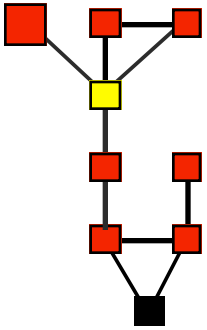
The primitive spaces used in shape-networks are one-dimensional lineal units (simple lines) and two-dimensional convex units (rounded spaces). Recent research has shown that humans make cognitive operations that transform three dimensional spaces into one and two dimensions and back. These shapes can be overlaid on any layout of interior or exterior built environments at any geographic scale to generate a network from which measures of patterns can be developed. One characteristic of shape-networks is that the analysis generates both graphic and numeric representations suitable for decision-making.

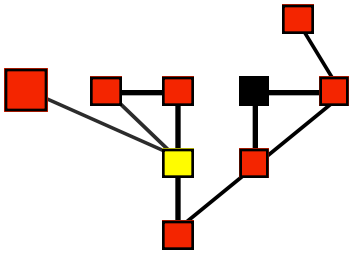
Decision trees The structure of a shape-network is similar to the structure of a decision tree but can be rearranged to start from different nodes. The shape-networks on the right show how one spatial pattern would be experienced and understood from three different spatial locations, represented by the yellow, black and red nodes.

Shape-network methods respond to federal court criteria for evaluating the admissibility of expert testimony. They are scientifically proven and court tested methods providing clear evidence of comparative differences: before-after; functional-dysfunctional; total-partial; ours-theirs; standard-substandard.

An example using convex units follows.



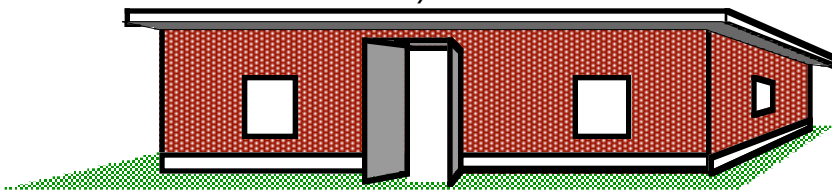




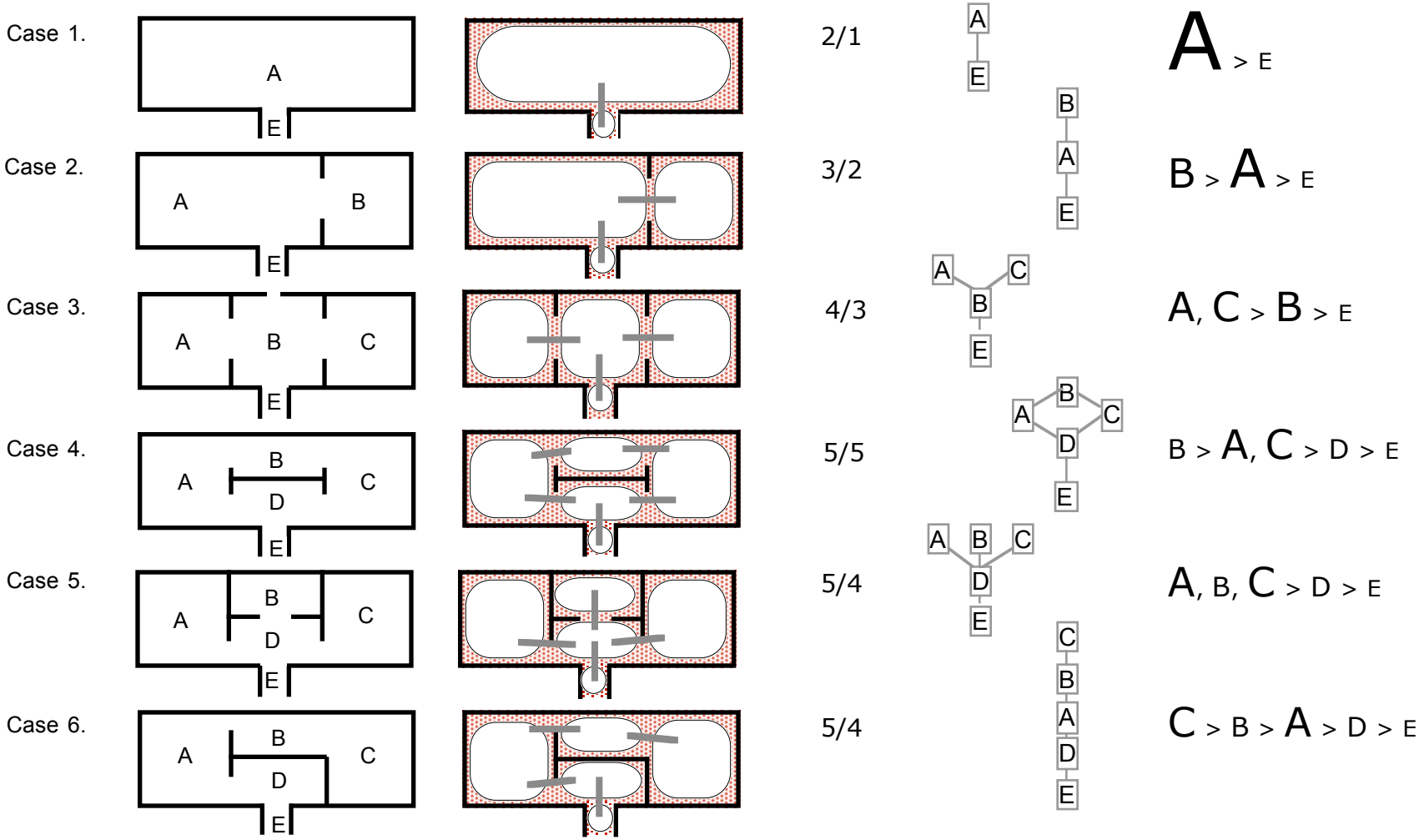
Shape-networks™ Transforming spatial patterns into quantitative measures

Physical boundaries and barriers form primitive spatial shapes. This example shows how functionality can be quantified by decomposing layouts into primitive spatial shapes (two-dimensional, convex shapes in this example) and their linkages. Each layout will function for different uses - offices, a meeting hall, an office-showroom, a gallery, front/back office etc. *It also shows how very small physical changes can result in very large, and unexpected, spatial and functional changes and whether these are are isolated or systemic*.

What you see:



What you get: Layout → Primitive shapes, links → Spaces/links → Space order from entry → Order-area inequality relationship



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