

eCAADe 2017

Sh^oCK!

Volume 1

Editors

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Sharing of Computable Knowledge!

Volume 1

Proceedings of the 35th International Conference on Education and Research in
Computer Aided Architectural Design in Europe

20th-22nd September 2017

Rome, Italy

Dep. of Civil, Building and Environmental Engineering

Faculty of Civil and Industrial Engineering

Sapienza University of Rome

Edited by

Antonio Fioravanti

Stefano Cursi, Salma Elahmar, Silvia Gargaro,

Gianluigi Loffreda, Gabriele Novembri, Armando Trento

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Theme

Sh^oCK! – *Sharing of Computable Knowledge!*

The theme of the 35th eCAADe Conference is *Sharing of Computable Knowledge! – ShoCK!* so, we have invited eCAADe community, members of Sibling Organizations and CAADFuture friends to face this exciting theme.

Why such a strong theme? Mainly for three reasons.

The first one, is that we live in a city that has been witness of several revolutions of the conceptions of architectural space: most turning points of space perception are present here by means of architectural masterpieces as Bruno Zevi stated. I like to quote Rem Koolhaas: “It is a platitude that the presence of history in Rome is detriment to the development and display of modern art. But if that were true, Rome – *a city of successive modernities* – would never happened.”

Secondly, as my DaaD research group states “Rome is an open-air museum of architectural avant-garde masterpieces of an *uninterrupted history* where styles are juxtaposed, intertwined and *stratified* other than culturally also physically...” This concept is very close to the modern concept of cognitive sciences: to think by means of several abstraction levels of intelligence. And the third reason is that we live in a Faculty founded in 1817 – right two centuries ago – has always had a multidisciplinary approach to understand and solve problems: from the outset Architecture, Civil engineering, Bridge construction, Topography, Geometry and Mathematics subjects were present. As a matter of facts this approach it is not limited to technical aspects as – most importantly – the Faculty, now Civil and Industrial Engineering, lives in *Sapienza* University of Rome – established in 1303 – a university that pursuits the “universal” approach where each discipline enhances the others.

Going back to the theme, it involves in turn several subjects: Internet of Things, pervasive nets, Knowledge ‘on tap’, Big Data, Wearable devices and the ‘Third wave’ of AI, ... All of these disruptive technologies are upsetting our globalised world as far as it can be predicted henceforth.

So, academicians, professionals, researchers, students and innovation factories... are warmly invited to further shake up and boost our innovative and beloved CAAD world – we already are in the post-digital era – with new ideas, paradigms and points of view.

I said “CAAD world” as I think that it contains and involves several disciplines but it is a new subject it its own that overcomes the former ones.

The underlain idea of this International Conference is that as a catalyst of creative energy it pursuits with determination founders’ purposes and to be a shocking vanguard, a melting

pot of novelties, in words: to become an “incubator” of innovative and seminal ideas, to generate enthusiasm, to be an occasion for new friendships and to facilitate the establishment of effective researches’ networks. The title of the conference reflects well these intentions:

ShoCK! – Sharing of Computable Knowledge!

So the aim of the Conference was to knock our habitual design activities out, to compare the various methodological and technological trends and to disseminate the latest research advances in our community. Will our fine buildings and design traditions survive? Or, will they ‘simply’ be hybridized and enhanced by methods, techniques and CAAD tools? Obviously, computation is needed to match the ever-growing performance requirements, but this is not enough to answer all these questions we have to deal with the essence of problems: *improve design solutions for a better life!*

Obviously, **computation** is needed to match the ever-growing performance requirements, but this is not enough... As life is not a matter of single individuals, we need to increase collaboration and to improve **knowledge** and **sharing**. This means going back to focusing on human beings, and involves the humanistic approach, and the long history of architecture... from handicrafts to thinking to technology... to handicrafts again.

A large spiral of the *architectura* as *eternal* as our city.

A.

Antonio Fioravanti

eCAADe 2017 Conference Chair

* This first volume of the conference proceedings of the 35th eCAADe conference contains 74 papers grouped under 13 sub-themes; both volumes contain altogether 155 accepted papers. The Conference was held at the Faculty of Civil and Industrial Engineering, Sapienza University of Rome, Rome, Italy, in via Eudossiana 18, Rome, on 20th – 22nd September 2017.

In addition to the accepted papers, the first volume contains *Keynote* speakers’ contributions concerning the themes of their keynote lectures and the *Workshop Contributions* including the contents of workshops given; the second volume furthermore includes the *Poster Session* contents.

All the papers of these proceedings will be accessible via CuminCAD - Cumulative Index of Computer Aided Architectural Design, <http://cuminCAD.scix.net>

Acknowledgements

Authorities, colleagues, researchers, professors, students, professionals all of you are welcomed to the 35th eCAADe conference, in Rome the *eternal city*.

It has been a long time ago – 31 years – since the previous eCAADe conference was held in this Faculty, hosted by our University - “La Sapienza”.

That time, Gianfranco Carrara, one of the eCAADe founders, chaired the 4th eCAADe conference in 1986. That time on, there was only one eCAADe conference in Italy precisely in Palermo in 1995 chaired by Benedetto Colajanni and Giuseppe Pellitteri. This Faculty – now Faculty of Civil and Industrial Engineering – inspired by Parisian and Austrian academic models, is quite old as it was funded by Pope Pius VII in 1817, so now it celebrates its Bicentennial!

But it is quite young compared to our mother University “La Sapienza” that was established by the Pope Bonifacius VIII in 1303.

The original idea of bringing the eCAADe conference back to Rome goes rather back in times, I remember it was in 2009 at eCAADe conference in Istanbul. You know things take their time in Italy, so only in 2013 my Faculty approved and on 21st March 2015 eCAADe Council granted us the permission to organize the 35th conference. Over the last years several people have helped us to make this conference happen. We thank the former Dean of Civil and Industrial Engineering Faculty, Prof. Fabrizio Vestroni and especially the present Dean, Prof. Antonio D’Andrea for their supports.

During the process of organizing the eCAADe 2017 we have had the privilege to experience the supportive, collaborative and frank atmosphere of eCAADe Council, whose members, no one excluded, have helped us with all organizational aspects.

Let us be touched in remembering for his humanity the former eCAADe President, Johan Verbeke, who recently passed away. We all are sad in this moment thinking is no more physically with us now, but at the same time we are grateful to have met him and exchanged ideas on equal terms as his habit. In spirit, he is present so we can tell him: Johan, special thanks for your open-minded support, we warmly thank you! We miss you, and we do not forget you!

How cannot we mention Joachim Kieferle a friend, who is also the eCAADe President, for his encouragement and unswerving support during the last years and his ability to cut up dead-

locks into pieces? A special thanks to the great Bob Martens for his ability in organizing complex tasks and simplifying processes – Dutch origin helps – his daily support was precious and helped us relentlessly. And a “suuppper” thanks to a “super” friend as Gabriel Wurzer for his optimism and silent help in difficult issues.

Also, we wish to thank all the other previous conference organizers, Henri Achten, Rudi Stouffs and Emine Mine Thompson, for sharing their experience and knowledge. A special thanks to more recent conference organisers Bob Martens, Gabriel Wurzer, Thomas Grasl, Wolfgang E. Lorenz and Richard Schaffranek together with Aulikki Herneoja, Toni Österlund and Piia Markkanen!

Quality is the vital issue concerning conference proceedings.

To improve it we used different means: *OpenConf* conference management system that easily ensured that none of the reviewers came from the same institution as the authors; through special relationships between Liverpool University and eCAADe thank to Martin Winchester’s support we were able to overcome program bugs; a second and handcraft check of interest conflicts among authors and reviewers was made during the reviewing phase; a double-blind peer review process; and an accurate reviewers’ selection. The selection was fair, and only extended abstracts with high grades were admitted to full paper phase.

Quality means also typographic quality control in two ways: for printing results and for respecting author’s layout; so, thanks to the well-known *ProceeDings* formatting management system eCAADe could fulfil these two needs.

Authors uploaded their extended abstracts (length of 1000 to 1500 words, two optional images, 5 to 10 references) by 1st of February 2017; each abstract was evaluated anonymously.

Altogether, we received 309 extended abstracts from 46 different authors’ countries, shortly after 5 were withdrawn. Each extended abstract had three blinded peer reviews so 912 reviews were accomplished in a short time and 188 papers were accepted for full paper submission. After a while 11 of these ones were withdrawn and eventually 155 papers were published in the eCAADe 2017 Proceedings.

Let us express our very grateful appreciations for all the 132 reviewers from all over the world for their constructive and thorough comments for each author. A special thanks to reviewers who spent their time to review more than 8 extended abstracts – Joachim Kieferle and Anand Bhatt - not to mention members of “Joker Reviewers’ Team”: Stefano Cursi, Salma Elahmar,

Paolo Fiamma, Silvia Gargaro, Gianluigi Loffreda, Wolfgang E. Lorenz, Davide Simeone, Gabriel Wurzer and me that were able to review abstracts during the last days to accomplish missing reviews on time.

We thank and congratulate all authors for their hard work and support on using the ProceeDings tool and finalizing their full papers carefully in time. In this last phase of editing full papers we want to thank for his “extra-ordinary” work Gabriel Wurzer, the Master of the ProceeDings and Wolfgang E. Lorenz and Ugo Maria Coraglia, who with high sense of responsibility worked with us and to successfully produce high quality proceedings.

We also continued the practice started in eCAADe 2015 conference in Vienna of having all the session chairs to give prospective comments of the papers and to evoke the discourse at early stage between the author and session chair for the 27 sessions of the conference. All the session chairs also participated the peer review process of the extended abstracts.

We owe great gratitude to the session chairs for their commitment and their long-term contribution to the process until the final paper presentations.

We thank the keynote speakers and their contribution of writing the keynote papers concerning their lecture themes: Gianluca Peluffo, Chair in *Exhibition Design and Art & Architecture*, IULM - International University of Language and Media; John Gero, Research Prof. in *Computer Science and Architecture*, University of North Carolina at Charlotte and Krasnow Institute for Advanced Study George Mason University; and Gernot Riether, Director of *School of Architecture*, NJIT – New Jersey Institute of Technology, Editor of *DCA Journal*.

Workshops are part of eCAADe conferences, so we thank all the organizers for their workshop and for their contribution of short papers (non-peer reviewed) about the contents of their own workshop.

We are also grateful to Wolfgang Dokonal and the eCAADe Council for organizing the traditional PhD workshop for young researchers and supporting the grant winners with a subsidy for traveling to Rome.

We recovered an old tradition of previous eCAADe Conferences bringing poster session to life again, so during the conference we had 4 free lectures on interesting themes.

This year for the first time we launch an international competition linked to the Conference, the “eCAADe2017 Logo Contest” that helped in disseminate the spirit and values of eCAADe in new areas. We thank the International Jury that was made up by Antonino Saggio (President, Chair in *Information Technology applied to Architecture and Urban and Architectural design*), Eleonora Fiorani (Vice president, Chair in *Cultural Anthropology and Sociology of Innovation*),

Henri Achten (former eCAADe President, Chair in *Computer Aided Architectural Design*), Maria Argenti (Chair in *Architectural Composition* and Editor in chief of *Rassegna di Architettura e Urbanistica*), and Antonio Fioravanti (Chair in *Architectural Engineering*). Two Winners and three Honourable mentions were awarded (see on website <https://www.daadgroup.org/result/>). We would like to express our gratitude for the administrative help in organizing this conference to eCAADe council and especially Nele De Meyere that has provided us valuable input and lessons learned from past conferences.

We have also had support from DaaDgroup for managing the conference services, ranging from the registration process to the actual on-site registration services. A big thank you goes to PhD students Ugo Maria Coraglia and Francesco Rossini for their extra-work in critical situations.

Thanks to the sponsors we were enabled to organize an international conference as eCAADe is. Financial supports, apart Sapienza University of Rome, was generously provided by A-Sapiens, AT Advanced Technologies, Autodesk; 3TI Progetti and Bentley Systems International Ltd. Technical support was provided by Epson Italia, Gangemi Editore, Geores, it solution, Noumena and ProceeDings.

We wish to also thank Gangemi Editore in person of Giuseppe and Fabio Gangemi for their very fast and accurate printing process and the high quality of both volumes.

As a special form of sponsorship, all members of the Organizing Team and students of Architecture-Building Engineering M. Course that donated their time to help prepare and organize this conference. Thank you all !!!

Rome, 1st September 2017

Antonio Fioravanti

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The 2017 eCAADe conference
is dedicated to



Johan Verbeke

current eCAADe vice-president, treasurer, and previous president and long standing council member, who unexpectedly passed away 6 weeks before this conference.

Johan has not only been very active in the eCAADe community but was also in the EAAE council, board member of ELIA and founding member of ARENA, an enthusiastic leader and promotor of architectural computing, research by design and research through reflective architectural and artistic practice.

He will always be in our hearts and minds.

eCAADe Council and eCAADe 2017 Conference Organisers

Contents

5	Theme
7	Acknowledgements
13	List of Reviewers
17	Dedication
27	KEYNOTES
29	Keynote Speakers
31	The Digital Design Build Studio Gernot Riether
37	Cognitive Design Computing John S. Gero
41	The navel of the world Gianluca Peluffo
43	WORKSHOPS
45	Internet of Homes (IoH) Eiman Elbanhawy, Daniel Gooch, Theodoros Georgiou, Aikaterini Chatzivasileiadi
49	CoOptimise Kristjan Nielsen, Mariam Khademi
51	Co-Design using HYVE-3D Tomás Dorta, Emmanuel Beaudry Marchand
53	Wall.4.all Bojan Tepavčević
55	LightWIRE Eugenio Bettocchi, Iacopo Neri
57	Parametric Design of Street Profiles Rui de Klerk, José Nuno Beirão
59	Structuring of Teaching and Learning Situations in Architectural Education Matthias Kulcke, Wolfgang E. Lorenz, Gabriel Wurzer
63	Dynamo: Applications for Design and Optimization Philipp Müller, Colin McCrone

65 AGENT-BASED SYSTEMS

67 Extended modelling

Yannis Zavoleas, M. Hank Haeusler

75 Emergent order through swarm fluctuations

Evangelos Pantazis, David Gerber

85 Modelling Buildings and their Use as Systems of Agents

Davide Simeone, Stefano Cursi, Ugo Maria Coraglia

93 Saving Lives with Generative Design and Agent-based Modeling

Sofia Sousa, Inês Caetano, António Leitão

103 Improving Proactive Collaborative Design Through the Integration of BIM and Agent-Based Simulations

Antonio Fioravanti, Gabriele Novembri, Francesco Livio Rossini

109 BIM

111 BIM-based Multiuser Collaborative Virtual Environments for end user involvement

Jesper Bendix Sørensen, Kjeld Svidt

119 H-BIM and web-database to deal with the loss of information due to catastrophic events

Vincenzo Donato, Stefano Giannetti, Maurizio Marco Bocconcino

129 Spatial Typology for BIM

Takehiko Nagakura, Woongki Sung

137 BIM Tools Overview

Steffen Wallner, Petra von Both

147 The uptake of BIM

Dana Matejovska, Ivana Vinsova, Michal Jirat, Henri Achten

153 An Automated Code Compliance system within a BIM environment

Panagiotis Patlakas, Andrew Livingstone, Robert Hairstans

161 Theory of Games and Contracts to define the Client role in Building Information Modeling

Giuseppe Martino Di Giuda, Valentina Villa, Angelo Luigi Camillo Ciribini, Lavinia Chiara Tagliabue

169 BIOMIMICRY

171 Biofilm-inspired Formation of Artificial Adaptive Structures

Mohammad Hassan Saleh Tabari, Saleh Kalantari, Nooshin Ahmadi

181 Feather-inspired social media data processing for generating developable surfaces: Prototyping an affective architecture

Chenjun Liu, Tsung-Hsien Wang, Mark Meagher, Chengzhi Peng

191 Optimization of Facade Design for Daylighting and View-to-Outside

Mohamed Adel Wageh, Mahmoud Gadelhak

199 Sun Shades

Timo Carl, Markus Schein, Frank Stepper

209 Thermal and Daylighting Optimization of Complex 3D Faceted Façade for Office Building

Amartuvshin Narangerel, Ji-Hyun Lee, Rudi Stouffs

219 Daylight Optimization

Mohammed Ayoub, Magdi Wissa

229 CAAD EDUCATION - HISTORY

231 Reinventing Design-Build projects with the use of digital media for design and construction

Ioanna Symeonidou

241 Optical Integrity of Diminished Reality Using Deep Learning

Tomohiro Fukuda, Yasuyuki Kuwamuro, Nobuyoshi Yabuki

251 New digital trends in current architecture

Giuseppe Pellitteri, Alessia Riccobono

261 Learning Space

Augustus Wendell, Ersin Altin

267 Tradition and Innovation in Digital Architecture

Daniel Almeida, José Pedro Sousa

277 CAAD EDUCATION - PHILOSOPHY

279 Computation As Design Logic Indicator

Anetta Kepczynska-Walczak

289 Competences for Digital Leadership in Architecture

Tadeja Zupancic, Johan Verbeke, Aulikki Herneoja, Henri Achten

- 297 Unfolding the design of architecture as a strategy to assess intellectual property**
Domenico D'Uva
- 303 Digital Design Hermeneutics**
Anthony Papamanolis, Katherine Liapi
- 313 Why Immersive?**
Hadas Sopher, Yehuda E. Kalay, Dafna Fisher-Gewirtzman
- 323 CAAD EDUCATION - TEACHING**
- 325 The Use of Simulation for Creating Folding Structures**
Asli Agirbas
- 333 Digital Fabrication in Education**
Philipp Eversmann
- 343 Adaptive Lighting for Knowledge Work Environments**
Piia Markkanen, Henrika Pihlajaniemi, Aulikki Herneojä
- 353 Learning by Merging 3D Modeling for CAAD with the Interactive Applications**
Mohamed Hassan Khalil
- 363 Teaching architecture students to code**
Tim Ireland
- 373 Early design stage automation in Architecture-Engineering-Construction (AEC) projects**
Ivan Renev, Leonid Chechurin, Elena Perlova
- 383 CAAD EDUCATION - TOOLS**
- 385 Contrasting Publications in Design and Scientific Research**
Gabriel Wurzer, Wolfgang E. Lorenz, Tomo Cerovsek, Bob Martens
- 395 The architectural gadget factory**
Volker Koch, Matthias Leschok, Petra von Both
- 401 The Role of VR as a New Game Changer in Computational Design Education**
Arzu Gönenç Sorguç, Müge Kruşa Yemişcioğlu, Çağlar Fırat Özgenel, Mert Ozan Katipoğlu, Ramin Rasulzade
- 409 Computational and Modeling Tools**
Firas Al-Douri, Ph.D.
- 419 Development of parametric CAAD models for the additive manufacturing of scalable architectural models**
Stefan Junk, Philipp Gawron

427 CITY MODELLING AND GIS

429 Parametric master planning via topological analysis using GIS data

Kuai Yu, M. Hank Haeusler, Alessandra Fabbri

439 Urban Pinboard

M. Hank Haeusler, Rob Asher, Lucy Booth

449 Rethinking the Urban Design Process from a Data Perspective

Yuezhong Liu, Rudi Stouffs, Abel Tablada

461 Advanced tools and algorithms for parametric landscape urbanism

Attilio Pizzigoni, Vittorio Paris, Andrea Micheletti, Giuseppe Ruscica

471 Merging the Physical and Digital Layer of Public Space

Chiara Farinea, Areti Markopoulou, Aldo Sollazzo, Angelos Chronis, Mathilde Marengo

477 Generative computational tools for the design of Urban Morphology

Mateos Shehu, Anna Yunitsyna

483 CITY MODELLING TOOLS

485 Towards a modular design strategy for urban masterplanning

Martin Dennemark, Sven Schneider, Reinhard Koenig, Abdulmalik Abdulmawla, Dirk Donath

495 The role of Open Data in identifying and evaluating the Livability of Urban Space

Eleanna Panagoulia

505 Human-driven and machine-driven decisions in urban design and architecture

Jacek Markusiewicz, Adrian Krężlik

515 Visual Programming meets Tangible Interfaces

Gerhard Schubert, Ivan Bratoev, Frank Petzold

523 The city as an element of architecture

Daniel Koehler

533 Visualizing and Analysing Urban Leisure Runs by Using Sports Tracking Data

Özgün Balaban, Bige Tunçer

541 COLLABORATIVE AND PARTICIPATIVE DESIGN

543 On-site participation linking idea sketches and information technologies

Peter Buš, Tanja Hess, Lukas Treyer, Katja Knecht, Hangxin Lu

- 551 Learning Participatory Urban Research**
Dieter Michielsen, Tonia Dalle, Mara Usai, Rosaura Romero, Burak Pak
- 561 SenCity City Monitor as a platform for user involvement, innovation and service development**
Henrika Pihlajaniemi, Anna Luusua, Esa-Matti Sarjanoja, Risto Vääräniemi, Eveliina Juntunen, Sini Kourunen
- 571 DSA - Digital Support for Art**
Armando Trento, Uwe Woessner, Joachim B. Kieferle, Andrea Cataldo
- 581 Data-responsive Architectural Design Processes**
Saleh Kalantari, Mona Ghandi
- 591 DESIGN TOOLS - PROGRAMS**
- 593 Collective Construction Modeling and Machine Learning: Potential for Architectural Design**
Taro Narahara
- 601 Integration of CFD in Computational Design**
Angelos Chronis, Alexandre Dubor, Edouard Cabay, Mostapha Sadeghipour Roudsari
- 611 Performative Materiality**
Mercedes Peralta, Mauricio Loyola
- 619 Integrated Adaptive and Tangible Architecture Design Tool**
Qinying Li, Teng Teng
- 629 The Application of Daylighting Software for Case-study Design in Buildings**
Mark B. Luther
- 639 APART but TOGETHER**
Alireza Borhani, Negar Kalantar
- 649 DESIGN TOOLS - ROBOTICS**
- 651 ROBOTRACK**
Renate Weissenböck
- 661 Hydroassemblies**
Dario Castellari, Alessio Erioli
- 671 Elements | robotic interventions II**
Christian J. Lange
- 679 tOpos**
Sebastian Bialkowski

- 689 Fibrous Aerial Robotics**
Samuel Pietri, Alessio Erioli
- 699 A cloud recycling light**
Liss C. Werner
- 709 DESIGN TOOLS - THEORY**
- 711 ARch4models**
Fábio Costa, Sara Eloy, Miguel Sales Dias, Mariana Lopes
- 719 A Visualization Dashboard and Decision Support Tool for Building Integrated Performance Optimization**
Mahmoud Gadelhak, Werner Lang, Frank Petzold
- 729 Integrated Algorithmic Design**
Renata Castelo Branco, António Leitão
- 739 Contemporary Stereotomic Trait, an Opportunity for the Development of the Volumetric Digital Architecture**
Irina Miodragovic Vella, Toni Kotnik
- 747 Free-form Transformation Of Spatial Bar Structures**
Hussein Hussein, Asterios Agkathidis, Robert Kronenburg
- 757 Evaluating the capability of EnergyPlus in simulating geometrically complex Double-Skin Facades through CFD modelling**
Salma El Ahmar, Antonio Fioravanti

KEYNOTES

Keynote Speakers

Gernot Riether

Gernot Riether is the Director of the School of Architecture and Associate Professor at the College of Architecture and Design at the New Jersey Institute of Technology (NJIT). In his Digital Design Build Studio he and his students are researching new novel computer controlled fabrication and manufacturing methods. He previously taught at Kennesaw State University, Ball State University, ENSA Paris La Villette, Georgia Tech, NYIT and Barnard College at Columbia University and is lecturing internationally.

His Digital Design Build Studio won competitions such as the design of the AIA Pavilion for the American Institute of Architects in New Orleans with a hydroponic spherical enclosure made of environmentally friendly polymers. The studio was commissioned for projects such as a public installation for the Nuit Blanche Festival in Paris where he took cues from biology to digitally create a lightweight structural envelope for a pavilion in which interactive art projects were displayed.

Projects from the Digital Design Build Studio were presented at the Centre Pompidou, featured in books on digital design and fabrication and published in prominent publications such as Architectural Record and DETAIL. Riether's studio has been funded by the AIA, the Austrian government, non-profit organizations such as MainX24, material fabricators, the construction industry and universities. His forthcoming book, Urban Machines, co-authored with architect Marcella Del Signore, explores the relationship between public urban spaces and information technology.



John S. Gero

John Gero is a Research Professor in Computer Science and Architecture at the University of North Carolina, Charlotte, and a Research Professor at the Krasnow Institute for Advanced Study, George Mason University. He is the author or editor of 50 books and over 650 papers and book chapters in the fields of design science, design computing, artificial intelligence, computer-aided design, design cognition and cognitive science. He has been a Visiting Professor of Architecture, Civil Engineering, Cognitive Science, Computer Science, Design and Computation or Mechanical Engineering at MIT, UC-Berkeley, UCLA, Columbia and CMU in the USA, at Strathclyde and Loughborough in the UK, at INSA-Lyon and Provence in France and at EPFL in Switzerland. Professor Gero is an international consultant in the field of design research.



Gianluca Peluffo

Architect, founder of the 5+1AA studio in 1995, deals with the theme of contemporaneity in the relationship between city, territory and architecture, as the realization of reality. The transformation of reality is, therefore, the cornerstone of an idea of architecture as a body and enigma, which is both realistic and emotional, pragmatic and sensual, shared and capable of creating amazement as a mechanism of knowledge.

The main research line developed during the years of scientific and didactic activity is linked to the central issue of the architecture project as a tool capable of triggering dynamics of the transformation of the space of the city and the territory. In this line of research, the architecture project is intended as an element of putting in shape and perception Reality and the Context, meaning the Context as a complex and variable set of real and imaginary city and territory. In this sense, the project must be interpreted as a narrative-perceptual process, that is, as a physical, visual and mental sequence of putting in shape and perception Reality and the Context.

In 2003 he was awarded the Benemerito Title of the School of Culture and Art of the Ministry for Cultural Heritage and Activities. In 2005 Silver Lion of the Venice Biennale for the New Palace of Cinema. In 1997 he won the Ph.D. grant in "Theories and Techniques of Architectural Design" at the Faculty of Architecture in Genoa, with a thesis entitled "Beautiful and useful, a superfluous opposition, public elegance and private comfort in the urban residence". In 2001 he will discuss the Ph.D. thesis with Professor Pasquale Culotta and Prof. Paolo Portoghesi. Research grant for the Academic Year 2004-2005 at the Faculty of Architecture of Genoa, Diparc, on the theme "Replacement and modification: building infiltration in the present city". In 2005 he won a competition for the role of Researcher at the DIPARC of the Faculty of Architecture of Genoa. In 2009 he is confirmed as Researcher and assumes the role of a researcher at the Faculty of Architecture of Genoa.

