eCAADe 2018

Computing for a better tomorrow

Volume 2
Editors
Anetta Kępczyńska-Walczak and Sebastian Białkowski
Faculty of Civil Engineering, Architecture and Environmental Engineering
Lodz University of Technology

1st Edition, September 2018


ISBN
9789491207167
978-94-91207-16-7

Copyright © 2018

Publisher: eCAADe (Education and Research in Computer Aided Architectural Design in Europe) and Faculty of Civil Engineering, Architecture and Environmental Engineering, Lodz University of Technology.

Cover Design: Mateusz Pankiewicz

All rights reserved. Nothing from this publication may be produced, stored in computerised system or published in any form or in any manner, including electronic, mechanical, reprographic or photographic, without prior written permission from the publisher. Authors are responsible for all pictures, contents and copyright-related issues in their own paper(s).
Patronage and Sponsors of the eCAADe 2018 Conference

Patronage:

Ministry of Science and Higher Education
Republic of Poland

TUL Rector
Professor Sławomir Wiak Ph.D., D.Sc.

Sponsors:

Gold

AUTODESK
Autodesk Inc.

GRAPHISOFT
GRAPHISOFT SE

A NEMETSCHEK COMPANY

Silver

VECTORWORKS
Vectorworks

Bronze

Bentley Systems Inc.

Technical Support:

eCAADe Special Support
OpenConf (Winchester, Martens)
ProceeDings (Wurzer, Lorenz, Coraglia)
CuminCAD (Martens, Cerovsek)
Voting System (Winchester)
Theme

Computing for a better tomorrow

This is the second volume of the conference proceedings of the 36th eCAADe Conference, held from 19-21 September 2018 at the Faculty of Civil Engineering, Architecture and Environmental Engineering, Lodz University of Technology, Łódź, Poland. Both volumes together contain the 181 accepted papers that are also available digitally in CuminCad (Cumulative Index of Computer Aided Architectural Design, http://papers.cumincad.org/ or http://cumin-cad.scix.net).

The theme of the 36th eCAADe Conference is Computing for a better tomorrow. When we consider the aims of research activities, design efforts and mastering towards ideal solutions in the area of digital technologies in the built environment, such as CAD, CAM, CAE, BIM, FM, GIS, VR, AR and others, we may realise the actual reason for that is to make life better, healthier, prettier, happier, more sustainable and smarter. The usefulness of undertaken studies might be tested and proved by the noticeable shared approach of putting humans and their environments in a central position: man and the environment, nature and design, art and technology... Natural disasters and climate change, crime and terrorism, disabilities and society ageing - architects, designers and scientists active in the built environment domain are not able to eliminate all the risk, dangers and problems of contemporary world. On the other hand, they have social and moral responsibilities to address human needs and take up this multifaceted challenge. It involves a co-operation and, moreover, an interdisciplinary and user-oriented approach.

The complexity of raised problems should not discourage us, on the contrary, it should stimulate activities towards living up to human dreams of a better and sustainable tomorrow. This calls for a revision of methods and tools applied in research, teaching and practice. Where are we? What are the milestones and roadmaps at the end of the second decade of the 21st century? Do we really take the most of the abundance of accumulated knowledge? Or we skip to explore another undiscovered domains?

We invited academicians, researchers, professionals and students from all over the world to address the multifaceted notions of using computing in architectural and related domains for developing a better tomorrow. Approaches discussing the theme from the perspective
of computer aided design education; design processes and methods; design tool developments; and novel design applications, as well as real world experiments and case studies were welcomed. In order to specifically address some of the questions above, we defined subthemes and organised specific sessions around these subthemes, during the conference as well as in the proceedings.

Topics included, but were not limited to:

- AI for design and built environment
- Building Information Modelling
- CAAD education
- City modelling and GIS
- Collaborative and participative design
- Design concepts and strategies
- Design tools development
- Design and structure optimisation
- Digital application in construction
- Digital design for sustainable buildings
- Digital fabrication and robotics
- Generative design

- Human-computer interaction in design
- Information technologies in cultural heritage
- Internet of things for built environments
- Material studies
- Parametric modelling
- Shape, form and geometry
- Simulation, prediction and evaluation
- Smart and responsive design
- Smart cities
- Spatial reasoning and ontologies
- VR, AR and visualisation

The first volume of the proceedings contains 87 papers grouped under 13 sub-themes while the second volume contains 94 papers grouped under 14 sub-themes. In addition to the accepted papers, the first volume is preceded by Keynote papers including keynote speakers contributions concerning the themes of their keynote lectures. Furthermore, it is enriched by special sessions papers and workshop contributions including the papers summarizing the ideas, goals and the content of workshops given.

Anetta Kępczyńska-Walczak
eCAADe 2018 Conference Chair
Contents

v Theme
vii Acknowledgements
xi List of Reviewers

9 FABRICATION | Virtual & Physical Prototyping
11 Towards a Digitally Fabricated Disassemble-able Building System
Filipe Brandao, Alexandra Paio, Nuno Antunes
21 From Control to Uncertainty in 3D Printing with Clay
Benay Gürsoy
31 Designing Shelters for 3D-printing
Duarte Jose, Shadi Nazarian, Negar Ashrafi
39 Spatial Graded Patterns
Iacovina Kontiza, Theodora Spathi, Patrick Bedarf
47 Prototyping Method for Complex-Shaped Textile Composite Panels
Kihong Ku, Satpal Gurjar
53 PET(s)culpt
Kateřina Nováková, Šimon Prokop, Jiří Vele, Henri Achten
59 Printing a Coffee Bar
Heike Matcha, Ante Ljubas, Harun Gueldemet

69 GENERATIVE DESIGN
71 Ceramic Components
Ana Anton, Ahmed Abdelmahgoub
79 Subdivisional Growth Logics
Christoph Klemmt
85 Mereologies
Daniel Koehler, Sheghaf Abo Saleh, Hua Li, Chuwei Ye, Yaonaijia Zhou, Rasa Navasaityte
95 Learning from Generative Design System in the 60’s
Maki Kasahara, Kiwa Matsushita, Akihiro Mizutani
103  Cooperative Trees by Adding Inosculated and Discrete Definitions to a DLA Design
Salvador Serrano Salazar, José Carrasco Hortal, Francesc Morales Menárguez, Juan Pablo Gutiérrez Salazar

113  Markovian Drift
Erik Swahn

121  Crystal Formations and Symmetry in the Search of Patterns in Architecture
Müge Kruşa Yemişcioğlu, Arzu Gönenc Sorguç, Çağlar Fırat Özgenel

129  HUMAN-COMPUTER INTERACTION IN DESIGN

131  UCHRON
Pierre Cutellic

139  Architecture-Human-Machine (re)configurations
Nicole Gardner

149  Metaphor
Jingoog Kim, Mary Lou Maher, John Gero, Eric Sauda

159  HOPLA
Krystian Kwieciński, Jacek Markusiewicz

169  Multi-Dimensional Interface Based Spatial Adaption
Theresa Lohse, Ryuta Fujii, Liss C. Werner

177  Funken
Alexander Stefas, Andrea Rossi, Oliver Tessmann

187  INFORMATION TECHNOLOGIES IN CULTURAL HERITAGE

189  A Critical Evaluation of Two Contextualised Digital Heritage Workshops
Danilo Di Mascio, Anetta Kepczynska-Walczak, Nicholas Webb, Marc Aurel Schnabel

199  Museum and Cultural Heritage in the World of Digital Technology
Georgios Dimopoulos

205  Cultural Heritage Knowledge Context
Silvia Gargaro, Michela Cigola, Arturo Gallozzi, Antonio Fioravanti

215  Mapping Urban Information as an Interdisciplinary Method for Geography, Art and Architecture Representations
Ursula Kirschner, David Sperling
INFORMATION TECHNOLOGIES IN CULTURAL HERITAGE
Cultural Heritage Knowledge Context

A model based on Collaborative Cultural approach

Silvia Gargaro\textsuperscript{1}, Michela Cigola\textsuperscript{2}, Arturo Gallozzi\textsuperscript{3}, Antonio Fioravanti\textsuperscript{4}
\textsuperscript{1,2,3}University of Cassino and Southern Lazio \textsuperscript{4}Sapienza University of Rome
\textsuperscript{1,2,3}\{silvia.gargaro|cigola|gallozzi\}@unicas.it \textsuperscript{4}antonio.fioravanti@uniroma1.it

Cultural Heritage is a wide concept. It’s what remains of the past generations Cultural Heritage includes tangible culture (such as buildings, monuments, landscapes, books, works of art and artifacts), intangible culture (such as folklore, music, traditions, language and knowledge) and natural heritage (including culturally significant landscapes, and biodiversity). A good preservation, restauration and valorization of Cultural Heritage embraces tangible and intangible culture, actually not evaluated in an holistic way. Cultural Heritage is not only an historical memory of the past, but the mirror of an anthropological reality that characterizes our personal and collective identity within a cultural context. The question is: How can we take into account these thought categories? The model proposed would be an used methodology to analyze the model for data acquisition, processing, modeling and implementation of knowledge on culture and social context through ontologies. The purpose of the research is to analyze the relationship between Cultural Context and Cultural Heritage. The contribution proposes an original approach to Cultural Heritage based on a social and cultural approach, transforming the user as an actor for the acquisition of raw data and cultural knowledge, applying the model to the Archaeological Complex of Casinum, in South Latium.

\textbf{Keywords:} Cultural Heritage, Context Knowledge, Intangible Knowledge, Ontologies, Human Behavior Constraints

\textbf{INTANGIBLE CONTEXT KNOWLEDGE IN CULTURAL HERITAGE}

Cultural Heritage is a wide concept. It’s what remains of the past generations Cultural Heritage includes tangible culture (such as buildings, monuments, landscapes, books, works of art and artifacts), intangible culture (such as folklore, music, traditions, language and knowledge) and natural heritage (including culturally significant landscapes, and biodiversity) (Cecarelli et al. 2017). A good preservation, restauration and valorization of Cultural Heritage embraces tangi-
This last step of the model was analyzed but not still applied.

CONCLUSION
The Cultural Heritage Knowledge Context (CHKC) aims to bring together heterogeneous data sets in a single digital object that allows access and verification in an integrated model. This includes data on the type of building, performance and construction, as well as material typically associated with the cultural heritage.

The novelty of CHKC is the formalization of the cultural context though ontologies to analyze the degree of knowledge and appreciation of the cultural heritage by the citizens / users, in order to verify the strategies for its conservation/restoration.

REFERENCES
Dore, C and Murphy, M 2012 ‘Integration of Historic Building Information Modeling and 3D GIS for...
Recording and Managing Cultural Heritage Sites,' 18th International Conference on Virtual Systems and Multimedia: "Virtual Systems in the Information Society", Milan, Italy, pp. 369-376


Gero, JS and Reffat, RM 2001, 'Multiple representations as a platform for situated learning Systems in designing,' Knowledge-based Systems, 14(7), pp. 337-351


Wissen Hayek, U 2011, ‘Which is the appropriate 3D visualisation type for participatory landscape planning workshops? A portfolio of their effectiveness,’ Environment and Planning B, 38, pp. 921-939


Al Jokhadan, A and Jabi, W 2016 ‘HUMANISING THE

COMPUTATIONAL DESIGN PROCESS,’ Proceedings ASCAAD16, London

Lewicka, M 2008, 'Place attachment, place identity, and place memory: Restoring the forgotten city past,' Journal of Environmental Psychology, 28, pp. 209-231


Murphy, M and Dore, C 2012 'Integration of Historic Building Information Modeling (HBIM) and 3D GIS for Recording and Managing Cultural Heritage Sites,' Proceedings of VSMM 2012, Milan, Italy, pp. 369-376

Murphy, M, McGovern, E and Pavia, S 2011 'Historic Building Information Modeling - Adding Intelligence to Laser and Image Based Surveys,' ISPRS International Workshop 2011, Trento, Italy


Simeone, D, Coraglia, UM, Cursi, S and Fioravanti, A 2016 ‘Behavioural Simulation for Built Heritage Use Planning,’ Proceedings of ecCAADe 2016, Oulu, Finland, pp. 503-510

Sosa, R and Gero, JS 2003, ‘Design and change: a model of situated creativity’, IJCAI Creativity Workshop


Wurzer, G, Popov, N and Lorenz, WE 2012 'Meeting Simulation Needs of Early-Stage Design Through Agent-Based Simulation,' Proceedings of eCAADe 2012, Prague, pp. 613-620
