

Computing in Architecture

Re-Thinking the Discourse

**The Second International Conference of the
Arab Society for Computer Aided Architectural Design
(ASCAAD 2006)**

Editors

Jamal Al-Qawasmi

Zaki Mallasi

**Sharjah, United Arab Emirates
25-27 April, 2006**

[Say: "Are those equal, those who know and those who do not know? It is those who are endued with understanding that receive admonition]. [Al-Zomor, 39, Verse 9, The Holy Qura'n]

Proceedings of ASCAAD 2006 Conference

Held at the School of Architecture and Design, American University of Sharjah, United Arab Emirates, 25-27 April, 2006

Copyright © by the he Arab Society for Computer Aided Architectural Design (ASCAAD)

All rights reserved by the individual paper authors who are solely responsible for their content.

Jamal Al-Qawasmi & Zaki Mallasi, editors
Cover design by

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, medium or by any means - electronic, mechanical, photocopying, recording or otherwise- without the prior written permission of the of the copyright owner.

1. architectural design
2. design computing

ISBN – 9948-427-03-3

Sponsors



American University of Sharjah



University City Professional Network

Acknowledgments

The second international conference of ASCAAD has been an enormous undertake that would not have been successfully completed without the efforts and cooperation of several people and organizations: conference organizing committee, international review committee, ASCAAD's Board of Directors, and the Architecture Department at School of Architecture and Design at American University of Sharajah.

We should like to express our thanks to all those who have contributed in some way to the ASCAAD '06 conference on Computing in Architecture, and to the production of the present proceedings volume. First, we want to thank all the authors that responded with their work to our Call for participation. Without their effort and trust, this conference would not have been possible. We also like to acknowledge the international review committee for their committed, disinterested, and hard work at evaluating the submitted work. A special thank go to the key speakers, Professor Miguel Dias and Professor Gerhard Schmitt, and all of the other participants who helped make the conference a success.

We also appreciate ASCAAD's Board of Directors support, encouragement and advice during this past year of work. We are particularly grateful to the School of Architecture and Design at American University of Sharajah, and University City Professional Network for the generous financial contribution toward supporting the research activities associated with ASCAAD '06. We want to thank American University of Sharajah for providing the university financial, logistic and academic support to the organization of this conference. We want to extend our recognition to Dr Wassim Jabi of New Jersey Institute of Technology for providing us the access to use online papers submission and evaluation system. Finally, we thank ASCAAD for giving us the opportunity to contribute to the advancement of computer aided activities in architecture in the Arab region, serve ASCAAD membership and the public, and, in the process, develop a friendship between us that is last.

Organizing Committee

Conference Chairs

Ahmed Mokhtar

American University of Sharjah, UAE

Ahmad Okeil

The British University in Dubai, UAE

Scientific Committee Chairs

Jamal Al-Qawasmi

King Fahd University of Petroleum and Minerals, SA

Zaki Mallasi

University of Teesside, UK

International Review Committee

Adel Abdou

King Fahd University of Petroleum and Minerals, Saudi Arabia

Aghlab Al-Attili

University of Edinburgh, UK

Ahmad Rafi M.

Multimedia University, Malaysia

Ahmed Mokhtar

American University of Sharjah, UAE

Ahmad Okeil

The British University in Dubai, UAE

Amar Bennadji

The Robert Gordon University, UK

Bob Martens

Vienna University of Technology, Austria

Branko Kolarevic

Ball State University, USA

Dino Bouchlaghem

Loughborough University, UK

Frank Petzold

Bauhaus University Weimar, Germany

Gerhard Schmitt*Swiss Federal Institute of Technology Zurich, Zurich***Guillermo Vasquez de Velasco***Texas A&M University, USA***Henri Achten***Eindhoven University of Technology, Netherlands***Jamal Al-Qawasmi***King Fahd University of Petroleum and Minerals, SA***Jerzy Wojtowicz***University of British Columbia, Canada***John Danahy***University of Toronto, Canada***Khaldoun Zreik***University of Caen, France***Khalid El Harrouni***Ecole Nationale d'Architecture, Morocco***Marc Aurel Schnabel***The University of Hong Kong, China***Nabeel Koshak***Umm Al-Qura University, Saudi Arabia***Nancy Cheng***University of Oregon, USA***Rabee Reffat***King Fahd University of Petroleum and Minerals, Saudi Arabia***Ramzi Hassan***Norwegian University of Life Sciences, Norway***Robert J. Krawczyk***Illinois Institute of Technology, USA***Thomas Bock***TU Munich, Germany***Thomas Fowler***California Polytechnic State University, USA***Wael Abdelhameed***South Valley University, Egypt*

Wasim Jabi

New Jersey Institute of Technology, USA

Zaki Mallasi

University of Teesside, UK

ASCAAD Board of Directors

Ahmad Okeil, President

The British University in Dubai, UAE

Jamal Al-Qawasmi, Vice President

King Fahd University of Petroleum & Minerals, Saudi Arabia

Members:

Aghlab Al-Attili

University of Edinburgh, UK

Nabeel Abdulkadir Koshak

Umm Al-Qura University, Saudi Arabia

Rabee Mohamed Reffat

King Fahd University of Petroleum & Minerals, Saudi Arabia

Ramzi Hassan

Institute of Landscape Architecture and Spatial Planning, Norway

Sameh Shaaban

RIBA Enterprises, UK

Thamer A. Alrugaib

King Fahad University of Petroleum & Minerals, Saudi Arabia

Zaki Mallasi

University of Teesside, UK

Table of Contents

Acknowledgments	v
Organizing Committee	vi
International Review Committee	vi
ASCAAD Board of Directors	viii
Table of Contents	ix
Editor's Preface	xiv

SECTION I: DIGITAL DESIGN EDUCATION

“Not Every new Monday...”: on using computer-games technology in architectural design education	2
<i>Frank Petzold and Jan Frohburg</i> <i>Bauhaus University Weimar, Germany</i>	
The Significant Role of an Electronic Gallery to the Education Experience and Learning Environment	16
<i>E. Amir Sharji and A. R. Mohd. Eshaq</i> <i>Multimedia University, Malaysia</i>	
Adapting Digital Technologies to Architectural Education Need	26
<i>Andreas Luesche and Salim Elwazani</i> <i>Bowling Green State University, USA</i>	
Evolution or Revolution: is digital conceptual design the way forward for Architects?	41
<i>Tahar Kouider</i> <i>University of Aberdeen, UK</i>	
A Collaborative Digital Design Workshop: an ANN-based paradigm approach	58
<i>Shang Yuan Chen</i> <i>National Cheng Kung University, Taiwan</i>	

SECTION II: COMPUTER APPLICATIONS AND FUTURE ARCHITECTURE

- Design Informatics: a case based investigation into parametric design scripting and CNC based manufacturing techniques** 73

Nimish Bioria, Kas Oosterhus, and Cas Aalbers

Technical University of Delft and ONL Rotterdam, the Netherlands

- Designing with Machines: solving architectural layout planning problems by the use of a constraint programming language and scheduling algorithms** 88

Thorsten M. Loemker

Technische Universität Dresden, Germany

- An Analysis of the Applications of Rapid Prototyping in Architecture** 107

Sajid Abdullah, Ramesh Marasini and Munir Ahmad

University of Teesside, UK

- Integrating Mass Customization with Prefabricated Housing** 124

Joseph, C. H. Huang, Robert J. Krawczyk and George Schipporeit

Illinois Institute of Technology, USA

- Sensor-based Aware Environment** 137

Mohammad Babsail and Andy Dong

The University of Sydney, Australia

SECTION III: THEORY AND CRITICAL EVALUATION

- Redemptive Technologies II: the sequel (A Decade Later)** 152

Michael Stanton

The American University of Beirut, Lebanon

The Autopoiesis and Mimesis of Architecture	167
<i>George Katodrytis</i>	
<i>American University of Sharjah, UAE</i>	
Plan is Dead: to BIM or not to BIM, that is the question	182
<i>Michael A. Ambrose</i>	
<i>University of Maryland, USA</i>	
Future of Communicating Digital Design in Architecture: overcoming the divisive power of Computer Aided Design	190
<i>Florian Techel</i>	
<i>University of Sharjah, UAE</i>	
Critical Environmentalism and the Practice of Re- Construction	208
<i>Craig Anz and Akel Ismail Kahera</i>	
<i>South Illinois University, and Prairie View A&M, USA</i>	
Musing Heideggerian Cyberspace	225
<i>Jon Daniel Davey</i>	
<i>Southern Illinois University, USA</i>	
SECTION IV: CONCEPTUAL DESIGN AND DIGITAL DESIGN PROCESS	
A Comparative Study of Digital and Traditional Tools for Participative Design	233
<i>Rashidah AB. Rahman and Alan Day</i>	
<i>University of Bath, UK</i>	
An Approach to 3D Conceptual Modelling	253
<i>Chie-Chieh Huang</i>	
<i>National Chiao Tung University, Taiwan</i>	

- Collaborative Architectural Design as a reflective Conversation: an agent facilitated system to support collaborative conceptual design** 264

G. Arjun and J. Plume

The University of New South Wales, Australia

- The Digital Design Process: reflections on architectural design positions on complexity and CAAD** 272

Ali Chougui

University of Ferhat Abba, Algeria

- The Relations Between Design Idea Emergence and Design Solution Direction: digital media use in mass exploration of architectural design** 289

Wael A. Abdelhameed

Couth Valley University, Egypt

SECTION V: DIGITAL VISUALIZATION AND RECONSTRUCTION

- Structural Performance Modelling in Architectural Design Education** 299

Bruce Lonman

American University of Sharjah, UAE

- Islamic Architecture and Digital Databases** 313

Rasha Ali

The University of Paris, France

- Digital Rectified Imagery: a survey method for design and conservation projects** 331

José Lerma and Salim A. Elwazani

Polytechnic University of Valencia; Bowling Green State University, Ohio, USA

Adaptive Generative Patterns: design and construction of Prague Biennale pavilion	342
<i>Giorgos Artopoulos, Stanislav Roudavski and Francois Penz Cambridge University, UK</i>	
I³-Eye-Cube: interactive intuitive mixed reality interface for virtual architecture	365
<i>Stephen K. Wittkopf, Sze Lee Teo, and Zhou ZhiYing National University of Singapore, Singapore</i>	
SECTION VI: ENVIRONMENTAL QUALITY MODELLING AND EVALUATION	
Using Space Syntax Software in Explaining Crime	382
<i>Linda N. Nubani The American University in Dubai, UAE</i>	
Visualization Management and Inspection for Plumbing Construction Quality Control	396
<i>Naai-Jung Shih and Pin-Hung Wang National Taiwan University of Science and Technology, Taiwan</i>	
Evaluation of a Higher Education Self-learning Interface	408
<i>A. Bennadji and A. Bellakhal The Robert Gordon University, UK and Institut d'Architecture, Universite Mohammed Khider , Algeria</i>	
A Real-Time Simulation Tool for Fault Detection and Diagnosis of HVAC Systems	422
<i>Yue Ma and Mohammed Zaheeruddin Concordia University, Canada</i>	

Editors' Preface

The influence of computing and information technology on architectural design education and practice is increasingly evident. Architectural design, practice, fabrication and construction are increasingly aided by and dependent on computing and digital technology. Digital technology has reconditioned the design process and how we operate as architects, and established new processes and techniques of fabrication. New computerized studios such as the paperless studio and the virtual design studio have been introduced in many architectural schools as new ways of practicing and teaching architectural design.

In the last decade or so, there is a continuous demand to deliver new skills in digital media and to rethink architectural design education and practice in the light of the new developments in digital technology. The proliferation of computers and telecomputing in design education and practice has resulted in a major paradigm shift and a reorientation in theoretical and conceptual assumptions considered to be central to traditional paradigm(s) of designing, practicing, and producing architecture.

The pervasiveness in the use of digital technology in architecture has given rise to a discourse and debate on the relationship between computing, digital technology and architecture. Topics in the debate are continuously changing in light of developments in the use of the digital technology. Current debates are focusing on a wide range of related issues among which virtualization of design education, digital design methods and pedagogies, future architecture with digital design, web-based design, computer-mediated collaborative design, virtual reality and design, virtual design studio, paperless studio, digital studio, design support environments, digital thinking, digital practice, digital production/fabrication, and digital visualization. Despite the extensive literature on the subject, the impact of digital technology on how we design, practice, teach, fabricate and produce architecture has not been sufficiently examined. Furthermore, architectural discourse is still dominated by the prevailing traditional analogue paradigm which puts great constraints on our understanding of recent developments in teaching, designing and practicing design.

Our goal in formulating the Call for Papers was to encourage discussion of these and other issues. The theme of the 2006 conference is "Computing in Architecture: Re-Thinking the Discourse". This captures the role of the conference as a forum to debate and reconsider current understandings of the way we design, practice, and produce architecture. The conference aimed to provide the participants an occasion to share and exchange experiences and research findings, and to stimulate more ideas and useful insights regarding how computing and digital media affects the design, production and evaluation of the built environment. More than eighty people from a diverse

community of researchers responded with abstracts, and sixty nine authors submitted papers for blind review. The thirty papers selected for presentation at this conference have the potential to broaden our knowledge and understanding of how digital technology is developing and applied to architectural education and practice. The papers are organized in the book under six sections or categories that correspond and match the sessions in the conference program. The sections are: digital design education, computer applications and future architecture, theory and critical evaluation, conceptual design and digital design process, digital visualization and reconstruction, environmental quality modelling and evaluation