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AND MATTHIAS KÖHLER

MADE BY ROBOTS

CHALLENGING
ARCHITECTURE
AT A LARGER
SCALE



Made By Robots Challenging Architecture At A Larger Scale Architectural Design

Andrea Quartara, Djordje Stanojevic



Made By Robots Challenging Architecture At A Larger Scale Architectural Design:

Made by Robots Fabio Gramazio, Matthias Kohler, 2014-05-09 Although highly ambitious and sophisticated most attempts at using robotic processes in architecture remain the exception little more than prototypes or even failures at a larger scale This is because the general approach is either to automate existing manual processes or the complete construction process However the real potential of robots remains unexploited if used merely for the execution of highly repetitive mass fabrication processes their capability for serial production of non standard elements as well as for varied construction processes is mostly wasted In order to scale up and advance the application of robotics for both prefabrication and on site construction there needs to be an understanding of the different capabilities and these should be considered right from the start of the design and planning process This issue of AD showcases the findings of the Architecture and Digital Fabrication research module at the ETH Zurich Future Cities Laboratory in Singapore directed by Fabio Gramazio and Matthias Kohler which explores the possibilities of robotic construction processes for architecture and their large scale application to the design and construction of high rise buildings Together with other contributors they also look at the far reaching transformations starting to occur within automated fabrication in terms of liberation of labour entrepreneurship the changing shape of building sites in situ fabrication and most significantly design Contributors Thomas Bock Jelle Feringa Philippe Morel Neri Oxman Antoine Picon and Fran ois Roche ETH Zurich contributors Michael Budig Norman Hack Willi Lauer and Jason Lim and Raffael Petrovic Future Cities Laboratory Volker Helm Silke Langenberg and Jan Willmann Featured entrepreneurs Greyshed Machineous Odico Formwork Robotics RoboFold and ROB Technologies

Made by Robots Matthias Kohler, 2014-04-30 Although highly ambitious and sophisticated most attempts at using robotic processes in architecture remain the exception little more than prototypes or even failures at a larger scale This is because the general approach is either to automate existing manual processes or the complete construction process However the real potential of robots remains unexploited if used merely for the execution of highly repetitive mass fabrication processes their capability for serial production of non standard elements as well as for varied construction processes is mostly wasted In order to scale up and advance the application of robotics for both prefabrication and on site construction there needs to be an understanding of the different capabilities and these should be considered right from the start of the design and planning process This issue of AD showcases the findings of the Architecture and Digital Fabrication research module at the ETH Zurich Future Cities Laboratory in Singapore directed by Fabio Gramazio and Matthias Kohler which explores the possibilities of robotic construction processes for architecture and their large scale application to the design and construction of high rise buildings Together with other contributors they also look at the far reaching transformations starting to occur within automated fabrication in terms of liberation of labour entrepreneurship the changing shape of building sites in situ fabrication and most significantly design Contributors Thomas Bock Jelle Feringa Philippe Morel Neri

Oxman Antoine Picon and Fran ois Roche ETH Zurich contributors Michael Budig Norman Hack Willi Lauer and Jason Lim and Raffael Petrovic Future Cities Laboratory Volker Helm Silke Langenberg and Jan Willmann Featured entrepreneurs Greyshed Machineous Odico Formwork Robotics RoboFold and ROB Technologies

Robotic Fabrication in Architecture, Art and Design 2014 Wes McGee, Monica Ponce de Leon, 2014-03-20 Robotic automation has become ubiquitous in the modern manufacturing landscape spanning an overwhelming range of processes and applications from small scale force controlled grinding operations for orthopedic joints to large scale composite manufacturing of aircraft fuselages Smart factories seamlessly linked via industrial networks and sensing have revolutionized mass production allowing for intelligent adaptive manufacturing processes across a broad spectrum of industries Against this background an emerging group of researchers designers and fabricators have begun to apply robotic technology in the pursuit of architecture art and design implementing them in a range of processes and scales Coupled with computational design tools the technology is no longer relegated to the repetitive production of the assembly line and is instead being employed for the mass customization of non standard components This radical shift in protocol has been enabled by the development of new design to production workflows and the recognition of robotic manipulators as multi functional fabrication platforms capable of being reconfigured to suit the specific needs of a process The emerging discourse surrounding robotic fabrication seeks to question the existing norms of manufacturing and has far reaching implications for the future of how architects artists and designers engage with materialization processes This book presents the proceedings of Rob Arch2014 the second international conference on robotic fabrication in architecture art and design It includes a Foreword by Sigrid Brell Cokcan and Johannes Braumann Association for Robots in Architecture The work contained traverses a wide range of contemporary topics from methodologies for incorporating dynamic material feedback into existing fabrication processes to novel interfaces for robotic programming to new processes for large scale automated construction The latent argument behind this research is that the term file to factory must not be a reductive celebration of expediency but instead a perpetual challenge to increase the quality of feedback between design matter and making

Robotic Fabrication in Architecture, Art and Design 2016 Dagmar Reinhardt, Rob Saunders, Jane Burry, 2016-02-03 The book presents the proceedings of Rob Arch 2016 the third international conference on robotic fabrication in architecture art and design The work contains a wide range of contemporary topics from methodologies for incorporating dynamic material feedback into existing fabrication processes to novel interfaces for robotic programming to new processes for large scale automated construction The latent argument behind this research is that the term file to factory must not be a reductive celebration of expediency but instead a perpetual challenge to increase the quality of feedback between design matter and making

Expanding Fields of Architectural Discourse and Practice Matthew Butcher, Megan O'Shea, 2020-11-27 Expanding Fields of Architectural Discourse and Practice presents a selection of essays architectural experiments and works that explore the diversity within the fields of

contemporary architectural practice and discourse Specific in this selection is the question of how and why architecture can and should manifest in a critical and reflective capacity as well as to examine how the discipline currently resonates with contemporary art practice It does so by reflecting on the first 10 years of the architectural journal P E A R 2009 to 2019 The volume argues that the initial aims of the journal to explore and celebrate the myriad forms through which architecture can exist are now more relevant than ever to contemporary architectural discourse and practice Included in the volume are architectural practitioners design researchers artists architectural theorists historians journalists curators and a paleobiologist all of whom contributed to the first seven issues of the journal Here they provide a unique presentation of architectural discourse and practice that seeks to test new ground while forming distinct relationships to recent and more longstanding historical legacies Praise for Expanding Fields of Architectural Discourse and Practice The story told by the authors of this work can thus be considered as the central tool of an architectural transgression Critique d art

Architectural Research Addressing Societal Challenges Volume 2 Manuel Jorge Rodrigues Couceiro da Costa,Filipa Roseta,Susana Couceiro da Costa,Joana Pestana Lages,2017-09-19 The EAAE ARCC International Conference held under the aegis of the EAAE European Association for Architectural Education and of the ARCC Architectural Research Centers Consortium is a conference organized every other year in collaboration with one of the member schools universities of those associations alternatively in North America or in Europe The EAAE ARCC Conferences began at the North Carolina State University College of Design Raleigh with a conference on Research in Design Education 1998 followed by conferences in Paris 2000 Montreal 2002 Dublin 2004 Philadelphia 2006 Copenhagen 2008 Washington 2010 Milan 2012 and Honolulu 2014 The conference discussions focus on research experiences in the field of architecture and architectural education providing a critical forum for the dissemination and engagement of current ideas from around the world **Architecture and Design for Industry 4.0** Maurizio Barberio,Micaela Colella,Angelo Figliola,Alessandra Battisti,2023-10-06 This book collects contributions of forefront research and practices related to the use of the enabling technologies of Industry 4 0 in the architecture and design fields and their impact on the UN s Sustainable Developments goals The book is structured into three sections research practice and technologies with the goal of creating a new framework useful for widespread awareness necessary to initiate technology transfer processes for the benefit of the public sector universities research centers and innovative companies and a new professional figure capable of controlling the entire process is essential Thus the book chapters arouse a series of relevant topics such as computational and parametric design performance based architecture data driven design strategies parametric environmental design and analysis computational and parametric structural design and analysis AI and machine learning BIM and interoperability VR and AR digital and robotic fabrication additive manufacturing and 3D printing R D and entrepreneurship circular architecture and didactics In the post digital era where the essence of design lies in the control and information of the process that holistically involves all the aspects

mentioned above rather than in formal research it is necessary to understand technologies and analyze the advantages that they can bring in terms of environmental sustainability and product innovation

**Challenges for Technology Innovation:
An Agenda for the Future** Fernando da Silva, Helena Maria Bártolo, Paulo Bártolo, Rita Almendra, Filipa Roseta, Henrique Amorim Almeida, Ana Cristina Lemos, 2017-04-21

The world is undergoing a profound transformation driven by radical technological changes and an accelerated globalisation process. A new culture of greater resource efficiency and disruptive innovation will require new technologies, processes and materials, fostering new knowledge, innovation, education and a digital society bringing forward new business opportunities and novel solutions to major societal challenges. Challenges for Technology Innovation: An Agenda for the Future is the result of the 1st International Conference on Sustainable Smart Manufacturing S2M held at the Faculty of Architecture in Lisbon, Portugal, on October 20-22, 2016. It contains innovative contributions in the field of Sustainable Smart Manufacturing and related topics, making a significant contribution to further development of these fields. This volume covers a wide range of topics including Design and Digital Manufacturing, Design Education, Eco Design and Innovation, Future Cities, Medicine 4.0, Smart Manufacturing, Sustainable Business Models, Sustainable Construction, Sustainable Design and Technology, and Sustainable Recycling.

Computational Design for Landscape Architects Brendan Harmon, 2024-05-31 This book is a guide to computational design for landscape architects, replete with extensive tutorials. It introduces algorithmic approaches for modeling and designing landscapes. The aim of this book is to use algorithms to understand and design landscape as a generative system, i.e. to harness the processes that shape landscape to generate new forms. An algorithmic approach to design is gently introduced through visual programming with Grasshopper, before more advanced methods are taught in Python, a high-level programming language. Topics covered include parametric design, randomness and noise, waves and attractors, lidar, drone photogrammetry, point cloud modeling, terrain modeling, earthworks, digital fabrication, and more. The chapters include sections on theory, methods, and either visual programming or scripting. Online resources for the book include code and datasets so that readers can easily follow along and try out the methods presented. This book is a much-needed guide, both theoretical and practical, on computational design for students, educators, and practitioners of landscape architecture.

Architectural Research Addressing Societal Challenges Manuel Jorge Rodrigues Couceiro da Costa, Filipa Roseta, Joana Pestana Lages, Susana Couceiro da Costa, 2019-08-08 The escalating interdependency of nations drives global geopolitics to shift ever more quickly. Societies seem unable to control any change that affects their cities, whether positively or negatively. Challenges are global, but solutions need to be implemented locally. How can architectural research contribute to the future of our changing society? How has it contributed in the past? The theme of the 10th EAAE ARCC International Conference, Architectural Research Addressing Societal Challenges, was set to address these questions. This book, Architectural Research Addressing Societal Challenges, includes reviewed papers presented in June 2016 at the 10th EAAE ARCC International Conference, which was held at the

facilities of the Faculty of Architecture of the University of Lisbon The papers have been further divided into the following five sub themes a Changing Society In Transit Global Migration Renaturalization of the City Emerging Fields of Architectural Practice and Research on Architectural Education The EAAE ARCC International Conference held under the aegis of the EAAE and of the ARCC is a conference organized every other year in collaboration with one of the member schools universities of those associations alternatively in North America or in Europe

Computer-Aided Architectural Design: The Next City - New Technologies and the Future of the Built Environment Gabriela Celani,David Moreno Sperling,Juarez Moara Santos Franco,2015-06-15 This book constitutes the refereed proceedings of the 16th International Conference on Computer Aided Architectural Design Futures CAAD Futures 2015 held in S o Paulo Brazil in July 2015 The 33 revised full papers presented were carefully reviewed and selected from 200 submissions The papers are organized in topical sections on modeling analyzing and simulating the city sustainability and performance of the built space automated and parametric design building information modelling BIM fabrication and materiality shape studies

Modelling Behaviour Mette Ramsgaard Thomsen,Martin Tamke,Christoph Gengnagel,Billie Faircloth,Fabian Scheurer,2015-11-12 This book reflects and expands on the current trend in the building industry to understand simulate and ultimately design buildings by taking into consideration the interlinked elements and forces that act on them This approach overcomes the traditional exclusive focus on building tasks while posing new challenges in all areas of the industry from material and structural to the urban scale Contributions from invited experts papers and case studies provide the reader with a comprehensive overview of the field as well as perspectives from related disciplines such as computer science The chapter authors were invited speakers at the 5th Symposium Modelling Behaviour which took place at the CITA in Copenhagen in September 2015

Computational and Manufacturing Strategies Andrea Quartara,Djordje Stanojevic,2018-08-11 This book highlights computationally enabled and digitally fabricated strategies used in the design of a series of full size wooden structures It introduces theoretical foundations and then focuses on the possibilities that have emerged as a result of the material aware processes The case studies expound wood as one of the most suitable materials to experience the seamless framework introduced with the digital design to construction chain Two main aspects of the pavilions constructed developed in various international academic groups are considered On one hand the case studies explore tolerances of raw and engineered material intertwined with machine processing they also address material enhancement through strip applications in timber construction In addition the structures are examined in the light of an extensible designing path which acts as an interoperable procedure bridging the virtual and the real

The Routledge Handbook of Architecture, Urban Space and Politics, Volume II Nikolina Bobic,Farzaneh Haghighi,2024-11-22 Architecture and the urban are connected to challenges around violence security race and ideology spectacle and data The first volume of this handbook extensively explored these oppressive roles This second volume illustrates that escaping the corporatized and bureaucratized orders of power techno managerial and consumer

oriented capitalist economic models is more urgent and necessary than ever before Herein lies the political role of architecture and urban space including the ways through which they can be transformed and alternative political realities constituted The volume explores the methods and spatial practices required to activate the political dimension and the possibility for alternative practices to operate in the existing oppressive systems while not being swallowed by these structures Fostering new political consciousness is explored in terms of the following themes Events and Dissidence Biopolitics Ethics and Desire Climate and Ecology Urban Commons and Social Participation Marginalities and Postcolonialism Volume II embraces engagement across disciplines and offers a wide range of projects and critical analyses across the so called Global North and South This multidisciplinary collection of 36 chapters provides the reader with an extensive resource of case studies and ways of thinking for architecture and urban space to become more emancipatory Chapter 1 of this book is freely available as a downloadable Open Access PDF at <http://www.taylorfrancis.com> under a Creative Commons Attribution CC BY 4.0 license

Fabricate Achim Menges, Bob Sheil, Ruairi Glynn, Marilena Skavara, 2017-04-03 Bringing together pioneers in design and making within architecture construction engineering manufacturing materials technology and computation Fabricate is a triennial international conference now in its third year ICD University of Stuttgart April 2017 The 2017 edition features 32 illustrated articles on built projects and works in progress from academia and practice including contributions from leading practices such as Foster Partners Zaha Hadid Architects Arup and Ron Arad and from world renowned institutions including ICD Stuttgart Harvard Yale MIT Princeton University The Bartlett School of Architecture UCL and the Architectural Association Each year it produces a supporting publication to date the only one of its kind specialising in Digital Fabrication

The Evolution of Computation in Architecture Michael Fox, Bradley Bell, 2024-10-31 This book is the first comprehensive overview of the pioneering works events and people that contributed to the paradigm shift defined by computation in architecture Only recently has computation fostered profound new ways of designing fabricating constructing and thinking about architecture While the profession sits at the end of the beginning of this historically transformative shift it is now possible to look back upon the rapidly maturing landscape of projects influencers and tools that have finally begun to catch up with the visionary thinking of the past Readers are guided through the fascinating and fast paced historical timeline of the development of computation in architecture Beginning with an account of the pioneering futuristic thinkers the authors then guide the reader through the birth of computation the appropriation of tools and the impact of experimentation on the profession leading into the legitimacy of research and how paradigms have been expanded The examples and influences are presented in a way that they can be understood and built upon This book is a must read for students of computation in architecture as well as researchers and practicing architects thinking about how the tools we use and the ways we design our buildings and environments with them can truly impact our lives

A Circular Built Environment in the Digital Age Catherine De

Wolf, Sultan Çetin, Nancy M. P. Bocken, 2024-01-03 This open access book offers a comprehensive exploration of the digital innovations that have emerged in recent years for the circular built environment Each chapter is meticulously crafted to ensure that both academic readers and industry practitioners can grasp the inner workings of each digital technology understand its relevance to the circular built environment examine real life implementations and appreciate the intriguing business models behind them Our primary objective is to blend scholarly knowledge with practical inspiration by providing real life case studies for each innovation The authors who possess extensive expertise in their respective fields have contributed chapters dedicated to digital technologies within their areas of specialization The book is organized into three distinct parts The first part focuses on data driven digital technologies and delves into how their capabilities can facilitate the transition to a circular built environment Essential aspects such as building information modeling BIM digital twins geographical information systems GIS scanning technologies artificial intelligence AI data templates and material passports are explored as vital tools for data collection integration and analysis in the context of circular construction In the second part various digital technologies for design and fabrication are introduced Topics covered include computational design algorithms additive and subtractive manufacturing robotic manufacturing and extended reality These discussions shed light on how these technologies can be leveraged to enhance design and fabrication processes within the circular built environment Finally the last part of the book presents emerging digital concepts related to business and governance It explores the role of deconstruction and reverse logistics blockchain technology digital building logbooks and innovative business models as enablers of circularity in the built environment The book concludes with a chapter dedicated to digital transformation and its potential to propel the built environment towards a regenerative future In addition to the substantive content the book features forewords and perspectives from esteemed experts providing valuable economic and creative insights to complement its comprehensive approach **Constructions** Michael Hensel, Christian Hermansen

Cordua, 2015-05-04 The current trend for constructing experimental structures is now an international phenomenon It has been taken up worldwide by design professionals researchers educators and students alike There exist however distinct and significant tendencies within this development that require further investigation This issue of AD takes on this task by examining one of the most promising trajectories in this area the rise of intensely local architectures In his seminal essay of 1983 Kenneth Frampton redefined Critical Regionalism by calling for an intensely local approach to architectural design Today Frampton's legacy is regaining relevance for a specific body of work in practice and education focused on the construction of experimental structures Could this ultimately provide the seeds for a compelling and alternative approach to sustainable design Contributors include Barbara Ascher Peter Buchanan Karl Otto Ellefsen David Jolly Monge Lisbet Harboe David Leatherbarrow Areti Markopoulou Philip Nobel Rodrigo Rubio Søren Sørensen Defne Sunguroğlu Hensel Featured practices Renzo Piano Building Workshop Rintala Eggertsson SHoP Studio Mumbai TYIN tegnestue Robot 2015: Second

Iberian Robotics Conference Luís Paulo Reis, António Paulo Moreira, Pedro Lima, Luis Montano, Victor Munoz Martinez, 2015-11-27 This book contains a selection of papers accepted for presentation and discussion at ROBOT 2015 Second Iberian Robotics Conference held in Lisbon Portugal November 19th 21th 2015 ROBOT 2015 is part of a series of conferences that are a joint organization of SPR Sociedade Portuguesa de Rob tica Portuguese Society for Robotics SEIDROB Sociedad Espa ola para la Investigaci n y Desarrollo de la Rob tica Spanish Society for Research and Development in Robotics and CEA GTRob Grupo Tem tico de Rob tica Robotics Thematic Group The conference organization had also the collaboration of several universities and research institutes including University of Minho University of Porto University of Lisbon Polytechnic Institute of Porto University of Aveiro University of Zaragoza University of Malaga LIACC INESC TEC and LARSyS Robot 2015 was focussed on the Robotics scientific and technological activities in the Iberian Peninsula although open to research and delegates from other countries The conference featured 19 special sessions plus a main general robotics track The special sessions were about Agricultural Robotics and Field Automation Autonomous Driving and Driver Assistance Systems Communication Aware Robotics Environmental Robotics Social Robotics Intelligent and Adaptable AAL Systems Future Industrial Robotics Systems Legged Locomotion Robots Rehabilitation and Assistive Robotics Robotic Applications in Art and Architecture Surgical Robotics Urban Robotics Visual Perception for Autonomous Robots Machine Learning in Robotics Simulation and Competitions in Robotics Educational Robotics Visual Maps in Robotics Control and Planning in Aerial Robotics the XVI edition of the Workshop on Physical Agents and a Special Session on Technological Transfer and Innovation *Digital Wood Design* Fabio Bianconi, Marco Filippucci, 2019-02-24 This book explores various digital representation strategies that could change the future of wooden architectures by blending tradition and innovation Composed of 61 chapters written by 153 authors hailing from 5 continents 24 countries and 69 research centers it addresses advanced digital modeling with a particular focus on solutions involving generative models and dynamic value inherent to the relation between knowing how to draw and how to build Thanks to the potential of computing areas like parametric design and digital manufacturing are opening exciting new avenues for the future of construction The book s chapters are divided into five sections that connect digital wood design to integrated approaches and generative design to model synthesis and morphological comprehension to lessons learned from nature and material explorations to constructive wisdom and implementation related challenges and to parametric transfigurations and morphological optimizations

The Enigmatic Realm of **Made By Robots Challenging Architecture At A Larger Scale Architectural Design**: Unleashing the Language is Inner Magic

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