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Hermund, Anders

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PARAMETRIC DIAGRAM

APPLIED 3D MODELLING AND PARAMETRIC DESIGN

First Author

Anders Hermund
PhD fellow – CITA
Center for IT and Architecture
Institute 4
Royal Danish Academy of Fine Arts
School of Architecture
Philip de Langes Alle 10
1435 Copenhagen K
Denmark
anders.hermund@karch.dk

EXTENDED ABSTRACT**Abstract**

This paper will introduce the PhD research into applied 3d modeling and parametric design outlining the idea of a parametric diagram linked to philosophical and applied examples.

Keywords

Diagram, Parametrics, Building Information Modeling, BIM, Architectural Creativity.

Introduction

This research investigates the applied use of building information modelling (BIM) and parametric systems in offices in the Nordic countries and internationally. In Denmark the implementation of the digital working methods related to BIM has been introduced by government law in 2007. Thus here the focus is on how these 'client demands' are being implemented, and what this means for the design of architecture. Internationally I look into the appliance of parametric systems as part of the design process, and as a tool to reduce cost of construction. By associating implementation of digital tools in a practical context with a theoretical framework I seek to shed light on the opportunities and challenges that will come to influence the way we work with architecture in the future.

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The Danish BIM incentive

The method of implementing BIM in Denmark has been to create a government initiative called Digital Construction [Danish: DDB / Det Digitale Byggeri]¹ consisting of a series of demands and declarations of obligatory use of digital tools and specifications about digital working method. Securing the implementation of digital working method on legislation, however, makes it an intriguing process, since the motivation is thus based on economic rather than aesthetic benefits. BIM, in the Danish context, has a very strong connection to the field of construction, and less to the field of creativity in the conception phase of architectural projects. The governmental request for a common description of the building phases has resulted in a working method dividing the construction process of the 3D model into seven phases with different levels of information, each containing more enriched detailing. The idea is obviously to facilitate the communication between the different stakeholders, but it represents a linear way of thinking, not sustaining the iterative processes of architectural design.

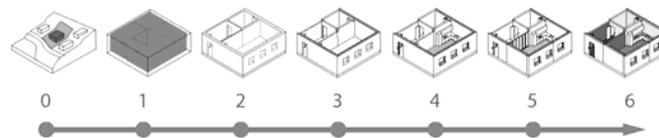


figure 1. The division of the construction process of the 3d model into seven phases, suggests a linear working method.

If BIM is to encompass the whole cycle of the building process, the importance of the fragile link between the

sketching phase and the later phases can not be trivialized.

Method

I am using a combination of interview based research and semiotic philosophical investigation to structure and distinguish the ways in which architecture's various analogue and digital representation of processes and their relationships emerge. By looking at how C.S. Peirce and G. Deleuze relates to the idea of the "diagram" in a theoretical understanding, a conceptual framework can established, in which architecture's premises in relation to the digital working methods can be viewed and discussed. I have also as part of my study participated in a wide range of activities related to computational architecture and BIM. I see my research as a largely theoretical research, but with many ties to the industry - and thus practicing architects. It's basically all about creating better architecture, and for that purpose, tools are used. This has always been the case for architects, but now we have a new type of tools and a potential new way of working. This is what makes us enthusiastic, scared of, blinds us, and moves the boundaries of what is possible.

The complexity of the construction industry requires that the implementation must be examined at several levels to create a broad understanding of the opportunities and difficulties such a large-scale vision of efficiency and better architecture creates. A relevant consideration is about design and the early architectural sketching phase. Understanding of how architectural projects are conceived is essential. Especially in a situation where digital media and design tools are so massively represented and significant for

¹ (DDB)

the way our world is perceived. Architecture is inextricably linked with the worldview we have, and symbiotic influences are ongoing features of the nature of both.

Creating good architecture demands beyond all the quantitative constituents also a qualitative aspect, which may be harder to measure and therefore harder to implement in a world solely concerned with calculation. How to ensure that the creative part, in the area of construction, will remain a part of the digital working method in the future? What is it that the architect can do, which no one else can do?

Being able to connect the crucial sketching phase with the vision inherent in BIM as a tool to control costs for the entire building life cycle is not something that happens in a completely smooth transition. By looking at the idea of BIM more like a mindset than as a mere toolbox, it could be possible to see new connections between design and subsequent digital handling of the project.

The diagram

Using the 'diagram' as an overarching concept, I suggest the idea of the 'parametric diagram' as a way of working to expose some of the processes taking place in a design development. The idea is that the parametric diagram can bridge between the rigid qualities and soft qualities within a building in its phase of conception. The proposal is that the diagram by nature can contain qualities that can be included in the design phase, without being reduced to mere quantities. This is what the architect can do.

The diagram is both part of the architectural practice as a tool that has been used since time immemorial to explain and understand contexts. The diagram, or abstract machine², is also in philosophy a way the world can be understood on operational terms. There must be an input to generate an output.

Exactly this span of definition makes the diagram interesting as the focal point for working with digital media in the phase of conception of an architectural project, and many of the newest types of architectural 3D modelling software are in their essence parametric and diagrammatic.

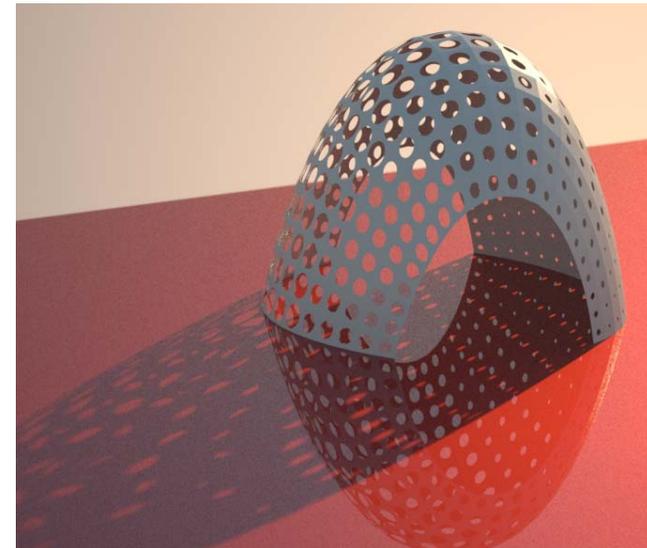


figure 2. Example of parametrically controlled geometry using solar data.

² (Deleuze, Guattari 2005) p. 141

Using the parametric diagram

As an example, the diagrammatic working method was briefly tested in three exercises in a short workshop in which an architectural mindset was being introduced to other actors in the construction sector.³ The workshop aimed at the forcing a discussion between what Dalibor Vesely describes as *the real possibilities* and the *possible realities*⁴ of architecture. Before the exercises the participants were handed a simple building programme for a school stating some requirements. They were asked to create two diagrams using 10 minutes for each. The first was a list of rigid qualities framing the conceptual intelligence of the possible realities. The next diagram was framing the visual intelligence, naming the soft qualities from the domain of dreams and imagination – the real possibilities. The concluding exercise was to relate the two diagrams in a physical cardboard sketch model, to realize that an architectural project is emerging creatively in the dialogue between the real possibilities and the possible realities - two previous exercises. This example will be used to illustrate BIM as a mindset, as a parametric-diagrammatic approach to designing architecture.

Acknowledgements

I thank all the participants at the BIM day architectural workshop at The Copenhagen School of Design and Technology, and my colleagues Odilo Schoch, Søren Nielsen, Morten Myrup for their help.

³ The resulting diagrams and models were hence made by people with no prior architectural background.

⁴ (Vesely 2004) p. 21



figure 3. Example of designing design diagrams.

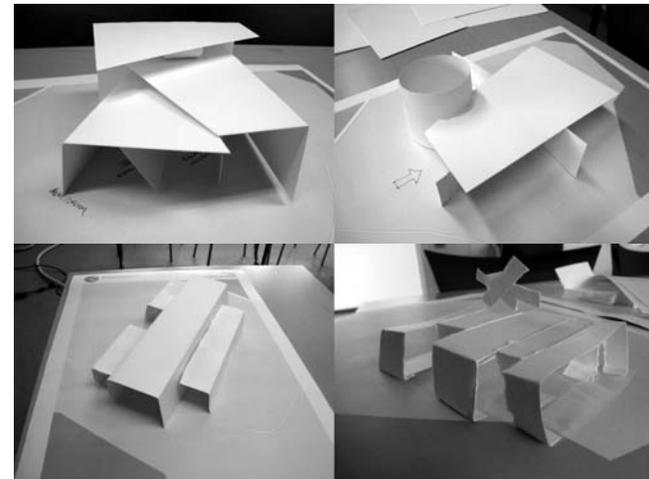


figure 4. Example of sketch models emerging from dialogue between diagrams.

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