Generative design defended

Performance-based generative design extends on both current computer analysis and parametric design techniques. The generative design extension comes by formulating rules, in a designer’s style, and executing them thousands more times than a designer would, could and probably should to develop a design that would often not be possible to conceive by hand. Designers often use rules, eg, the rules for proportioning mentioned, and relax rules when necessary or desired. Computational rules can act in the same way but also encode far more information than a designer might be able to deal with at once, eg, carrying out free-form panelization while meeting fabrication constraints so that the dimensions and shapes do not frighten the glazier. So, generative design processes are not so foreign in their actions, at least to some designers.

While a computer may generate something beyond that which most human brains can, it is often possible to study the design and decipher how it works, especially as it is based on a designer’s own rules, eg, spatial, structural, fabrication or otherwise. Comprehension and synthesis are different mental processes. While a designer may not fully understand the process that created the design, they can try to decipher and understand the results. If it can not be deciphered to some degree, the likelihood that it can be successfully built will be small. In this quest it is possible that they might learn something new about the design scenario, competing constraints and objectives as well as the nature of structural form. In relation to structural generation, careful investigation of the initial structural model used and the resulting force flow and behavioural evaluation usually yields some insight. Designs that are not easily interpreted yet logical in some highly sophisticated, novel or bizarre way have potential to create intrigue, don’t they?

Why the computer came up with a particular design with the method discussed in the article though is a difficult question relating to mathematics (combinatorial optimization) and random sequences of actions that is too complicated to describe here. Understanding of the generative process at some level though will also be essential for its effective use. Generative design tools will never be black boxes and if made as such will probably not be used to their full potential.

This understanding of a generative process will come from designers writing their own rules and playing with them manually before launching a semi-automated and then automated process.

Digitally refined Amsterdam canopy. (See ’Dimensionless topologic rigour’)

Towards a dimensionless topologic rigour
Generative design techniques (‘Digital canopy: high-end computation/low-tech construction’ arq 6/3, pp230–245) tend to intrigue and slightly scare (arq 6/4, pp293–294 – letter from Sam Price) at the same time. It is reassuring to know that computers will only be as smart as we can program them. We can even control if they learn and how they learn. Design capabilities using generative methods agreeably are a product of both how smart we make the generative algorithms and how intelligently designers can make use of them. A human designer alone probably would not have come up with the canopy design built and a computer alone could not have.

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Experiencing with generative rules, design objectives and constraints is necessary to create an effective generative model that reflects design intent. The generative process just speeds up the play and directs it to often find more interesting designs and potentially to solve difficult problems. Just as when using the computer for structural analysis, the quality of the model is reflected in the quality of the results.

This iterative process was carried out when designing the Amsterdam canopy; however, unfortunately the students could not be included in this design stage given time restrictions. Amsterdam was a highly experimental workshop. Given more time, it would have been better to include the students in the canopy design process using eifForm. With this basis, their understanding of the structure and new geometry would have grown rather than initially developing with the construction of the structure. We will leave that experiment for the next workshop opportunity.

In the meantime, we are currently working on developing new generative methods and equally methods aimed to make generative design tools dynamic, qualitative, interactive and include contextual visualization all to foster intelligent and effective use. The quest is exactly as Sam Price described, ‘to finally free ourselves from the tyranny of dimensions and allow us to produce [beneficial and newly logical] designs that are dimensionally random’.

It is not that the generative design process will lack ‘intellectual rigour’, but rather just a new kind of dimensionless, parametric and topologic rigour that is hoped will open new avenues and design possibilities.

Kristina Shea is a Lecturer in Engineering at the University of Cambridge

[For further discussion of the issues involved in integrating generative design tools see Kristina Shea’s ‘Generative Design: Blurring the lines between architect, engineer and computer’ to appear in the Architectural Design Engineering Exegesis CAD/CAM series.]

Casbah correction
In their article, ‘Casbah: a brief history of a design concept’, (arq 6/4, pp. 321 – 336) Robert Oxman and his co-authors state that the matchbox models are ‘unsigned’, (caption to Figure 3b). They are not. Elsewhere, they are always credited to Herman Hertzberger. for instance in Wim van Heuvel, Structuralism in Dutch Architecture, 010 Publishers, Rotterdam, 1992, p. 13 and also in monographs on Hertzberger.

It should also be noted that the original pictures included a series of more simple serial compositions starting with a simple row house. The more complicated assemblies illustrated in arq were presented as an end.
point – in Forum’s typically didactic manner. These models occupy a pivotal position in Hertzberger’s work: he was the most mathematical member of the Forum group, and probably also the one least interested in the anthropologic fascinations of the other members.

HANS VAN DER HEIJDEN
Rotterdam
Hans van der Heijden is a partner in BIQ, Architecten, Rotterdam. See pp. 12-31 of this issue.

Gender debate
Sarah Wigglesworth and Jane Wernick’s article, ‘Clear Water Garden; A Study In Design Research and Collaboration’ (arq 6/2, pp. 214–229) contained (p. 216) the following passage:

‘There was a very productive equality in our working relationship. Partly because the power structure between different genders and knowledges was almost entirely absent.’

Both at the refereeing stage and later, following publication, this passage attracted comment – from both architects and others of both sexes – to the effect that gender differences are an inappropriate subject for a research journal.

Provoked by this, we invited a number of female architects to give us their views. Just under half responded – three in the form of the following letters and one who telephoned to state that she could raise no enthusiasm for the debate.

THE EDITORS

Neither inappropriate nor surprising
Sarah Wigglesworth and Jane Wernick’s article explores how a close collaboration in design can become research when ideas are passed freely between the designers, leading to unexpected and original solutions.

Each author holds that the success of the collaboration was dependent on the openness of their working relationship, based on mutual trust and respect. Jane Wernick explains how they were actively interested in exploring each other’s ideas together, and this suggests an equality of status which is, in my experience, unusual in design collaboration. It is appropriate, given the subject of the article, that the authors touched briefly on the factors that made their collaboration so productive, and to include gender among these is neither inappropriate nor, unfortunately, surprising.

The more normal situation is for one person to lead the design, setting the design agenda and drawing on the ideas of their collaborators (whether from the same discipline or from other disciplines) only where those ideas enhance their own. The process requires the collaborators to defer to the leader. It is inherently more single minded, and it could be argued that it is less likely to produce innovative solutions.

Where one person leads the design they may do so because the group believes that their ideas are the strongest, or it may be because they claim seniority by reason of their discipline, personality or status.

Even working among talented and intelligent people it is rare to find an atmosphere of equality which allows all team members to contribute fully, and all of their efforts to be focused on the project itself. I appreciate the discussion of such issues in arq.

LIZ PRIDE
London
Liz Pride is a Director of MacCormac Jamieson Prichard where she has been heavily involved in the University of Cambridge’s West Cambridge masterplan and housing

A fundamental component
Is the subject of ‘gender difference’ an appropriate subject for a research journal? Perhaps it is only in the realm if architecture that this question could possibly arise at all. Elsewhere, in the real world, we know gender difference is accorded the seriousness and consequent academic research status it deserves as it is understood as a fundamental component within our culture.

That the subject has raised its head in an article that questions the process of making architecture and speculates on the nature of collaboration is hardly surprising either. Women, and their specific awareness of gender, are at the cutting edge of redefining both the culture and the profession of architecture. Pertinently within the same issue, Kristina Shea shares her research on the evolution of other design methodologies that are equally embedded in collaborative enterprise.

That we should question ‘the power structure between different genders and knowledges’ goes hand in hand with questioning the very nature of practice and the profession. If we fail to redefine contemporary practice what hope do we have of evolving a relevant architecture for tomorrow?

DEBORAH SAUNT
London
Deborah Saunt is a partner in DS+HA, and worked with Jane Wernick and others on the winning entry for the recent Designs for Democracy competition in Letchworth.

Not out of place, but …
I don’t necessarily think that gender comments are out of place in a research publication, but it is slightly unsatisfactory to bump into them in passing.

My own life has been so entirely occupied with being an architect (rather than a female architect) that I feel rather out of step with the sentiment expressed by both authors. Collaboration is clearly the thing, but I haven’t personally found that any easier (or more difficult) with women.

M. J. LONG
London
M. J. Long is a partner in Long and Kentish and a member of the arq Editorial Board. One of the architects for the British Library, London she has recently completed the National Maritime Museum, Cornwall.

Letters should be addressed to Peter Carolin, arq, c/o University of Cambridge Department of Architecture, 1 Scroope Terrace, Cambridge CB2 1BQ, UK F +44 (0)1223 332950 or Email pc207@hermes.cam.ac.uk The Editors reserve the right to shorten letters.