Transformative Design

A Process Orientated Design Method to Explore Digital Tools within the Making of Architectural Design

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The paper presents an architectural design method, which was tested in a master class for four times. It combines the education of complex digital tools with their simultaneous use in the whole design process of an architectural (experimental) building design.

The design method contains four steps: thematic association, idea to form, form to function, site implementation. The four steps are open to subjective conceptions as well as to individual use of different digital tools but all related to the overall building brief.

Tools mostly used and educated were 3d animation softwares. Scripting, rapid prototyping and VR have also been included. The presentation format is film or other interactive, time based media.

Keywords: Problem based approach; digital design education; architectural education; 3D modeling; design method.

1. Introduction

The capacity of computational design exceeds digital drawing, as soon as its imaginative capabilities are unleashed, i.e. by a design process taking the unforeseen and dynamic into account. This gave the design series its distinct name – design in four dimension (e4d).

In many architectural schools the mediation of design knowledge is separated from the so called technical skills, neglecting the means used and their enormous influence on the results quality. (Barber, T. and Hanna, R. 1998; Tidafi, Temy and Ivanka Iordanova 2006).

Taking these observations into account, several questions evolve: How could digital tools be used besides a form driving engine (Terzidis, Kostas 2004) or digital substitution of traditional approaches (Knight, Michael et al. 2006)? What kind of designs would be born from the consequent use of digital techniques within the design process? What is the shape of an adequate design method to support different imaginative digital tools and an innovative design process?
2. Context and Aim of e4d design series

The e4d series was initially set up to provoke innovative designs, questioning already established techniques in existing (analogue) design studios. To gain the greatest impact possible, we introduced digital tools into all essential phases of the design:

- analysis and abstraction
- development of concept
- elaboration and visualization

The e4d series aims at crossbreeding traditional design approaches, which usually lead to a somehow “building-like” design (given brief, site, building program) with the experimental capacities of the digital realm (time based and interactive processes, complex correlation of parameters and geometries). Therefore tools were selected, which provide a higher level of creative freedom than common CAD software, with its background in building construction. According to this mainly 3d animation and modeling software was introduced to the students (Mark, Earl (2006)) and taught parallel to the project based design class (Bridges, Alan H. (1992)).

3. Structure of e4d design process

The e4d projects, mainly attended by 4th year students, took place within a strict schedule of 13 weeks time. The digital knowledge was taught parallel by concentrated tutorials (3-4 double days) giving an overview of the techniques and a more problem based assistance by former students for supplementary help. Further imagination arose from thematic and technical lectures at the beginning.

The e4d series consists of 4 distinctive steps (associative references, idea to form, form to function, site implementation), which can be seen as tasks of their own, each being developed to a final presentation. They enable the student to look at the given architectural brief from different angles and allow the innovative and subjective use of digital tools from the start of the project.

This rigid structure was not only introduced to reassure the otherwise highly experimental design approach, but also provided a mental fallback solution for students, who could not cope with a previous step as the next level might develop more suitable ideas the structure gives the student a continuous chance to reenter productive work.

We focused in each design project on a specific topic, to test the methods ability to adjust to different tools. In the beginning we dealt with the software’s experimental possibilities, combining innovative 3d modeling features, animation and rendering styles. Later, specific tasks, as Virtual Reality and its making, light simulation and the transfer of light into VR space, Dynamic Systems, 3d video capturing and Augmented Reality were examined.

Finally the results of the steps were combined into a single animation or interactive presentation, highlighting the design process and the designed building.

Step 1: Brief, research, associative references

This phase aimed to give all students an atmospheric and/or conceptual idea for their project. The phase started with a briefing, not demanding a digital solution.
Step 2: Transformation, idea to form
Due to digital techniques ideas (e.g. images, dynamic fields and structures of any scale) are directly transformed into form, evaluated afterwards. Instead of running through the traditional order of design (urban context as start, box-like figure as proposal), the students create a problem-specific and detailed 3d-object.

Step 3: Form to function
The invented atmospheres and structures are used to refine the given building program. In a reversal of usual design approaches this bottom up process provides the chance to test the solutions ability to scale and adapt to other formations.

Step 4: Site implementation
A site strategy and an urban layout is developed. It is adjusted and interconnected to the previous steps.

4. Examples of e4d design tasks
Four different design tasks were created as an experiment in digital techniques and teaching – constantly improved by insights made during the process.

Summer term 2004 | NCCA Kaliningrad/RU
Task and process of this project ingrained the most in traditional design studios. Our brief asked for an extension to an existing Art Center, situated in an old fortress’ tower. A dialog between the massive old structure and the new building had to be designed. Abstract atmospheric images were demanded first, from which the students derived structure and concept. A focus was set on the use of software specific tools (dynamics, metaballs, layering of surfaces). The last 2-3 weeks were used to refine the concepts in form of movies.
Winter term 04/05 | instant homes

“Instant homes“ was an attempt to develop new networked living structures and communicative atmospheres free of boundaries given by site or function, which were introduced later on. This studio had a strong emphasis on interaction, movement and the creation of atmosphere in design. VR, digital design reviews and the use of light simulation were used intensively. (Tamke, Martin 2005) At first the functional aspects of living were abstracted to pure structure - serving as blueprint for the later elaboration. The final presentations were done as interactive multimedia files, taking reference to the seminars overall topic.

Summer term 2005 | Chernikov museum

This design demanded radical ideas for a museum for the Russian architect, well known for his expressive drawings. Focusing on one single work of Chernikov, the students started individual approaches. After formulating a manifest, the following transformation mimicries the traditional way of adopting a 2d sketch into a 3d drawing, but underlined the graphic qualities of Chernikovs drawings. Movements within the building were stressed in the later steps. Movies presented the graphic and dynamic qualities of the designs.

Summerterm 2006 | Campus symbiont

The shift from mainly synthetic to mixed reality design processes was stressed in the last of the e4d series. The aim to emphasize the sites specificity and to take the granularity of reality into account was done with the use of digital Video for analysis and development of an idea. 3d tracking tools helped to overlay digital and video footage with the virtual space. The movie centric approach dealt further on with the crossbreeding of the designs in physical
and virtual realm and was closed by the making of architectural movies – consisting of synthetic as well as video material.

5. Discussion of teaching process

According to Questionnaires done, the students appreciated the general approach. Some would have liked less abstract approaches and support by using analogue tools. Most students asked for more lessons in techniques and more personal tutorials and claimed a lack of time. Especially the time consuming and theory based starting phase (abstraction, transformation) has been always a matter of discussion. Still, most students experienced the intense project as a worthwhile learning situation and a highlight in their curriculum, giving them new skills for project communication due to digital skills and a new method to approach architectural design in general.

The modular system of the series (design tutorials, technical workshops by experts and guidance by previous e4d students at the end of the program) proved flexible to adjust to new circumstances and future digital tools.

The division of the project into 4 different steps proved to give the students a reliable structure to orient and a fall back level, if they did not cope with the abstract level of the first steps or with the projects experimental approach in general. The approach furthermore refreshed motivation and curiosity as soon as a new phase was entered.
6. Discussion of design results

The resulting design projects are of great diversity in terms of concepts. Although all students were confronted with the same architectural problem and course structure, individual approaches can be classified:
1. students starting with a strong abstract idea as the solution to the architectural problem
2. students starting with a strong interest in a specific digital tool
3. students starting with a strong interest in exploring new sculptural forms
4. students starting with their repertoire of analogue techniques

The starts subjective abstraction of the architectural problem not only frees the student from traditional expectations, but enables him to find an experimental proposition. The order of the classification above was thought to be a ranking of the resulting design quality. This assumption was proved to be true by the work handed in, but students who constituted their abstract idea at a later stage in the process also developed significantly good results.

7. Conclusion and future prospects

The e4d series explores the inherent qualities of digital production and representation of design. The 4-step e4d structure provokes experimental design concepts, as well as the tutorials give broad insides to digital techniques. As these parts are taught parallel, the students are encouraged to superimpose technique and concept, leading them to a highly subjective design, inseparably connected to both.

The claim to teach digital techniques by means of architectural design and vice versa seems to be fulfilled. In order to achieve a balance between both sides, compromises had to be made:

The time necessary to learn and carry out experiments within software, alien to most students, reduces the amount of detailing and functional and constructional parameters are often of lower development. The approach chosen, stressed the formal and conceptual quality of the design. Our aim was the discovery of new spatial and conceptual relationships. Some of the work led to new tectonic qualities, which might be worked out to new construction methods. Other participants simply ignored questions of buildability and focused on different fields. These fields were highly determined by the proposals given and the digital techniques introduced to the students. Especially
the projects dealing with experimental, formal structures in the beginning led to new tectonic inventions.

The building qualities related to concept, form and movement are generally deeply detailed – a different focus arose within the projects. New forms and design concepts are stressed, the four dimensional presentations emphasize the buildings atmospheric and dynamic qualities.

During the design series a direct link between the student’s ability to handle the software and its will to use it in an experimental way could be drawn. Those, who used 3d software before, performed usually better. Thus, the use of digital techniques should be emphasized throughout the student’s curriculum, enabling him of critical mastering between different packages and methods.

Students, who come with a learned set of fixed analogue tools, have to transform this knowledge to the e4d structure – a problem for weaker students. Consequently the concentration on only one digital tool and a less individual approach was discussed by the staff regularly, as the self-positioning of the students in the “experimental” designs would take less time and provide specialization. This master class-like system was never established. The student’s responsibility for his decisions, his self-conscious positioning in terms of design strategy is not only important to develop a personal agenda, but seems to create extraordinary and unforeseen results in design. While some of the projects results may be seen as situated within the realm of blob- or bionic architecture, the method introduced does not aim at formal qualities, but towards a discussion of design methods in the digital realm, which don’t have necessarily to follow well established rules of site, program and tectonics.

The experimental use of tools and techniques from different disciplines will continue to produce new, innovative results.

In order to foster the theoretical background in digital techniques, we are currently introducing a preliminary research seminar with practical exercises, enabling the students to experiment with digital media. The same students, charged with detailed digital knowledge, will work on the next e4d project in spring 2007.

Acknowledgements

We would like to thank Tom Schülke, Sven Havemann, Prof. Dieter Fellner and all students who put massive efforts into their projects.

References


