PROTOCOLS, FLOWS AND GLITCHES

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About CAADRIA

The Association for Computer-Aided Architectural Design Research in Asia (CAADRIA) promotes teaching and research in CAAD in Asia, and has members on six continents.

CAADRIA was founded in 1996 with the following objectives:

- To facilitate the dissemination of information about CAAD among Asian schools of architecture, planning, engineering, and building sciences.
- To encourage the exchange of staff, students, experience, courseware, and software among schools.
- To identify research and develop needs in CAAD education and to initiate collaboration to satisfy them.
- To promote research and teaching in CAAD that enhances creativity rather than production.

CAADRIA organizes among others an annual conference, the first of which was held in 1996 in Hong Kong. Since then, 21 conferences have been held in Australia, China, Hong Kong, India, Japan, Korea, Malaysia, Singapore, Taiwan, and Thailand. The 22nd conference, in 2017, will be held in Xi'an Jiaotong-Liverpool University, China. The conferences provide an opportunity for teachers, students, researchers, and practitioners to meet each other and learn about the latest research in the field. The proceedings of the conferences are available both on line and in research libraries around the world.

CAADRIA is one of the four founding organizations of the International Journal of Architectural Computing (IJAC), and supervises one issue each year. IJAC is published by Multi-Science in both paper and electronic versions.

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Conference Theme

Protocols, Flows and Glitches

Data structures and network protocols now integrate operations of entire industries, and digital workflows encompass virtually all stages of architectural production. Buildings and the processes they undergo are represented by digital building information models, which are shared across disciplines to generate options and support decisions before they are committed to built form.

Yet, there are limits to the reach of digital modelling and predictability. The tools and frameworks within which building information models are created and used, are themselves subject to constraints and forces similar to those that impede architectural production and maintenance, including technical glitches, noise, error, versioning and compatibility issues, limits to quantifiability, questions of cost effectiveness, incomplete “information”, and challenges of interpretation and negotiation. The question arises whether more powerful tools resolve challenges, or whether, in doing so, they encourage us to venture deeper into territories where yet more challenges are encountered?

However, our field of computer-aided architectural design engages also that which cannot, or cannot yet, be readily described or modelled. We thus negotiate the reach of formal representation, deepening appreciations of human agency and creativity and laying foundations for industry-transforming technologies.

CAADRIA2017 features original high quality papers and posters presenting current computer-aided architectural design research in a general sense, accommodating a broad spectrum of approaches ranging from speculative, informal investigations to conventional scientific research, including but not limited to the following topics:

- Computational design research and education
- Computational design analysis
- Generative, algorithmic and evolutionary design
- Digital fabrication and construction
- Collaborative and collective design
- Design cognition
- Virtual/augmented reality and interactive environments
- Virtual architecture and city modelling
- Human-computer interaction
- Ubiquitous and mobile computing
- Practice-based and interdisciplinary computational design research
- Theory, philosophy and methodology of computational design research
- Simulation and Visualization
- Building Information Modelling
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New Structures
Manfred Grohmann

Digital Regionalism
Philip F. Yuan

Digital Apparition in Contemporary Chinese Architecture
Weiguo Xu

In Search of Organized Complexity
Zhenfei Wang
New Structures

Manfred Grohmann

University of Kassel, Germany

Bollinger+Grohmann, Frankfurt, Germany

While the design and construction of complex projects has always been a challenge for architects and engineers, workflows have completely changed over the past decades with the introduction of advanced digital technologies. High quality architecture and innovative construction can only be ensured with an interdisciplinary and integral planning approach. Architecture and construction is always based on functional, mechanical and structural principles and requires depth of experience with materials, construction methods and technologies on the part of all involved actors. But to push the boundaries with new projects it also needs actors who are willing to develop and realise the new. Digital tools and methodologies allow us to leave behind tried and tested typologies and to design structures that are tailored to suit their specific function. Computer-aided design, calculation, optimization and at the end manufacturing all help with the efficient implementation of such projects across all scales. A variety of exemplary projects illustrate these new kinds of structures, such as the Hermes Rive Gauche (architects RDAI), the Sphere Deutsche Bank (architect Mario Bellini), the Hungerburgbahn (architect Zaha Hadid), the Rolex Learning Center (architects SANAA), and the European Central Bank (architects COOP Himmelb(l)au).

SPEAKER BIOGRAPHY

Prof. Grohmann holds a diploma degree in Civil Engineering from the Darmstadt Technical University. Since 1996 he has been Professor for Structural Design at Kassel University. Besides being guest professor at the Städelschule in Frankfurt and the ESA – École d’Architecture in Paris, he is furthermore since 2015 Honorary Professor at the University of Melbourne and the University of Nottingham. In 1983 Klaus Bollinger and Manfred Grohmann established the practice Bollinger+Grohmann, now located in Frankfurt am Main, Berlin, Vienna, Paris, Oslo, Melbourne, Berlin, Munich and Rome with around 150 employees. Both combine teaching at architecture schools with their practice. Bollinger+Grohmann combine a high level of interdisciplinary knowledge like architectural geometry, software development, material and fabrication technologies with engineering expertise. Their range of services includes structural and façade design, geometry development, building physics and sustainability. The field of work spans between the structural design of housing, office, commercial, exhibition and event facilities as well as classic civil engineering structures such as bridges, roofs and towers.
Digital Regionalism

Philip F. Yuan

*College of Architecture and Urban Planning (CAUP) Tongji University, China
Archi-Union Architects and Fab-Union Intelligent Engineering Co. Ltd, China*

During the past decades in China, as the widespread concerned about material, craftsmanship and regional culture, digital design and fabrication technology has been leading an important role in interpreting and indicating a computational regionalism. In the perspective of Performative Tectonics, traditional materials have been not only the driving force for architectural form-finding process, but also differentially reflect the material performance and fabrication as well. Rather than being passive elements, performative tectonics has become the basis aspect due to its real participation. Meanwhile, as the significant roles of architectural robots, "digital factory" has realized the innovation of traditional tectonics. Architecture industry is experiencing a promotion from "traditional craft" to "mass customization". From the low-tech construction of the "Silk Wall" project in 2010 to the project of "Chi She" with robotic fabrication in 2016, Philip F. Yuan has been exploring the theory and practice of Computational Regionalism.

SPEAKER BIOGRAPHY

Philip F. Yuan, born on 1971, has accomplished achievements on the research and discovery progress of Digital Design and Intelligent Construction area. In recent years, Philip F. Yuan was awarded a variety of educational and design prizes, including Winner of Feng Jizhong Architectural Education Award in 2013, Excellent guidance tutor of National Board of Architectural Accreditation, China & Institute of Architectural Education and Accreditation, Architectural Society of China, Winner of the Young Architect Award of Architectural Society of China in 2014, the Nomination Award in 2014 ARCASIA Award, the 2014 Wienerberger Brick Award, Shenzhen Biennale Popularity Award in 2015, Gold and Silver Prize of Architectural Design awarded by Architectural Society of China in 2016. Philip F. Yuan has published more than 120 academic theses and his architectural design projects on academic architectural journals and magazines like ARCHITECT, ARCHITECTURE DESIGN, ARCHITECTURAL VIVA, PLAN, DETAIL, SPACE, AREA, etc. He has written 7 books including Fabricating the Future, Scripting the Future, and From Diagrammatic Thinking to Digital Fabrication.
Digital Apparition in Contemporary Chinese Architecture

Weiguo Xu
Chair, School of Architecture, Tsinghua University, China

Although architects seek cultural value of architectural design in the background of Pragmatism in mass construction in China, the designs, however, couldn't get rid of the commercial and pragmatic essence, even if it is excellent works we thought. Another design phenomena seems not to attract enough attention, which is using new digital technologies for architectural design. As design result, these designs are absolutely not direct expression of the technology, but a kind of new ideological value of architecture. It includes the expression of human behaviour, mental sensation, environmental restrictions, new social requirements and so on. It appears like apparition in practical projects, also in research and teaching in China. And it is going to be a general trend that cannot be halted to infiltrate into different aspects of architecture and to create a future scenery of architecture. The speech will introduce the digital new architectures in China including project, research and teaching.

SPEAKER BIOGRAPHY

Xu Weiguo is Professor and Chair of Architecture at the School of Architecture, Tsinghua University, Director of the DADA, and a leading scholar and architect in digital design. He has published more than 100 papers and 14 books, including books (co-authored with Neil Leach) Fast Forward>>(2004); Emerging Talents, Emerging Technologies (2006); (Im)material Processes: New Digital Techniques for Architecture (2008); Machinic Processes (2010); Design Intelligence: Advanced Computational Research(2013); Digital Factory(2015); and Architecture/Non-Architecture (2006), Parametric Non-linear Architecture Design(2016); Digital Architecture Design Works(2016). Several of his research projects have been funded by the Natural Science Foundation of China. He has lectured worldwide, been visiting scholar at MIT in 2007, and taught in SCI-Arc and USC in 2011-2012. He has curated the DADA series of events in 2013, and co-curated the Architecture Biennial Beijing 2004, 2006, 2008 and 2010.
In Search of Organized Complexity

Zhenfei Wang

_HDD_FUN, China_

High technology design and low technology construction is the design philosophy of HHD_FUN, we believe smart design can achieve the complexity within short schedule and low budget. The keynote will illustrate this methodology through several built projects in different scale including architecture, interior, installation, product design and more.

SPEAKER BIOGRAPHY

Zhenfei Wang graduated from Berlage Institute in Rotterdam with an Advanced Master degree of architecture in 2007. He worked in UNStudio (Amsterdam). Before that, he gained his Bachelor degree of Architecture from Tianjin University. He founded HHD_FUN together with Luming Wang in 2008. Zhenfei Wang was awarded the third prize of the New Chinese Architecture at CA’ASI which held by Architecture Studio office and AREA magazine. As emerging architects, HHD_FUN were invited to participate in the 2019 Venice Biennale and the “Machinic Processes” Architecture Biennial Beijing 2010 (organised by Weiguo Xu and Neil Leach). HHD_FUN also won the “2015 Iconic Award” and “2016 German Design Award”. As cross-over architects, HHD_FUN is keeping in close touch with artists, designers and engineers from various fields.
Foreword

The annual CAADRIA (Association for Computer-Aided Architectural Design Research in Asia) conference provides an international community of researchers and practitioners with a venue to exchange, to discuss and to publish their latest ideas and accomplishments. This volume contains the 87 research papers that were accepted for presentation at the 22nd International CAADRIA Conference, hosted and organised by the Department of Architecture at Xi'an Jiaotong-Liverpool University in China. The contained papers can be obtained digitally from CUMINCAD.

This volume is the outcome of an extensive collaborative effort of a team of volunteers, and it marks another year of growing quality and strength in the history of CAADRIA. Calls for papers in August of 2017 resulted in the submission of 190 abstracts. These were initially blind reviewed by the paper selection committee, which invited 171 abstracts for further development. Of these, 117 full papers were submitted to the full paper review stage. A team of 138 international reviewers assist us in the full review stage. Three international reviewers carried out a double-blind review of each submitted paper. Following the reviewers’ recommendations, 86 papers were finally accepted for publication.

We congratulate the authors for their accomplishment. Next to the authors, the reviewers, who volunteered valuable time and effort, deserve our sincere thanks and acknowledgements. We sincerely thank the organising team at Xi’an Jiaotong-Liverpool University, in particular Dr. Christiane Herr, conference chair. We would also like to extend a special thanks the Proceedings team – Gabriel Wurzer and Wolfgang Lorenz – for their relentless support with customizing the system to the needs of this CAADRIA Proceedings.

On the following pages, we acknowledge and thank those who contributed to the production of this volume. In closing, we sincerely thank the CAADRIA community for offering us the honour to serve as members of the paper selection committee for CAADRIA 2017.

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