

“数字渗透”与“参数化主义”

DADA2013 系列活动 数字建筑国际学术会议论文集

Digital Infiltration & Parametricism

Proceedings of the DADA2013 International Conference on Digital Architecture

黄蔚欣 刘延川 徐卫国 主编

Weixin HUANG Yanchuan LIU Weiguo XU



清华大学出版社

“数字渗透”与“参数化主义”

DADA2013 系列活动 数字建筑国际学术会议论文集

Digital Infiltration & Parametricism

Proceedings of the DADA2013 International Conference on Digital
Architecture

黄蔚欣 刘延川 徐卫国 主编

Weixin HUANG Yanchuan LIU Weiguo XU

清华大学出版社

北京

内 容 简 介

DADA 是数字建筑设计专业委员会(Digital Architecture Design Association)的简称,它隶属于中国建筑学会建筑师分会,由 23 位国内从事数字建筑设计的建筑师及学者于 2012 年 10 月发起成立。本论文集收集了 DADA2013“数字渗透”系列活动——数字建筑国际学术会议的主要论文共 61 篇,其中中文文章 40 篇,英文文章 21 篇。这些论文涉及数字建筑相关的多个领域,包括参数化和生成式设计、数字建筑设计理论与教学,数字设计实践,互动式和响应式装置、实验性建造,以及建筑信息模型与虚拟现实等,较全面展示了数字技术与建筑设计相结合的最新成果,并表现出不同的观点和思想,这势必引起更多的讨论和探索。

版权所有,侵权必究。侵权举报电话:010-62782989 13701121933

图书在版编目(CIP)数据

“数字渗透”与“参数化主义”: DADA2013 系列活动·数字建筑国际学术会议论文集: 汉、英/黄蔚欣, 刘延川, 徐卫国主编. —北京: 清华大学出版社, 2014

ISBN 978-7-302-34382-0

I. ①数… II. ①黄… ②刘… ③徐… III. ①数字技术—应用—建筑设计—国际学术会议—文集—汉、英 IV. ①TU201.4-53

中国版本图书馆 CIP 数据核字(2013)第 260142 号

责任编辑: 周莉桦 赵从棉

封面设计: 陈国熙

责任校对: 王淑云

责任印制: 王静怡

出版发行: 清华大学出版社

网 址: <http://www.tup.com.cn>, <http://www.wqbook.com>

地 址: 北京清华大学学研大厦 A 座 邮 编: 100084

社 总 机: 010-62770175 邮 购: 010-62786544

投稿与读者服务: 010-62776969, c-service@tup.tsinghua.edu.cn

质 量 反 馈: 010-62772015, zhiliang@tup.tsinghua.edu.cn

印 装 者: 北京嘉实印刷有限公司

经 销: 全国新华书店

开 本: 185mm×260mm 印 张: 38.75

字 数: 1037 千字

版 次: 2014 年 4 月第 1 版

印 次: 2014 年 4 月第 1 次印刷

定 价: 128.00 元

产品编号: 056766-01

前言

本论文集收集了 DADA2013“数字渗透”系列活动——数字建筑国际学术会议的主要论文。

DADA 是数字建筑设计专业委员会(Digital Architecture Design Association)的简称,它隶属于中国建筑学会建筑师分会,由 23 位国内从事数字建筑设计的建筑师及学者于 2012 年 10 月发起成立;其宗旨是联合国内建筑行业中从事数字建筑的建筑师、学者、及相关企事业单位和学术团体,开展国内及国际化数字建筑设计的广泛学术交流,促进数字建筑的研究和实践,推动数字建筑知识及技术的迅速普及;同时,积极引导建筑行业内从设计、生产,到施工、管理等不同领域之间的沟通与衔接,为整个建筑行业整合升级、形成可持续发展的新型产业链做出应有贡献。

“数字渗透”系列活动包括数字建筑展、数字建筑国际学术研讨会、数字建造设计竞赛三部分。数字建筑展由 5 个分展组成,包含国际建筑师展(Patrik Schumacher 策展),国际学生建筑设计作品展(徐卫国、Neil Leach 策展),中国数字筑造展(高岩、王鹿鸣策展),数字装置作品展(宋刚、袁烽、彭武策展),设计竞赛入围作品展(周宇舫、井敏飞策展)。“数字渗透”这一主题形象地描述了数字技术对建筑设计的影响及作用,其结果正在改变建筑设计的方方面面;同时由于数字设计本身所具有的本质属性,一种新的建筑设计趋势正在形成。这一系列活动正是试图展示在数字技术影响下建筑设计所取得的成果。

本次会议自 2013 年初开始面向海内外专家学者征集论文。征文过程分为摘要征集、全文提交、文章修改等阶段,论文都经过了摘要征集阶段两位组委会成员的审查,以及全文提交后两位国际评审委员会成员的审查。在整个论文征集阶段我们共收到投稿 101 篇,最终共有 61 篇文章(中文 40 篇,英文 21 篇)通过审查,收录在本论文集中。这些论文涉及数字建筑相关的多个领域,包括参数化和生成式设计、数字建筑设计理论与教学,数字设计实践,互动式和响应式装置、实验性建造,以及建筑信息模型与虚拟现实等。

本次会议的组织离不开相关专家学者和学术组织的支持,会议组委会感谢 DADA 委员和国际评审委员会成员在论文评审阶段辛勤的工作!中国建筑学会建筑师分会和亚洲计算机辅助建筑设计学会(CAADRIA)帮助我们向海内外专家学者发布了会议的信息,在此也特别表示感谢!

黄蔚欣 刘延川

FOREWORD

These proceedings contain 61 papers of the DADA2013 International Conference on Digital Architecture, which is a part of the series of events of DADA2013 under the theme of Digital Infiltration.

Digital Architecture Design Association (DADA) is an official organization under the Architect Association of the Architectural Society of China. DADA was founded in October 2012 by 23 domestic architects and scholars who work in the realm of digital architecture. DADA aims to unite architects, scholars, enterprises, institutions and academic organizations in the building industry in China that works in the realm of digital architecture, to facilitate domestic and international academic exchanges on digital architectural design, to propel digital architectural research and practice, to promote the dissemination of digital architectural knowledge and technologies; at the same time, actively guide the communication and connection of different area in the building industry, including design, production, construction and operation, and contribute to the building industry in its process of integrated promotion into a new sustainable industrial chain.

The series of events of “Digital Infiltration” include a Digital Architecture Exhibition, an International Conference, and a Design Competition. The Digital Architectural Exhibition is composed of 5 parts, including International Architects Exhibition (curated by Patrik Schumacher), International Students Exhibition (curated by Xu Weiguo and Neil Leach), China Digital Making Exhibition (curated by Gao Yan and Wang Luming), Digital Installation Exhibition (curated by Song Gang, Yuan Feng and Peng Wu), and Competition Works Exhibition (curated by Zhou Yufang and Jing Minfei). The theme of “Digital Infiltration” vividly depicts the impact of digital technologies on architectural design, and the results are changing architectural design in all of its aspects. The series of events seeks to display the achievements of architectural design under the influence of digital technologies.

DADA2013 conference began to call for papers among domestic and international experts and scholars at the beginning of 2013. This process included the phases of abstract submission, full paper submission and camera-ready paper submission. All abstract submission were subjected to double peer-review by DADA committee members, and all full paper submission were subjected to double peer-review by international review committee members. We received a total of 101 submissions, and of these 61 full papers (including 40 Chinese papers and 21 English papers) were finally accepted by the conference and included in these proceedings. The papers comprise a variety of topics, including parametric and generative design, digital architectural theory and education, digital design practice, interactive and responsive installation, experimental construction, building information model and virtual reality.

We hereby would like to thank all those who contributed to DADA2013 conference. We sincerely thank the DADA committee members and international review committee members for their hard working in the reviewing phases. We also sincerely thank the Architect Association of the Architectural Society of China, and Association of Computer-Aided Architectural Design Research in Asia (CAADRIA) for helping us to announce the conference information to the world.

Weixin HUANG, Yanchuan LIU

DADA2013 数字建筑国际学术会议

主办：中国建筑学会建筑师分会数字建筑设计专业委员会

承办：清华大学建筑学院

会议组委会：

主席：邵韦平

成员：Patrik Schumacher、Neil Leach、Mark Burry、Michael Weinstock、徐卫国、徐全胜、黄蔚欣、袁烽、周宇舫、徐丰、刘延川、佟晓威、张晓奕、王振飞、于雷、刘宇光、宋刚、过俊、彭武、范哲、Sam Cho、Paul Mui、高岩、穆威、胡磊、林秋达、井敏飞、常镗

总协调人：黄蔚欣、刘延川

DADA2013 International Conference on Digital Architecture

Digital Architecture Design Association (DADA), Architect Association of Architectural Society of China

Host: School of Architecture, Tsinghua University

Organization committee:

Chair: Weiping Shao

Members: Patrik Schumacher, Neil Leach, Mark Burry, Michael Weinstock, Weiguo Xu, Quansheng Xu, Weixin Huang, Feng Yuan, Yufang Zhou, Feng Xu, Yanchuan Liu, Xiaowei Tong, Xiaoyi Zhang, Zhenfei Wang, Lei Yu, Yuguang Liu, Gang Song, Jun Guo, Wu Peng, Zhe Fan, Sam Cho, Paul Mui, Yan Gao, Wei Mu, Biao Hu, Qiuda Lin, MinFei Jing, Qiang Chang

Coordinator: Weixin Huang, Yanchuan Liu

国际论文评审委员会

International Review Committee

Jane Burry RMIT University, Australia
Teng-wen Chang National Yunlin University of Science and Technology, Taiwan
Sheng-Fen Chien National Cheng Kung University, Taiwan
Sam Cho 华中科技大学 / Huazhong Univ. of Science and Technology, China
Benjamin Dillenburger ETH Zurich, Switzerland
Tomohiro Fukuda Osaka University, Japan
Ning Gu The University of Newcastle, Australia
Michael Hansmeyer ETH Zurich, Switzerland
Alvin Huang University of Southern California, United States
Yasushi Ikeda Keio University, Japan
Immanuel Koh Architectural Association, UK
Jordan Kanter Illinois Institute of Technology, United States
Andrew Li Athlone Research, Japan
Elena Manferdini SCI-Arc, United States
高岩 / Yan Gao 香港大学 / The University of Hong Kong, Hong Kong
何捷 / Jie He 天津大学 / Tianjin University, China
胡磊 / Biao Hu 湖南大学 / Hunan University, China
黄勇 / Yong Huang 沈阳建筑大学 / Shenyang Jianzhu University, China
吉国华 / Guohua Ji 南京大学 / Nanjin University, China
姜宏国 / Hongguo Jiang 哈尔滨工业大学 / Harbin Institute of Technology
靳铭宇 / Mingyu Jin 北方工业大学 / North China University of Technology, China
孔黎明 / Liming Kong 西安建筑科技大学 / Xi'an Univ. of Architecture and Tech., China
李彪 / Biao Li 东南大学 / Southeast University, China
李建成 / Jiancheng Li 华南理工大学 / South China University of Technology, China
刘延川 / Yanchuan Liu 中旭建筑设计 / ZPAD, China
梅小妹 / Xiaomei Mei 合肥工业大学 / HeFei University of Technology, China
穆威 / Wei Mu 华中科技大学 / Huazhong Univ. of Science and Technology, China
倪伟桥 / Weiqiao Ni 华中科技大学 / Huazhong Univ. of Science and Technology, China
沈源 / Yuan Shen 清华大学 / Tsinghua University, China
盛强 / Qiang Sheng 天津大学 / Tianjin University, China
宋刚 / Gang Song 华南理工大学 / South China University of Technology, China
孙澄宇 / Chengyu Sun 同济大学 / Tongji University, China
孙红三 / Hongsan Sun 清华大学 / Tsinghua University, China
汤众 / Zhong Tang 同济大学 / Tongji University, China
童滋雨 / Ziyu Tong 南京大学 / Nanjin University, China
王津红 / Jinhong Wang 大连理工大学 / Dalian University of Technology, China

虞刚 / Gang Yu 东南大学 / Southeast University, China
于雷 / Lei Yu 清华大学 / Tsinghua University, China
袁烽 / Philip Yuan 同济大学 / Tongji University, China
俞传飞 / Chuanfei Yu 东南大学 / Southeast University, China
许蓁 / Zhen Xu 天津大学 / Tianjin University, China
张昕楠 / Xinnan Zhang 天津大学 / Tianjin University, China
王朔 / Shuo Wang 华南理工大学 / South China University of Technology, China
曾旭东 / Xudong Zeng 重庆大学 / Chongqing University, China
邹贻权 / Yiquan Zou 湖北工业大学 / Hubei University of Technology, China
邹越 / Yue Zou 北京建筑大学 / Beijing University of Civil Eng. And Architecture, China

主旨演讲人

Keynote Speakers

**Architecture is Communication :
Organisation Articulation Signification**

Patrik Schumacher

Projection & Reception

Jesse Reiser+Nanako Umemoto

**Gaudí's Sagrada Família 2013 :
a living laboratory for traditional and innovative digital fabrication**

Mark BURRY

Creating Efficient Structures and Materials for Digital Architecture

Yi-Min (Mike) Xie

Architecture is Communication : Organisation Articulation Signification

Patrik SCHUMACHER

Zaha Hadid Architects

Abstract: Architecture is Communication. The city is a complex, densely layered text and a permanent broadcast. The intensification of communication constitutes the essential form of cultural advancement within contemporary network society. The furthering of this vital capacity requires a new built environment with an unprecedented level of complexity, organized and articulated into a rich, variegated order of the kind we admire in natural, self—organized systems. The built environment should be conceived and designed as a three—dimensional, 360 degree, layered interface of communication. Our ambition as architects and urban designers must be to spatially unfold more simultaneous choices of communicative situations in dense, perceptually palpable, and legible arrangements. The visual field must be rich in interaction opportunities and information about what lies behind the immediate field of vision. The built environment can communicate the more the more becomes simultaneously visible. Its communicative capacity further depends on the coherency of its internal order so that what is visible allows for inferences about what is invisible or not yet visible. This depends on the lawfulness of its spatial order. Its information richness also depends on the consistency of its form—function correlations, so that a positional or morphological distinction makes a predictable difference in terms of expected social interaction pattern. The patterns of communicative interaction can be modelled via programmed agents that respond to the semiologically encoded environmental clues. The system of signification works if the agents consistently respond to the relevant positional and morphological clues so that behaviours to be expected can be read off the articulated environmental configuration. As agents cross significant thresholds their behavioural rules are modulated. Territorial distinctions thus order and coordinate interaction patterns.

Projection & Reception

Jesse REISER+Nanako UMEMOTO

Reiser+Umemoto, RUR Architecture P.C.

Abstract: At best, technology can deliver conclusive solutions to trivial problems of culture, while culture in its most robust forms resists final capture by technology. Technique is thus a way of combating technological inertia; it forms the essence of style. The mark of a mature project in architecture is characterized by the systematic flouting of its founding principles. Youthful reliance on the rigor of the exact disciplines (i. e. mathematics, engineering, computation) matures into the ability to craft precise forms of fiction; it is what separates an architect's use of geometry from that of a mathematician, or the architect's use of forces from that of the engineer. Maturity thus is a process of becoming undisciplined.

This lecture explores the groundbreaking exo-skeleton O-14 tower in Dubai by New York-based practice, Reiser+Umemoto. Jesse Reiser will give an account of the design's realization and present a manifesto of sorts, as he delves into the complex interrelationships this architectural model weaves between technology, expression and politics in the context of the 'nowhere place' of the global city. The lecture will also examine the firm's two ongoing projects in Taiwan: the Taipei Pop Music Center and the Kaohsiung Port Terminal as well as the recent University of Applied Arts Vienna competition proposal.

Gaudí's Sagrada Família 2013: a living laboratory for traditional and innovative digital fabrication

Mark BURRY

RMIT University, Melbourne, Australia

Abstract: Catalan architect Antoni Gaudí i Cornet died with only a small proportion of his design for the Sagrada Família Basilica in Barcelona actually built—principally just the apse and the four extraordinary towers that form the east facing transept: the Nativity Façade. Gaudí inherited the project after the resignation of the project's first architect Francisco de Paula del Villar y Lozano one year after work had commenced on site in 1882, and he directed the project for 43 years until his death in 1926. His studio (based on site) was set on fire a decade later at the beginning of the Spanish Civil War burning all his drawings and smashing all his elaborate 1:25 and 1:10 scale models of his design for the whole basilica.

After the war work resumed gathering all the model fragments and painstakingly rebuilding the shattered models. It was only in the late 1970's that the work on site had advanced sufficiently enough for serious investigation into the main body of the building to commence: the nave, transepts, principal façade and the entire roof and towers. As these investigations developed, the task facing Gaudí's latter—day collaborators became better understood, not least the enormity of the challenge. This period coincided with the arrival of the digital design age, and it became apparent that the way Gaudí had envisaged the building being continued in his absence was complemented by the opportunities presented by the emerging technologies in several surprising ways. The fact that Gaudí sought to fuse his structural and constructional strategies through a unique geometrical logic is beautifully simple as a concept, but highly complex operationally, and this proved to be a formidable challenge, not least through the fact that he never fully implemented these strategies during his lifetime.

Mark Burry's keynote address will detail these strategies and explain how Gaudí put them in place as an elegant and effective strategy for the continuation of the building in the absence of his guiding hand. He will also outline how the continuation of the Sagrada Família Basilica has not only made best use of both traditional and emerging technologies for both the description of complex designs and also its building, offering a model for their extrapolation to unrelated projects beyond this particular building and its singular needs. His talk will demonstrate that far from being an anachronism in our time the continuing work at the Sagrada Família Basilica is in fact a model of teamwork and innovation for the future fabrication of our most adventurous architecture. Gaudí's fusion of structural and constructional design, principally through the use of a coherent use of geometry, will be shown to be so fresh an approach that the project today acts as a living laboratory for others to learn from in all respects. His talk will conclude by describing the

FabPod, a structure to reduce sound transmission in open spaces recently completed in RMIT University's Design Hub in Melbourne. This project demonstrates how the lessons drawn from the efforts to complete Gaudí's in good faith decades after his death offer powerful support for those creative designers who, like Gaudí, are unwilling to be constrained by a narrow perception of what represents 'the possible'.

Creating Efficient Structures and Materials for Digital Architecture

Yi-Min (Mike) XIE

RMIT University, Melbourne, Australia

Abstract: Innovative and efficient designs of structures and materials can be achieved by using topological optimisation techniques that are capable of maximising the performance of the load bearing system and minimising its weight. The evolutionary structural optimisation (ESO) method, originally proposed by Professor Xie and his colleagues, has been well developed for this purpose. ESO is based on the simple concept of gradually removing inefficient material from a structure or redistributing the underutilised material to the most needed locations. Such a simple but universally applicable technique can be used to not only significantly reduce the weight and the associated energy consumption of aircraft and motor vehicles but also produce strikingly elegant structural designs of bridges and buildings. This presentation will highlight recent developments of ESO and its applications to conceptual designs of a variety of structures and materials.

目录 /Content

“数字渗透”与“参数化主义”	1
‘Digital infiltration’ and ‘Parametricism’	
徐卫国	

实验性建造

Experimental Construction

Knot Making	7
Zhiwei Liao 廖智威	
Assembling Equilibrium	12
Brendan Shea and Nicholas Pajerski	
基于泰森多边形的参数化设计方法与建造	21
武雪缘	
Building Simplexity	32
Kristof Crolla	
美术院校中的参数化设计与建造教学实录	43
徐 炯	
Autonomous Tectonics	52
M. del Campo, A. Fure, W. McGee, S. Manninger and A. Flexer	
聚焦物质属性的数字化形态设计	62
孙澄宇	

数字景观设计

Digital landscape Design

Computational Methods towards Cultural Landscape	73
Junfeng Ding 丁峻峰	
山地居住区道路系统的生成算法研究及其项目实践	79
祁鹏远, 冉旺龙	
基于脑纹珊瑚结构的景观系统研究	86
翟炳博, 徐卫国, 黄蔚欣	

建筑信息模型与虚拟现实

BIM & Virtual Reality

绿色建筑能耗模拟软件的 gbXML 接口开发与应用 孙红三, 吴如宏, 燕 达	97
风景园林设计阶段 BIM 技术提升需求及应用 匡 伟	107
建立小型 VR 系统并利用 BIM 模型快速生成 VR 环境的案例 张亚斌, 赵 希, 曹 颖	114
基于 CAVE 的建筑设计系统的架构与应用 邹 越, 陈宇杰, 周 琼, 高 杰	123
基于遗传算法的仿生建筑形式多目标优化方法研究 周姚熠	130
基于粗糙集的建筑设计风险数据挖掘和事例库推理研究 杜吉顺, 方立新	138

性能与优化

Performance and Optimization

Decision-making Support Platform for Heritage Building Preservation and Renovation Han Feng, Jianguo Wang, Yu Zhang and Shi Hu	147
Space Loop & Additional Sunlight in a Collection of Residential in Dalian by the Autodesk Ecotect Contrast Group Application LYU Zhongzheng, Tang Jian, Zhang Jingyu and Lin Hongda	158
Responsive Parametricism Based on Illuminance Wang Li and Cheng Cheng	169
Application of Interactive Environmental Performance Analysis in a Virtual Environment Marc Aurel SCHNABEL and Tian Tian LO	179
Study on the interoperability among BIM S/W for Algorithm Design Data Zhou Shaoying, Seunghwa Park and Inhan Kim	189
基于参数化方法的鞋盒形音乐厅设计与技术分析研究 吕 帅	200
Multi-Criteria Design Optimization using IFC language with Performance Analysis Tian Tian LO and Marc Aurel SCHNABEL	210

设计实践

Design Practice

求同存异	225
彭 彦	
非线性建筑建造误差分析与解决办法	238
李晓岸	
由模拟推进的整合化设计	246
Martha Tsigkari, Angelos Chronis, Sam Conrad Joyce, Adam Davis, 封帅 and Francis Aish	
Vascular Strategies for Microclimates Concourse of Waterloo Station, London, UK	256
Shuai Feng 封帅	
阿里巴巴淘宝城展示中心	264
张晓奕, 林 海, 明 晔	
数据、空间与经济	273
杨镇源	
夏热冬冷地区公共建筑的数字化动态可持续性设计	283
朱子晔, 王 峰, 朱力元	
设计与施工过程逻辑的一致性	295
张晓奕, 明 晔, 林 海	

互动和响应式装置

Interactive and Responsive Installation

Data-driven Responsive Architecture	307
Indraprastha Aswin, Hafidz and Yasser	
基于行为性能的互动建筑表皮设计研究	317
袁 烽, 张 媚	
A Self-organizing Wireless Sensor Network for Indoor Environment Surveillance	327
Li Li 李力	
Responsive Microclimate	339
Cagla Gurbay, Yemin Ma, Prajish Vinayak and Jinjing Yu	
A Multimodal Toolkit for Thermal Performance Feedback in Conceptual Design Modelling	349
Mani Williams, Jane Burry, Flora Salim, Stig Anton Nielsen, Alexander Peña de Leon, Kamil Sharaidin and Mark Burry	