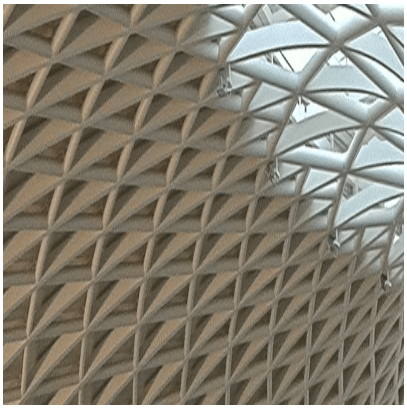

Whatâ??s wrong with parametricism

Description

NURBS (Non-uniform rational B-spline curves) and *blobs* (blobs) are big in architecture. We used to talk simply about *parametric* design, and some still do. Parameters are the constants in an equation, set of equations, or a computer program (script). They define and limit what the equation will produce, e.g. the shape of a curve. But you can in fact vary these constants to produce new shapes, patterns, and objects, like chairs.

Parametric design

It takes skill to design a chair, but itâ??s a step cleverer to design a procedure or computer program for making many chairs, with variations â?? or more specifically, to write a program or script that produces an image of a chair in three dimensions on a computer screen. Such an algorithm should then provide users with access to key parameters, such as the height of the seat, the back, the length of the armrests, etc. Varying these parameters produces different designs within a â??familyâ?• of designs.

With a parametric design, anyone can customise a chair of their own by entering the values they prefer into the computer. The output might then drive a CNC (computer numeric controlled) production line, or a 3D printer, to deliver a chair you can sit on.

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Constraints

Much of the skill in parametric design resides in establishing the relationship between parameters. If thereâ??s no back to the chair (it has a height of zero) then the method of fixing the arms would have to change. If the seat is too high then it may topple over. So *constraints* are key to the idea of parametric design.

The values anyone can enter into the parametric system on the computer have to be limited therefore. The designer of the program might not let the user decide on the number of legs, and there would be limits on the height of the seat. Itâ??s also the case that the various parameters and constraints will interact. When the seat is made to project out further then perhaps the arms should extend as well. Some parameters will conflict. If the chair arms go back too far they will collide with the geometry of the chair back.

People who use computer-aided design systems (CAD) and BIM (building information modelling) understand the parametric design of chairs fairly well, and computer-aided design and

modelling systems provide libraries of parameterised furniture and building elements.

Bigger blobs

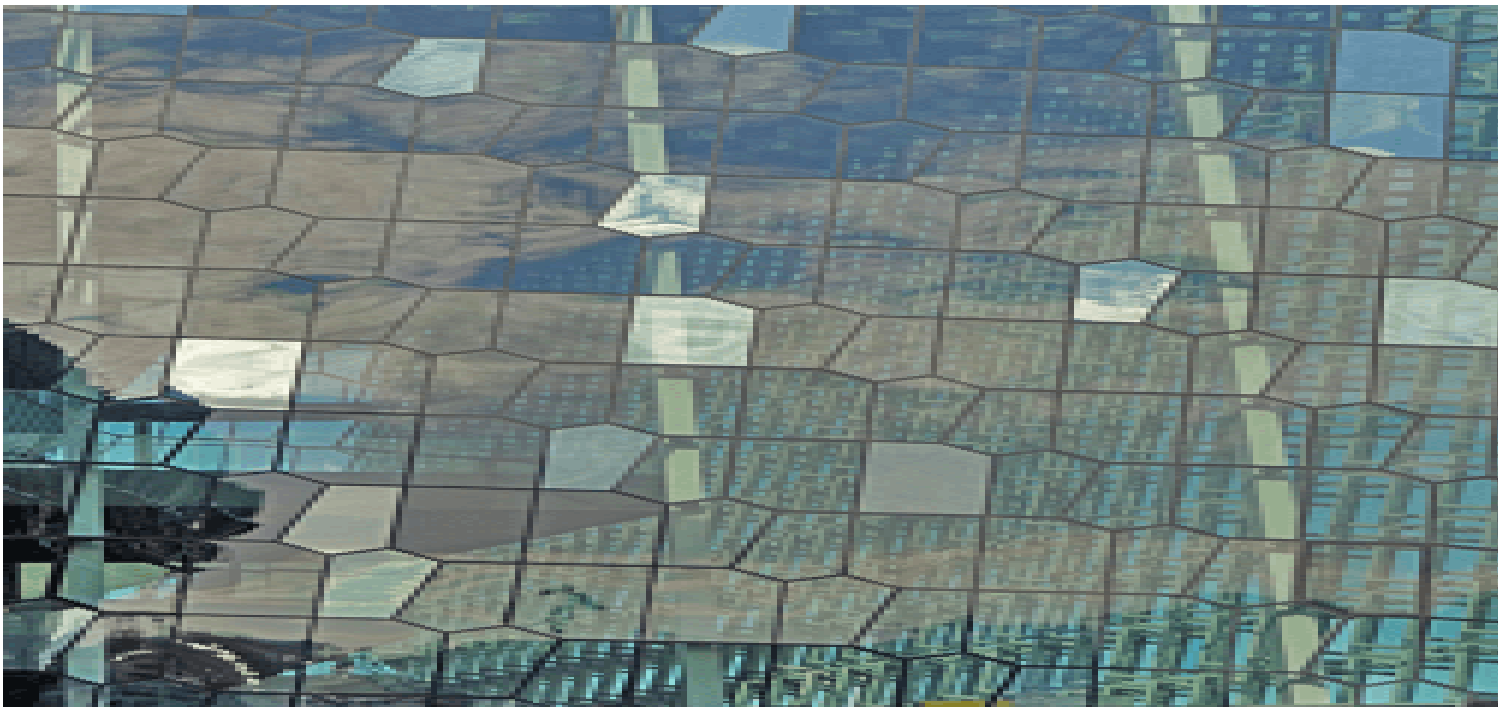
The complexity of parametric design gets compounded in the case of bigger entities, such as whole houses or hospitals. Not only are real buildings made up of many geometrical relationships and constraints, but also involve the selection and *arrangement* of many parametric components.

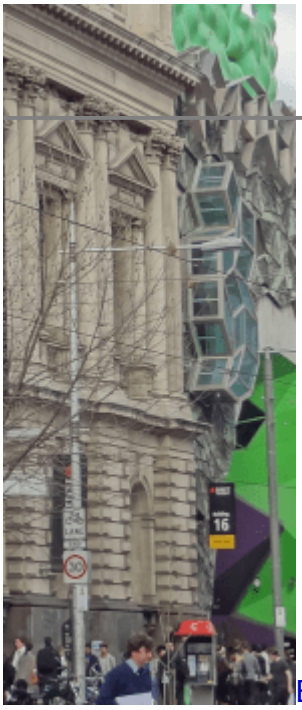
My colleague Graham Shawcross has illustrated the so-called combinatorial problem (â??explosionâ?• of results) of arranging rooms in a house, or perhaps just dividing a rectangle into a series of smaller rectangles. There are millions of ways of dividing a rectangle into just a dozen sub-rectangles. Itâ??s not just a problem of enumerating all those possibilities, but of sifting, sorting and selecting the best or most suitable for some purpose or other.

Wicked designs

Add to the problem of constraints and combinatorics the ill-defined, â??wickedâ?• and random configuration of constraints imposed by environment, context, people, competing stakeholders, social norms, and cultural practices. There are parametric definitions of crowds, swarms and mobs, but as yet nothing that models human sociability and responses to environments in total â?? the stuff of architecture.

These issues of programs, constraints, combinatorics and limitations are well known to anyone who has worked in the area of parametric design. Itâ??s no wonder that parametric design flourishes in the production of elegant sweeping building facades and continuous organic roof structures, rather than floor plans, circulation routes, and subtle spatial interventions. With skins, surfaces and sculptural abstractions the constraints and their interdependencies are more amenable to algorithmic control, unencumbered by issues of use, history, culture, politics, and the complexities of human inhabitation.

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Parametrics and everything

If algorithms donâ??t after all deliver as some parametric enthusiasts hope or expect, then perhaps thereâ??s mileage in elevating parametric discourse to even less plausible but suitably mysterious realms.

People who want to promote parametric design to a totalising system or world view can appeal to the complex nature of communication networks. After all, communications systems are networks of so many parameters interacting with one another. Isnâ??t that what people in society do! The other tactic is to appeal to organic systems: the complex myriad of communicating and interacting cells and organisms that make up life.

Both strategies appear to be evident in Patrik Schumacherâ??s theorising over his invented term â??parametricism.â?• The theory starts with a simple design trajectory â??facilitated by the attendant development of parametric design tools and scripts that allow the precise formulation and execution of intricate correlations between elements and subsystems.â?• But this leads rapidly to a highly desirable â??solid new hegemonic paradigm for architecture.â?•

In writing about how such creations adapt to their environment, Schumacher draws an analogy with â??the way a single genotype might produce a differentiated population of phenotypes in response to diverse environmental conditions.â?• Genetics and evolution feature prominently in parametricist reasoning.

Parametricist discourse seems to leapfrog over several decades of parametric research and bursts in with claims of a â??new paradigm,â?• obscurely and ambiguously presented but appropriately named. It looks as though the words *parametricism* and *parametric* bear the same relationship that *scientism* does to *science*.

According to the Oxford English Dictionary, *scientism* is â??A term applied (freq. in a derogatory manner) to a belief in the omnipotence of scientific knowledge and techniques; also to the view that the methods of study appropriate to physical science can replace those used in other fields such as philosophy and, esp., human behaviour and the social sciences.â?• Parametricism comes across as belief in the omnipotence of parametric knowledge and techniques bent on replacing all others.

Architectural idealism

Parametricism is also an ancient idea that persists as another *ism*, namely *idealism*. The mathematician Roger Penrose said â??By some miraculous insight Plato seems to have foreseen â?¦ [that] the actual external world can ultimately be understood only in terms of precise mathematics â?? which means in terms of Platoâ??s ideal world â??accessible via the intellectâ??!â?• (205).

Parametricism also resonates with Stephen Hawkings controversial claims about a theory of everything (TOE) â??â?¦ if we do discover a complete theory, it should in time be understandable in broad principle by everyone, not just a few scientists. Then we shall all, philosophers, scientists, and just ordinary people, be able to take part in the discussion of the question of why it is that we and the universe exist. If we find the answer to that, it would be the ultimate triumph of human reason â?? for then we would know the mind of God.â?•

Notes

- See http://www.patrikschumacher.com for articles and references to Schumacherâ??s publications.
- The quotes above are from Schumacher, Patrik. 2008. *Parametricism as Style â?? Parametricist Manifesto* available online.
- Technically, a parameter is different to a variable. According to the OED, a parameter is â??a quantity which is fixed (as distinct from the ordinary variables) in a particular case considered, but which may vary in different cases; esp. a constant occurring in the equation of a curve or surface, by the variation of which the equation is made to represent a family of such curves or surfaces. Also (Computing): a quantity whose value is specified when a routine is to be performed.â?•
- Colleagues and I worked on the logic of constraints in the context of artifical intelligence and expert systems for designers in Coyne, Richard, Michael Rosenman, Anthony Radford, M Balachandran, and John Gero. 1990. *Knowledge-Based Design Systems*. Reading, Mass.: Addison-Wesley. I thought we pushed the parametric programme to the limit, but it seems tame

and sensible by comparison with the claims of parametricism.
- The difficulties encountered in parametric design might suggest that design is actually impossible. Not really. There are other understandings of the design process that appeal to templates, prototypes, narrative, dialogue, play, metaphor, interpretation, embodied interaction, etc.
- Parametricismâ??s trajectories of thought mirror that of â??hardâ?• AI (artificial intelligence). As its uses in real-world problems seem so prosaic and limited, letâ??s use its claims to populate the amorphous areas of creativity, social organisation, all living things, and the ultimate destiny of human kind in transcendent mind melds.
- Cumincad, the online Cumulative Index of Computer Aided Architectural Design reveals over 700 books and articles on parametric design in architecture, dating back to the 1970s. You can view Googleâ??s n-gram for *parametric*. *Parametricism* hasnâ??t yet made it to the dictionaries.
- Graham Shawcrossâ?? blog is at http://grahamshawcross.com/
- Also see Wicked problems, Why experts are better than algorithms, Arboreal architecture gets wrong end of the stick, and Whatâ??s wrong with posthumanism.

Bibliography

- Hawking, Stephen. 1988. *A Brief History of Time: From the Big Bang to Black Holes*. New York: Bantam.
- Parnell, Steve. 2011. The style war manifesto: The Autopoiesis of Architecture: A New Framework for Architecture. *Architects Journal*, (233) 6, 42-44.
- Penrose, Roger. 1989. *The Emporerâ??s New Mind: Concerning Computers, Minds, and the Laws of Physics*. London: Vintage, p.205.
- Schumacher, Patrik. 2009. Parametricism: A New Global Style for Architecture and Urban Design. *Architectural Design*, (79) 4, 14-23.

Category

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2. constraints
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