

Q2. How far can shape grammars go in describing forms – can they describe anything? What are they good at, and what do they struggle with?

A2. Shape grammars let me calculate anything I can draw on a piece of paper, or I can make in three dimensions. In this sense, there aren't any limits as to the forms shape grammars can be used to describe. In fact, shape grammars also let me describe what I see, for example, in terms of symmetry or in a parsing process that picks out (embeds) distinct parts and shows how they're related in structures of varied kinds – graphs, hierarchies, topologies, etc. Identity rules that look like this

$$x \rightarrow x$$

where drawing₁ and drawing₂ are exactly the same, are particularly good for symmetry and parsing. Identities $x \rightarrow x$ may seem useless – at least most of my students think so – because they don't change anything when I apply them. (My word processor agrees with my students. It's certain the right x is a mistake, because it repeats the left one. For computers, identities are merely typos.) But embedding goes on all the same to show the way visual calculating works in shape grammars – shape grammars let me use anything I can see. And then there's what's hard. It isn't so much that shape grammars struggle with some things, it's more that people seem to struggle with shape grammars, to say they're tricky to use and a formalist aberration – even when it only takes seeing and drawing for shapes and rules. I guess no one expects shapes or anything to be utterly unstructured, for calculating to allow in visual ambiguity and everything that this implies, without qualification or restriction. I just mentioned that to some in computer science, the very idea of visual calculating seems impossible, silly and *ubuesque*, because there aren't any symbols or units – calculating is always 0's and 1's in Turing machines. Others in art and design find visual calculating twisted and immoral – seeing in too many ways lacks sincerity and authenticity. Visual calculating asks questions that are better left to creative artists and designers in their personal work and private (secret) practices. You have no right to how others see, or to anyone's soul; it's not OK. There's no reason to think about visual calculating – it can't be done, and should never be tried. Maybe so, but visual calculating is what shape grammars do. I've tried them out time and again, and they're up to the job – and then much more in strange and extravagant ways. Shape grammars meld calculating, and art and design, outside the precious limits

of possibility (logic) and morality. True and false, and right and wrong need not exceed the 0's and 1's in symbolic calculating – but this is inevitable for seeing that's rife with ambiguity. There's more to shapes than describing them in terms of given structures.

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