PREFACE

This is the electronic compilation of three physical volumes, of the Proceedings of the 37th eCAADe and the 23th SIGraDi Conferences, held as a Joint Event from 11-13 September 2019 at the Faculty of Architecture of the University of Porto, in Portugal. The three volumes together contain the 221 accepted papers that are also available digitally at CumInCAD (Cumulative Index of Computer Aided Architectural Design) – http://papers.cumincad.org

Theme

"We stand on the brick of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope and complexity, the transformation will be unlikely anything humankind has experienced before."
Klaus Schwab, *World Economic Forum*, 2015

Looking for confronting the discipline of Architecture with the most critical topics nowadays, the eCAADe SIGraDi Conference 2019 was dedicated to the theme of:

Architecture in the Age of the 4th Industrial Revolution

Going back in history, the 1st Industrial Revolution occurred between the 18th and 19th centuries, when water and steam power led to the mechanization period. By then, social changes radically transformed cities and, together with manufactured materials like steel and glass, promoted the emergence of new building design typologies like the railway station. In the end of the 19th century, the advent of electrical power triggered mass production systems. This 2nd Revolution affected the building construction industry in many ways, inspiring the birth to the modern movement. For some, standardization emerged as an enemy of arts and crafts, while, for others, it was an opportunity to embrace new design agendas, where construction economy and quality could be controlled in novel ways. More recently, electronics and information technology fostered the 3rd Revolution with the production automation. In architecture, the progressive use of digital design, analysis and

fabrication processes started to replace the traditional means of analogical representation. This opened the door for the exploration of a higher degree of design freedom, complexity and customization. The rise of the Internet also changed the way architects communicated and promoted the emergence of global architectural practices in the planet.

Today, in the beginning of the 21th century, we are in a moment of profound and accelerated changes in the way we perceive and interact with(in) the world, which many authors, like Klaus Schwab, do not hesitate to call as the Fourth Industrial Revolution. Extraordinary advancements in areas like mobile communication, artificial intelligence, big data, cloud computing, blockchain, nanotechnology, biotechnology, facial recognition, robotics or additive manufacturing are fusing the physical, biological and digital systems of production. Such technological context has triggered a series of disruptive concepts and innovations, like the smart-phone, social networks, online gaming, internet of things, smart materials, interactive environments, personal fabrication, 3D printing, virtual and augmented realities, drones, self-driving cars or the smart cities, which, all together, are drawing a radically new world.

Challenges

Like in the past, if the world changes, the discipline of architecture cannot remain indifferent. It must understand and adapt to the new circumstances and why not, orient some of the undergoing transformations. Since digital technologies are at the core of the emerging paradigm, the eCAADe SIGraDi Conference 2019 became a privileged space to promote a comprehensive discussion about the place and role of Architecture in the Age of the 4th Industrial Revolution. Therefore, we invited researchers, professors, professionals and students to address questions like:

- *What is the impact of new technologies in architectural education and practice?*
- *What are the emerging opportunities and threats to our discipline caused by the rise of new intelligent processes and material systems?*
- *How are architects balancing between resistance and adoption regarding the convergence of cyber, physical and biological systems?*
- *How can digital technologies contribute for a better and more responsible built environment?*

The topics proposed for the Conference included, but were not limited to:

AI for design and built environment
Additive manufacturing and construction
Art and Design
Big data and analytics in architecture
Building Information Modelling
City Information Modelling and GIS
CAAD Education and teaching
Collaborative and participative design
Cyber-physical systems in architecture
Design concepts and strategies
Design thinking and methods
Digital design for sustainable buildings
Digital fabrication and robotics

Digital technologies for cultural heritage
Digital research in architectural practice
Generative design
Game design technology
History and Future of CAAD
Human-computer interaction
Internet of things in architecture
Interactive and responsive environments
Material studies and innovation
Parametric and algorithmic design
Simulation, prediction and evaluation
Smart Cities
Virtual and Augmented Reality

The first volume of the proceedings contains 89 papers grouped under 12 topics, the second volume contains 95 papers grouped under 12 topics, and finally the third volume contains 37 papers grouped under 4 topics. In addition to the accepted papers, we acknowledge our guest speakers in the first volume and the workshops organized the days before the Conference in the third Volume.

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eCAADe SIGraDi 2019 Conference Chairs