



Humanizing Digital Reality

Design Modelling Symposium Paris 2017

Editors : Klaas De Rycke, Christoph Gengnagel, Olivier Baverel, Jane Burry,
Caitlin Mueller, Minh Man Nguyen, Philippe Rahm, Mette Ramsgaard Thomsen.

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Foreword

The National School of Architecture at Versailles (ENSA-V) and the Design Modelling Symposium have come together because they share the same vocation, the same commitment that of offering an innovative terrain to explore the potential of the digital revolution through education and research in architecture and urbanism.

The DMS will support the transformation of the school and aims to accentuate the path that so clearly defines ENSA-V: ensure fruitful links between education, research, and a deliberate return via digitalization to a control and an intensified exploration of the material. The creation of a fablab focusing on the new paradigm “digitalization as a return to the material” will be launched. It will be run by teams concerned with innovation, made up of students, teachers, researchers, and practitioners.

Together with the DMS, ENSA-V will inaugurate these new spaces—hospitable, flexible, and open—destined to provide new national and international educational perspectives, able to flourish at all levels and weaving close ties between patrimony and innovation, between heritage and a vision of the future.

ENSA-V will also inaugurate, with the DMS, a new educational vision which incites teachers, researchers, and students to focus on three unifying themes—“plan/non-plan,” “acceleration/deceleration,” and “living in the world”. Extending over three years, they will encourage a community in movement, interdisciplinary and cosmopolitan, to meet to devise scholarly contributions, to envisage innovative experiments, and to construct audacious hypotheses. From today, ENSA-V’s objective is to provide this community with the resources necessary to develop, to flourish, and to fully disseminate its work.

In anticipation of the first manifestations of this three-year strategy, this work will illustrate the powerful opportunity for areas of exploration that crosscutting architectural and digital disciplines provide when together they devise a hope for human activities.

Jean-Christophe Quinton



Workshop at ENSA Versailles

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Finally, we thank ENSA-V for hosting and supporting the Design Modelling Symposium Paris 2017.

Design Modelling Symposium Paris, 16/09–20/09/2017

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Introduction

Digital and physical human environments interfere more and more. Mobile devices, drones, cars, robots, smart production methods, intelligent cities and—following Antoine Picon's observations in his text further in this book—even digitized odors are constituting new layers on top of our daily lives and are becoming much more common layers in an ever more digitized world. They seem to alter our regular physical interactions and surrounding physical or digitized world. Even without looking as far back as the middle ages, but just thirty years ago at the dawn of the World-Wide Web we might question how far the reality is from becoming digital and how much the digital influences reality?

The changes that we are considering are inherently human, being man-made and expressing an unbridled belief in constant progress. This positivist belief focuses primarily on action and overlooks a multitude of aspects; It disregards the real role and place of human (inter)action, of human and digital (inter)action, how far the digital can and will change the real/reality, how much we can control our reality with(in) the digital, and how much of it is actually still controlled by humans?

Much has been written and debated about the influence CAD, and data has had on buildings, on city planning, on fabrication and its processes. We could invert the question asking instead to what extent are humans still in control of our digital/real surroundings?

In the line of the positivist movement some 150 years ago, anthropocentrism seems to be a logical continuation of progress where humans control the built and unbuilt environment and are central in bringing and implementing solutions. In contemporary reality, ever better computers emulate and control ever better natural phenomena evolving to a hoped for all-encompassing matrix for future cities and future relationships.

Technological advances seem a culmination of this positivist idea. Nowadays, preachers and technological zealots and specifically proponents of AI even predict the removal of humans from the equation. Building on that thought, we can ask ourselves how far our reach as humans really goes? Do the complex algorithms that we use for city planning nowadays live up to expectations and do they offer sufficient quality? Are they an extension of ourselves? Are they self-controlled? How much data do we/they (the computing power) have and can we control? Are current inventions reversing the humanly controlled and invented algorithms into a space where humans are controlled by the algorithms?

Are processing power, robots, and algorithms of the digital environment and construction in particular, not only there to rediscover what we already know or do they really advance the fields of construction and architecture?

The Design Modelling Symposium is an interdisciplinary platform to explore recent developments, their meanings and place in the environment of architecture,

engineering, and art. This year's conference will try to offer some answers and exchange on the following questions;

1. What is big data? What does it teach us and in what fields? Is it preconceived or only processed data? How is data flowing, toward or away from something? Intelligent cities? How is city-planning changed by the data knowledge, what are the current and future algorithms running the current and future towns? What smarter elements are they suggesting and how "smart" should cities become? What are its flaws?
2. What are the benefits and the possibilities in design with robotics? Are they just a tool or a goal in themselves? Should we look for ways by which the very technical approach of robotic design could define future design solutions? Is there a new archi-botic paradigm?
3. How much can we construct nature? What is nature/material; a perfectly controlled algorithm which can be used/abused as one wishes? What role does geometry play? Is the data crunching, digital design, and digital fabrication merely a help in statistical empirical and descriptive science? Is it merely a numerical transcript of natural phenomena? Does it just support—but in continuous faster loops—exploring and exploiting natural possibilities for constructing or can it go beyond that point and help uncover new ways and perhaps new laws of nature? Can it be treated as a behavioral and statistical science proactively informing building processes?
4. What is data sharing, workflow, collaborative? How digital tools create an environment that can help teams designing projects? Is it disruptive constructive or linear? How do we inform the process and then control the output until the physical result?
5. How emulation can influence the project? What is the relationship between hypothesis, analysis, physical testing, post-rationalization, and when can we fully predict the reactions in the real world? How can post-construction measurements inform real-time projects?
As computational fluid dynamic analysis and the gathering of data through drones and other real-time data is gaining ground, how is the digitalization of the weather, of the total physical environment, of real-time data influencing design?

This initial approach to the position of man in the digital era leaves us deliberately with only questions. We felt that over the course of 2017 and with the approaching symposium in September, these open-ended questions would be slowly answered by—in chronological order—the members of the board, by the keynote speakers, by the scientific contributions, and finally by the event of the symposium itself with workshops, speeches, and conversations.

The first step was taken by the board. The board works both as a think tank, as a guardian of the researched content and of quality and as a moderator.

The first step was to organize the questions into different topics. The topics then should be given boundaries—or a framework—within which possible answers (hypothesis/theories) can be treated and organized. The hypotheses should come from

the participants, namely the keynote speakers, the contributors of scientific papers, and the participants at the symposium.

The framework of the topics is described in more detail by the responsible topic leaders later in the book.

We found that for the five topics, we could further reorganize them under three overarching global themes;

A. Design and Modeling of Matter

- material practice (Mette Ramsgaard Thomson, Christoph Gengnagel)
- structural innovation (Olivier Baverel, Caitlin Mueller)

B. Design and Modeling of Data

- data farming (Tomas Diez, Klaas De Rycke)
- data shaping cities (Jane Burry)

C. Design and Modeling of Physics

- thermodynamic practice (Philippe Rahm)

Each topic is debated over half a day during the symposium. Specific chosen keynote speakers help to conceive the topics.

From 148 very interesting and high-level scientific submissions, 45 were finally chosen to deliver possible answers to the initial questions.

The symposium is the final step. It started with a series of questions, evolved to defining topics, delivering a framework and initial definitions, being tested in scientific papers and finally being debated at the symposium.

About this book, the book tries to follow an empirical research approach. There is an original question based on some observation (hypothesis-intro), followed by induction or the formulation of hypothesis (topics), further to deduction (experiments and rephrasing by the keynotes) and then to the testing (scientific papers). This should normally be finalized with an evaluation or a general conclusion. Since empirical research is observation based and has no simple final value but rather a field of possibilities or rather probabilities, the book leaves it open to the conference participants to formulate any conclusion. This way the book perfectly falls in line with this year's overall theme; what shall each human become in the vast area of data treatment in the fields of architecture and engineering?

All of the available data on these topics will be gathered on a digital and physical platform which we hope will enhance further discussion and—who knows—progress!

Klaas De Rycke
Minh Man Nguyen

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Part I

Material Practice



Tamke M., Baranovskaya Y., Holden Deleuran A., Monteiro F., Figueiro R., Stranghöfner N., Uhlemann J., Schmeck M., Gengnagel C., Ramsgaard Thomsen M.: Bespoke materials for bespoke textile architecture, IASS annual symposium 2016 “spatial structures in the twenty-first century”, at Tokyo 2016

Current design practice in architecture and engineering is undergoing radical changes. The ability to integrate advanced simulation in the early design phase and live sensor data from the environment of site, production, or material, fundamentally changes the act of design from one of pure projection to one of calibration of behavior. The speculative and creative process of design now engages tools that change the way we understand performance across the scales of environment, structure, element, and material giving us the ability to conceive new hybridized structural morphologies and rethink and invent their underlying material practices.

Christoph Gengnagel
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Computational Material Cultures

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Fig. 1 Pavilion's envelope consists of wooden lamellas formed by an intricate network of bent and tensioned segments. This self-equilibrating system physically computes the shape of the pavilion during assembly on site. *Institute for Computational Design (Achim Menges) and Institute of Building Structures and Structural Design (Jan Knippers), ICD/ITKE Research Pavilion 2010, University of Stuttgart, 2010*

Architecture provides the material context within which most of our everyday life unfolds. As a material practice, it effectuates social, cultural, and ecological relevance through the articulation of the built environment. This articulation is intrinsically tied to the processes of intellectual and physical production in which architecture originates: the processes of design and materialization. Today, the reciprocal effects of these two processes on each other can be seen through a different lens, and computation constitutes a critical factor for this contemporary reassessment of the relation between the generation and the materialization of form and space.

On the one hand, computation enables architects to engage facets of the material world that previously lay far outside the designer's intuition and insight. On the other, it is increasingly understood that—in its broader definition—computation is not limited to processes that operate only in the digital domain. Instead, it has been recognized that