Dynamic Generative Diagrams

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Digital Technology offers new possibilities regarding the way we work in creative design processes. But so far our methods and strategies have not been altered much. The potential in digital technology will only be partly released if we do not adapt to the technology by altering our design techniques in various ways.

At some architectural schools and in some few practices, students, tutors and architects are inventing and exploring new techniques and design strategies adapted to the use of computers.[1] In many of those cases the computer is used as a means to apply generative material in the design process. Though the arguments for doing this are many and diverse, from a perspective of design methodology such generative material is meant to produce an unanticipated output that would fertilise the design process. The use of such generative material raises a series of questions about the design process as such and the role of the designer. Also the use of generative material puts forward a discussion on what such material represents.

Though there are many diverse interpretations of what creative processes are, common to most explanations is in one or another sense the emergence of the unanticipated.[2] In the beginning the end is not imagined. This is embedded in our conception of the design process as a mode of creation. Creation implies the arrival of something new, something, which has been unimagined before.

If we directly leave this to computerised emergence[3] it would have at least two negative impacts. The designer is reduced to a less creative workhorse in the design process. But more serious, the results would be unprocessed formalism with no cultural content or

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[1] see Peter Zellner, Peter Eisenmann(Eisenman) Greg Lynn (Lynn 1999), See ANY 23 for a collection of essays.

[2] Creativity and the internalised elements of the creative process remains a puzzling and unexplored phenomenon. Though the very phenomenon of creation is still unexplained, on a pragmatical level many different explanation models exist paralell and all contribute to the understanding of creativity. These models span from pragmatic, psychometric, cognitive, social-personality models to confluence models, which try to embrace creativity as a multipe component phenomena. For an overwiev of the latest academical research on creativity see (Sternberg 1999) Paralell there exists an intuitive professionbased and still partly unrecognised understanding of creativity through praxis, a perspective that often might be more productive for design research.

[3] Genetic algorithm and artificial design intelligence.

meaning, since culture in human interpretation is meaningless for machines. [4] The techniques suggested here indicate a slightly altered but not alien role for the designer through selection, interpretation, analyses and modification.

Generative diagrams animate us to look at any type of graphical information and computational process in an abstract and structural way. Diagrammatic thinking in this sense opens the possibility to free computer generated material and computer software from its determined context. The material can therefore be reinterpreted, redefined, re-mapped and re-coded to instrumentalise it in a design process. All this is done in a qualitative and visual manner based on playful and intuitive manipulation of graphical represented information on the search for new formal input. But, it also can imply a systematic and ñmechanicalî search for, and development of new structural principles. The technique gives a creative boost and helps to break established design schemata or "resist the motivated".[5]

Since the computer (in such a process) is an engine for the production of the unanticipated the designers attention is moved from production to preparation and set-up design and to postproduction, which means coding (projection). To use the computer this way implies an intimate human-machine relation since the result is only unanticipated in context. The humans role is to be the un-anticipator.

Human sense (meaning, culture) is projected to the material through the process of coding which gives the generative material content and makes it ready for reuse.[6] (eksempel fra VORB?) Though projection is increasingly important compared to a "traditional" (internal self-centric) design process, the designer is by no means totally removed from production. But the production process is altered. The designer is in phases obliged into a state of disinterest and detachment, operating the parameters of the processes rather than beeing the process engine him or her self. [7]

To utilise the initially uncoded and generic material it is on one hand investigated for its structural inherent organisation[8], on the other it is related to external information or use,

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[4] Greg Lynn says that .. *the failure of artificial intelligence suggest a need to develop a systematic human intuition about the connective medium rather than attempting to build criticality into the machine.* (Lynn 1999) page 19

[5] In this way of treating the creative process we look at it simply from the perspective of the output and not as an internalised process. We rather investigate the symptoms (products) of creative processes than their internal causes. I suggest this as a productive attitude for the design researcher towards the problem of creativity.

[6] Though meaning is already present since the designer introduces a priory an intention-driven selection through the choise of technology, design of process and selction of parameters.

[7] Disinterest and personal detachment to the process of creativity connects on one side to ethics of science (CUDOS) on the other to certain movements in art. This gives this mode of work its fascinating potential. See also Eisenmann: *My use of the diagram proposed a different rationale, one that could be both more logical and more involved with a process of architecture somewhat distant from the design process of the traditional author-architect.* (Eisenman 1999) page

[8] structural in its litteral sense as the organisation and layout of formal issues like framework, outline, distribution, direction, density, border conditions and similar features of form in general.

be it form or program. A simple and direct associative and metaphorical based projection might be most obvious. But there is a high risk that such an approach will lead us into non-productive banalities. We need to extract processable material, which is open-ended either because it is not determent (complex, blurred, unclear, open for several interpretations) and / or because it operates on a generic - diagrammatical level. We need to raise our view to the level of visual thinking and depict emergent material on a structural level.[9] Diagrammatic thinking will open up diverse modes of interpretation, which helps to avoid a direct and banal translation of the generative material.[10]

For informing formal issues the material could serve more as scaffolding than template.[11] The borderlines between scaffolding and templating are blurred. The scaffold though supporting final form and thus related to final form is at the same time free to possess its own structure and appearance. But even more: the scaffold is structurally dependent on final form so it is (re-) generated simultaneously with final form. (Example pavilion section) The difference lies in the degree of directness in the translation of the diagrammatic material into form. This can be done through the construction of descriptive notions[12], (example: collision follow me) or through formal findings of possibilities and negotiations of the potential spaces indicated by the diagram (example pavilion) In some cases the formal input can be used in direct ways and then negotiated towards surroundings (example a_drift) (reversed scaffolding)

As input to inform and articulate program the generative diagram is used on its structural level as "resistant agent" to negotiate distribution of program. From this point of view a grafted and negotiated set of generic information will give a more articulated, suggestive and adaptive form of programmatic organisation.[13]

The diagrams role in the process of giving form is to give resistance to the obvious, which is central in any creative process. This could from a cognitive perspective be described as the breaking of design schemata[14]. Eisenmann described this as overcoming the motivated where the diagram is to act as a resistant agent to *"...separate form from function, form from meaning and architect from the process of design."* (Eisenman) page 214

Resent work by OCEAN contributes to how the generative computer generated diagram can embrace time through the appliance of animation techniques. The generative diagram

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[9] Visual thinking as described in detail by Arneim. (Arnheim 1969) Visual thinking in this sense is here seen as the precondition for diagrammatical thinking.

[10] The diagram is in that sense an engine for datareduction since it clarifies and emphasises certain readings of the material while diguising others.

[11] Stan Allan referes to certain structures serve as scaffolds for events unanticipated by the architect. (Allen 1999) page 54

[12] I imagine here a process similar to that in a qualitative research, open coding and following analyses that produce linguistic, though diagrammatic effects.

[13] grafting as a design strategy see Kipnis and Eisenmann (Kipnis 1993) (Eisenman) see also the Changliu Grouping area project 1994 which was important to the development of grafting as a graphic image based technique.

[14] Schemata as described by Piaget (Gelernter 1988)

unfolds over time through animation processes. This we call the dynamic generative diagram.[15]

The unfolding of time-based sequences of events is inherent in program and hence in architecture. Such sequences operate in fields of parallelity (time), mutual influences and relations called Channelling Systems[16] The diagrammatic force-space is central to the understanding of any artefacts program. Programmatic issues need therefore to be treated considering duration, adaptability and change. The generative material can be applied to the diagrammatic field of forces to articulate it qualitatively in a similar way as landscape articulates travelling. But since form also is able to trigger program (to host, embed, "dock" and spin off actualities) the qualitative articulated treatment of form generates a seamless interrelation between form and program. The generic material introduces qualitative features to the program. It gives form to the forces and introduces therefore implications to the very core of design (giving form) and hence design creativity. (boble diagram)

From that point the generative material can be used for suggestive purposes, to modulate gestures of actualities, to rehears triggering conditions, adaptability to unexpected events or uncontrolled (catastrophic) scenarios.

Though what is mentioned so far is the rational and motivation of dynamic generative diagrams, it is also possible to investigate their use from a level of operability (praxis). This lifts the technique out from its embedment in specific architectural theory and makes it accessible on a general level of design praxis as a superficial creative technique. This implies that a certain surface layer of the technique is general and possible to apply to any design process regardless motivation.

Computer animation is the ultimate tool to produce large arrays of possible solutions in an mechanical disinterested and uncontrolled way. In a process where parts of the formal production are left to the computer we want to use the computers ability to produce unanticipated results. (a_drift, chamberworks, T??l?)

Since such arrays are sequential they can be remapped and recoded in systems where the linearity of time is manipulated through superimposure, reversal, scratching, merging, collapse, and the separation of sequence and duration. (tidsrom)

Lately, some new teaching based explorative research at the AA School of Architecture, (Diploma unit four) and the Oslo School of Architecture (Institute of Industrial Design) indicate a return to physical analogue modelling, where the physical model appears as generative mechanical diagrams in combination with digital models. The digital techniques are here translated and reinvented in an other medium. This reinvention

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[15] The use of animation in such a way has been suggested earlier.(Lynn 1998; Rakatansky 1998; Lynn 1999)
[16] Chanelling Systems see AD spring 2000 (OCEAN)

tweaks the use of dynamic generative diagrams because of its altered possibilities and limitations.[17]

The oscillation between digital and physical diagram fertilises the process towards different conditions. Since the virtuality of the diagram seamlessly is processed into design (form and program) through a series of design techniques and strategical concepts the merging of physical and digital models help to make this translation from the digital based virtual to the physical represented virtual and on to the concrete tectonic as smooth as it should be.[18] This latest step, where the virtual and physical is merged, concludes this suggestion of a design strategy for the digital age.

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[17] OCEAN projects like Jyv?skyl?, Chamberworks and wokshops: Building Dynamic Relations (Helsinki Vaasa 1997) Dynamic Realations in Design (Oslo 1998) Vorb3 (1998) Vorb4 (1999)

[18] Both representations infact being analogue we intend to create a topological transformation between the media. See also brian massumi..