Dynamic Generative Diagrams

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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. 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.

Though there are many diverse interpretations of what creative processes are, common to most explanations the emergence of the unanticipated.[1] Creation implies the arrival of something new, something, which has been unimagined before.

If we directly leave this to computerised emergence[2] 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 meaning, since culture in human interpretation is meaningless for machines. [3] The techniques suggested here indicate a slightly altered but not alien role for the designer through selection, interpretation, analyses and modification.

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[1] Creativity and the internalised elements of the creative process remains a puzzling and unexplored phenomenon. Many different explanation models contribute to the understanding of creativity. These models span from pragmatic, psychometric, cognitive, social-personality models to confluence models that try to embrace creativity as a multiple component phenomena. For an overview of the latest academic research on creativity see "Handbook of Creativity" (Sternberg 1999). Parallel there exists an intuitive profession based and still partly unrecognised understanding of creativity through praxis, a perspective that often might be more productive for design research.

[2] Genetic algorithm and artificial design intelligence.

[3] 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

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. The technique gives a creative boost and helps to break established design schemata or "resist the motivated".[4]

Since the computer (in such a process) is an engine for the production of the unanticipated the designer's attention is moved from production to preparation 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 human's 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.[5] (fig.1) 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 being the process engine him or her self. [6]

To utilise the initially un-coded and generic material it is on one hand investigated for its structural inherent organisation[7], on the other it is related to external information or use, 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. This implies visual

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[4] 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.

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

[6] 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 49

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

thinking and depicting emergent material on a structural level.[8] Diagrammatic thinking will open up diverse modes of interpretation, which helps to avoid a direct and banal translation of the generative material.[9]

For informing formal issues the material could serve more as scaffolding than template.[10] 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. (fig.2) 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[11], (fig.3) 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 (fig.4) (reversed scaffolding)

The diagrams role in the process of giving form is to give resistance to the obvious, which is central in any creative process. 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[12] contributes to how the generative computer generated diagram can embrace time through the appliance of animation techniques. The generative diagram unfolds over time through animation processes. This we call the dynamic generative diagram.[13]

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[14] 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 events) the qualitative articulated treatment of form generates a seamless

[8] Visual thinking as described in detail by Arneim. (Arnheim 1969) Visual thinking in this sense is here seen as the precondition for diagrammatical thinking.
[9] The diagram is in that sense an engine for data reduction since it clarifies and emphasises certain readings of the material while disguising others.
[10] Stan Allan refers to certain structures serve as scaffolds for events unanticipated by the architect. (Allen 1999) page 54
[11] I imagine here a process similar to that in a qualitative research, open coding and following analyses that produce linguistic, though diagrammatic effects.
[12] http://www.ocean-net.org
[13] The use of animation in such a way has been suggested earlier.(Lynn 1998; Rakatansky 1998; Lynn 1999)
[14] Chanelling Systems see AD spring 2000 (OCEAN) (Bettum and Hensel 2000)

interrelation between form and program. The generic material introduces qualitative articulation 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.

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 scenarios.

Computer animation is the ultimate tool to produce large arrays of possible solutions in an mechanical disinterested and uncontrolled way. 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.

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 another medium. This immigration between media deforms the use of dynamic generative diagrams because of its altered possibilities and limitations.[15]

The oscillation between computer based and physical diagram constructs a unique seamless bridge between the abstract generative, the abstract representative and represented program, form and construction.[16] This latest step, where the virtual and physical is merged, concludes this suggestion of a design strategy for the digital age.

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

[16] Both representations infact being analogue we intend to create a topological transformation between the media. See also Brian Massumi (Massumi 1998)

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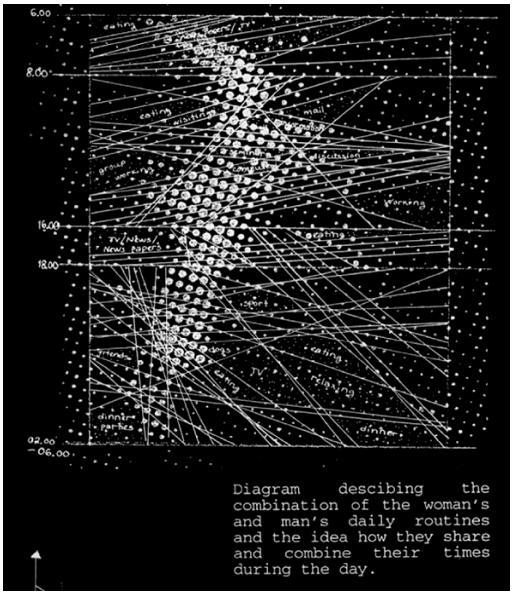

Fig1: Articulated diagram derived from generative material to render different variations of an imaginative couples day. The diagram is in to transparent layers, which give different readings of intensity when displaced. ("Building Dynamic Relations" workshop Vaasa Helsinki 1998)

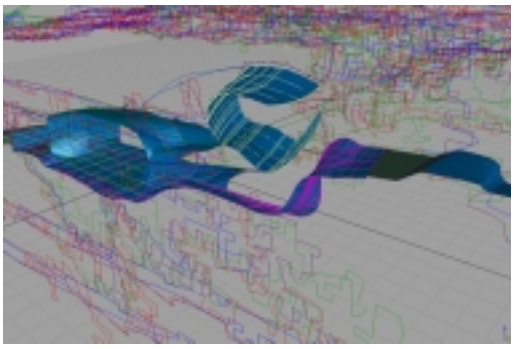

Fig2: The initial particle animation is captured and processed to render a reduced dataset as scaffolding information, which informs the design of a section of the "Synthetic pavilion" (OCEAN oslo 1998)

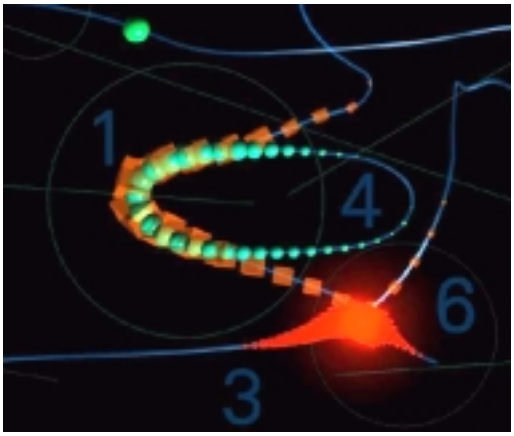

Fig3: Animated cursors create an event, which is formed and rendered in a diagrammatic way. The event in this case was called "Collision / Follow Me" (Synthetic Landscape phase 3, OCEAN oslo 1998)

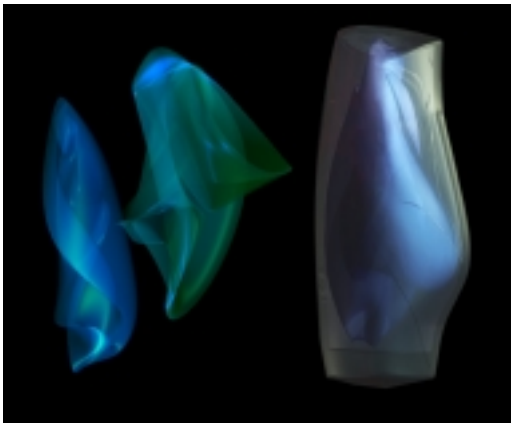

Fig4: To the left initial animation sued to form inner core of the final object to the right. The inner core and in between layers where negotiated towards an ideal outer form, a cylinder.
(a_drift Time capsule, Invited competition New York Times 1999, OCEAN cologne, helsinki, oslo)