The aim of these workshops and conference is to help transfer and spread newly appearing design technologies, educational methods and digital modelling supported by information technology in architecture. By organizing a workshop with a conference, we would like to close the distance between practice and theory.

Architects who keep up with the new designs demanded by the building industry will remain at the forefront of the design process in our information-technology based world. Being familiar with the tools available for simulations and early phase models will enable architects to lead the process. We can get "back to command".

The other message of our slogan is "Back to command". In the expanding world of IT applications there is a need for the ready change of preliminary models by using parameters and scripts. These approaches retrieve the feeling of command-oriented systems.
Editor
Mihály Szoboszlai
Faculty of Architecture
Budapest University of Technology and Economics

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CAADence in Architecture. Back to command
Budapesti Műszaki és Gazdaságtudományi Egyetem

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CAADence in Architecture
Back to command

Proceedings of the International Conference on Computer Aided Architectural Design

16-17 June 2016
Budapest, Hungary
Faculty of Architecture
Budapest University of Technology and Economics

Edited by
Mihály Szoboszlai
Theme

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Our slogan “Back to Command” contains another message. In the expanding world of IT applications, one must be able to change preliminary models readily by using different parameters and scripts. These approaches bring back the feeling of command-oriented systems, although with much greater effectiveness.

Why CAADence in architecture?
“The cadence is perhaps one of the most unusual elements of classical music, an indispensable addition to an orchestra-accompanied concerto that, though ubiquitous, can take a wide variety of forms. By definition, a cadence is a solo that precedes a closing formula, in which the soloist plays a series of personally selected or invented musical phrases, interspersed with previously played themes – in short, a free ground for virtuosic improvisation.”

Nowadays sophisticated CAAD (Computer Aided Architectural Design) applications might operate in the hand of architects like instruments in the hand of musicians. We have used the word association cadence/caadence as a sort of word play to make this event even more memorable.

Mihály Szoboszlai
Chair of the Organizing Committee
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Members of our local organizing team have supported this event with their special contribution – namely, their hard work in preparing and managing this conference.

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Developing New Computational Methodologies for Data Integrated Design for Landscape Architecture

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Abstract: The form language of the currently ongoing trend of parametric design remains often symbolic and arbitrarily interchangeable. In order to counteract this general trend within landscape architecture, the increasing digitalization in design should not contribute to generating even greater meaningless complexity. The main goal within the postgraduate study program Master of Advanced Studies in Landscape Architecture (MAS LA) at the Chair of Prof. Christophe Girot at ETH Zurich, is to examine which workflows are suitable for understanding a place with its given potentials as local data sets to generate a responsive and sustainable landscape design. Often data is integrated at the outset of the design process – in contrast, we would like to propose the thesis that an understanding of a site and the conceptual stance drawn from it influences the choice of data and not the contrary. It is therefore necessary to search for new methodic approaches and workflows in order to understand a place with its different contextual layers and integrate the right data as parameters in the process.

Keywords: Didactics and digital education, Modeling with scripting, Visualization and communication, Computational Methodologies

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INTRODUCTION

Today’s architecture is very often disconnected from the terrain and from its surroundings. Landscape architecture has followed the trend and can very often been understood as fragmented. Natural elements are too often simply used as set pieces that have nothing to do with their original environment. Places become illegible and unintelligible due to an incredible confusion of program, materials and plants. ‘Green infrastructure’ has become the dominant gesture of current planning efforts.

We are currently at a crossroads where conventional approaches to landscape architecture do not serve justice to the increasing complexity of environmental issues, which require solutions that are both visionary and sustainable [6]. Climate change, global developments such as urban sprawl and the rapid growth of cities require strategies that integrate geographical, ecological, sociological and infrastructural datasets into planning. Landscape architecture is challenged to combine heterogeneous fields of action that are both physical and philosophical, scientific and poetic, and bring together past, present and future
potentials into a single meaningful whole [7, 13]. This situation has lead the team of Prof. Christophe Girot to develop a framework and tools to recall the potentials of landscape architecture with a special focus on computational design methodologies. Landscape architecture has to be strengthened as an integrative discipline deeply rooted in shaping and preserving nature to the design of sustainable environments with a site-specific character by integrating future-oriented technology. In the era of ’data-overload’ special attention must be given towards how data is handled and how specific information is chosen to move from mere ’data mapping’ and ’datascapes’ to the development of coherent and fully functional data-driven design tools [16]

HOW TO TRAIN A MEANINGFUL EDUCATION OF COMPUTATIONAL TOOLS?

Landscape Architecture Design Simulation – MAS LA ETH Zurich

The one-year MAS LA program works within a range of future-oriented technical and design inputs, theoretical issues and discussions, as well as feedback from international specialists, from landscape architecture and information technology to landscape design simulation. The program picks on current problems and investigates new workflows, which can be evaluated and applied experimentally to site-specific issue. The focus lies on the use and deployment of the latest computational techniques as well as 3D landscape illustration methods in order to enable the graduates to explore new computational design strategies which accommodate the complex environmental and dynamic issues facing us today. For the last three years, the MAS LA program has been involved in researching new fields of application that explore the range of the programs in relation to the representation of real data (sensor data and open access data) as a design tool. Our experience up to now is based on the use of Processing (Open Source programming language with direct visual output) and Grasshopper [12]. The main goal is to learn a creative approach to handling complex correlations. At the beginning, the elementary understanding of the data is the focus, which will subsequently be researched for new strategies. These are then visualized in order to be able to make a design-relevant decision [4] (Figure 1).

A research into the software packages generally applied for data visualization reveals that the process of reflection is often forgotten. The visual representation, whether it is a model or a drawing, is often a very similar fact or design solution and runs the danger of being mistaken for the other [1,2]. Our experience shows that in ’Big Data Visualizations’ in landscape architecture, in addition to understanding the data, a certain basic understanding of programming is required in order to be able to independently control the situation and the application of the data. The current rapid developments in technology make an almost unlimited application of optional complex data sets possible; whether self-developed or downloaded from an open-source site. In turn, this requires a methodical and didactic further development of the design tools on university sites [11].

Explorative Data Mapping: Experimental Teaching Tools

Within the design process, what methods are needed to identify relevant information from the abundance of data sets available [8,9]? How can the data be visualized in order to derive subsequent meaningful decisions for the design? We explore these questions experimentally in the MAS LA Module: Programming Landscapes – Explorative Data Mapping.

As a result of the 5 week module the students were able to interact with the data in a very design oriented manner. The methodology of the module is comprised of three steps. First the application possibilities of open access data for the creation of design tools within landscape architecture will be examined at a theoretical level. Subsequently, methods and workflows in programming will be elaborated in order to develop concrete tools and methods, based on case studies from teaching and reference projects from professional practice, to reveal possibilities for integrating databases as interactive design tools in planning in the third and final step.
Figure 1: Interactive scripted tool by MAS LA 2015/16 students Thalia Poziou and Erick Galicia. By scrolling over the aerial photo of the site (image top left), the section is automatically drawn which displays the interpreted data of the site in correlation with the proposed design (image lower row). The input for the program are different layers of site-specific data, which are integrated into the script by colored maps (images top middle and left).

While classic statistical representations have the main task of communicating complex ideas clearly, exactly and efficiently, we are currently living in a time that has almost unrestricted opportunities to access data that can be considered design-relevant. Through simple technical access using, e.g. quadrocopters in combination with sensors, various data that deliver real-time information on site-specific conditions can be recorded.

Data that provides supplements to the classic GIS information 'datascapes', especially in landscape architecture, can be applied as design tools on various levels. Experience with our students, however, show that the data sets are often not completely understood and the resulting false parameters can then influence the design. The designs quickly become endlessly complex and can no longer be controlled [11].
Pilot Project at Aalto University: Digital Landscape Architecture Studio

The studio cooperation between ETH Zurich and Aalto University concentrated on new readings of landscape systems by integrating emerging tools, like site-specific data capturing and data visualization, in combination with traditional hands-on design tools. Students were encouraged to cross disciplines and theoretical boundaries and critically analyze dataset information as a design tool (Figure 2-4). Workflows developed at the Chair of Professor Christophe Girot were tested within a new environmental setting. The focus lies on the usage of site-specific data as design supportive tools, as well as experimental modes of representation and visualization to test and communicate the design proposal [3]. Collecting data responsibly and independently and integrate it as relevant tools in the design process. Students are encouraged to cross discipline and theoretical boundaries and critically analyze the dataset information.

With the simple technical access of sensor technology, for example in combination with Arduino (an open-source electronics platform based on easy-to-use hardware and software), one can generate a plethora of environmental data regarding place-specific conditions in real time through the use of UAVs (unmanned aerial vehicle). Data that can create datascapes, especially in landscape architecture, as a supplement to conventional GIS information, can be used at various levels as design tools [5].

REFLECTING ON THEORETICAL POSITIONS

Researchers like Jeremy W. Crampton are raising the question: “...how today Big Data are framing the contours of our lives in the age of the algorithm?” Relevant positions of key figures in this domain with a strong connection to the practice of landscape architecture are summarizing the

Figure 2: Aalto University: Site Perception Tools: Workshop with Luis Fraguada (IAAC Barcelona) at Digital Landscape Architecture Studio: Students gathering site-specific data with sensors. Development of Grasshopper scripts to postprocess the data into the design chain. Main purpose of the workshop is to find relevant conclusions be made from the flood of existing information and to develop workflows most suited to keeping data relevant and meaningful to design.

Figure 3: Aalto University: Project: FLUX by students Jussi Virta and Sanna Sarkama. FLUX manipulates the design site with an artistic intervention using the seasonal flood event as a tool to get the people closer to the existing water. The starting point and goals of the design were future growth of population around Gräsanoja; improvement and increase of recreational values in the area; making the water more accessible; and turning the flood into a positive feature. To achieve the complex design goals, the students developed their individual computational design process.
Aalto University: Project: GRAAS. Gräsanoja Renewal, by students Minna-Mari Paija and Antuané Nieto-Linares. The project seeks to minimize this infrastructure disruption of the place by utilizing topography as a binding agent. Urban and green infrastructure are the responsive elements to the demands of the site. The integration of wind and sound data was used to shape the new landform which will use the excavation material from the near-by metro construction area.

ongoing discussion like Jürgen Döllner as follows: “A rapidly growing collection of digital tools, systems, and applications is shaping the way we manage challenges in scientific disciplines and, to a significant degree, defines the scope of possible options and solutions we can develop. In the past few years, a general movement toward distributed, service-based IT solutions can be observed. The software architecture of geovisualization applications and systems demands efficient methods for coping with the conditions and restrictions of mobile devices such as limited networking and computing resources.”

Carl Steinitz, a former member of the Harvard Laboratory for Computer Graphics: “For serious societal and environmental issues, designing for change is inevitably a collaborative endeavor, with participants from various design professions and geographic sciences, linked by technology from several locations for rapid communication and feedback, and reliant on transparent communication with the people of the place who are also direct participants.”

When one sets these theses within the context of landscape architecture, it becomes apparent where the potential and also the challenges in the area of “big data” lay. Dependent on the scale and the complexity of the given landscape architectural problem and its context, different databases may be relevant. Here, the research addresses both sociological-cultural questions with relation to big data as well as the question how this development may be embedded in the theoretical context of information theory and what kind of impact can be expected from it. In the wide field of “big data” questions, the focus of the analysis is parameter-based design, the correlation of data generation and integration and its possible qualitative improvement of a design.

What kind of theoretical relevance does the large field of data visualization with special focus on data mapping and datascapes with relation to data mapping and datascapes with relation to the development of a design methodology and how can these developments be arranged in the general theoretical reflection of the ‘era of computational architecture and landscape architecture’?
CONCLUSIONS
Holistic Approach, we need to be critical!
Landscape architects have to deal with a high level of complexity in their designs, as they have to deal with dynamic forces such as water, tidal activity, wind, and changes of season and their influence on geology and vegetation over time. Therefore landscape architects are currently challenged to generate a new digital workflow by creating multiple software platforms to communicate and exchange data information [14]. This position allows for the development of visionary solution strategies that open new possibilities for combining elements by discarding simple and often restrictive algorithms. By freeing design from linear control and the context-free grid, the results of these aforementioned methods show controllable, transparent and better answer to complex planning tasks. The change from top-down to bottom-up allows the design process to become comprehensible and flexible [15]. At the moment, the work of finding relevant data often resembles that of a search machine: one is only able to find truly relevant data in the flood of information by creating customized tools. These pick up on the particular qualities and assets focused on by the designer for a certain project and link them to relevant information. This information, in turn, can help one look beyond one’s own area of expertise and establish participative work processes that can strengthen the quality of the designing in the discipline of landscape architecture.

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Why CAADence in architecture?

"The cadence is perhaps one of the most unusual elements of classical music, an indispensable addition to an orchestra-accompanied concerto that, though ubiquitous, can take a wide variety of forms. By definition, a cadence is a solo that precedes a closing formula, in which the soloist plays a series of personally selected or invented musical phrases, interspersed with previously played themes – in short, a free ground for virtuosic improvisation."