WORKSHOP ON CONSTRUCTION AWARE DESIGN, RAPID-PROTOTYPING SPATIAL RECONSTRUCTION AND PERFORMANCE

THE AMERICAN UNIVERSITY IN CAIRO
DEPARTMENT OF CONSTRUCTION AND ARCHITECTURAL ENGINEERING
JANUARY 30TH TO THE FEB 2ND

WORKSHOP WEBSITE:
HTTP://WWW.GEO-ARAB-DESIGN.COM/TRAINING/2011/WORKSHOP-CAIRO-2011.HTML?SUBMENUHEADER=99

YOU WILL LEARN THE SOFTWARE THAT IS USED IN PROJECTS BY ZAHA HADID ARCHITECTS, ASYMPTOTE ARCHITECTURE, MARIO BELLINI ARCHITECTS AND OTHERS TO DESIGN THE PANELING SYSTEMS. YOU WILL GET A QUICK INTRODUCTION TO RHINO AND GRASSHOPPER. YOU WILL LEARN HOW TO DIGITALLY RECONSTRUCTION DATA FROM 3D SCANNERS AND EVEN FROM REGULAR PHOTOGRAPHS. YOU WILL LEARN HOW TO PRINT 3D MODELS USING STATE OF THE ART MACHINES. YOU WILL LEARN HOW TO PERFORM BASIC ENERGY AND PERFORMANCE ANALYSIS OF YOUR DESIGNS. ALL THIS WILL BE PROVIDED IN A COMPREHENSIVE 4 DAY WORKSHOP TO BE TAUGHT BY INTERNATIONAL EXPERTS IN THE FIELD AS WELL AS LOCAL RESEARCHERS.

LIMITED NUMBER OF SEATS AVAILABLE

SPONSORS: AUC, KEMET CORP, KAUST (CENTER FOR GEOMETRIC MODELING), EVOLUTE

WHO SHOULD ATTEND: ENGINEERS, ARCHITECTS, CONSTRUCTION MANAGERS, FABRICATORS, ETC…

WORKSHOP FEES: PROFESSIONALS: 2500 L.E. STUDENTS: FREE
LIMITED SEATS AVAILABLE: 30

IMPORTANT DATES:
DEADLINE FOR RSVP: DECEMBER 30TH
PAYMENT: BY FIRST DAY OF THE WORKSHOP

WORKSHOPS SCHEDULE AND SPEAKERS:

SUNDAY JAN 30

09:00 – 10:00 REGISTRATION
10:00 – 11:00 3D RECONSTRUCTION OF SCENES FROM COLLECTION OF UNORGANIZED 2D PHOTOGRAPHS (VACLAV HLAVAC)
11:00—13:00 INTRODUCTION TO RHINO (M. ZAGLOUL)
13:00 – 14:00 LUNCH
14:00 – 16:00 INTEGRATION WITH OTHER SOFTWARE (M. ZAGLOUL)

MONDAY JAN 31

SPATIAL RECONSTRUCTION OF DIGITAL MODELS (MICHAEL HOFER)
10:00 – 12:00 THEORY
12:00 – 13:00 LUNCH
13:00 – 13:00 Applications

TUESDAY FEB 1

10:00 -- 12:00 ARCHITECTURAL GEOMETRY (MOHAMED SHALABY)
12:00 – 13:00 LUNCH
13:00 – 15:00 DIGITAL FABRICATION (KHALED NASSAR)

WEDNESDAY FEB 2
CONSTRUCTION AWARE DESIGN: DESIGNING PANELIZATIONS OF ARCHITECTURAL FREEFORM SURFACES USING SUBDIVISION MODELING AND OPTIMIZATION. (MATHIAS HÖBINGER)

10:00 – 12:00 THEORY
12:00 – 13:00 LUNCH
13:00 – 13:00 Applications

3D RECONSTRUCTION OF SCENES FROM COLLECTION OF UNORGANIZED 2D PHOTOGRAPHS

Vaclav Hlavac, http://cmp.felk.cvut.cz/~hlavac

Czech Technical University in Prague, Czech Republic

Workshop topic

The underlying ideas needed to reconstruct a 3D scene from 2D images will be explained. This technique has been competitive to 3D laser scanning lately.

For the practitioners, like most of the workshop participants, it could a technique useful for their `toolbox' as they can get basic 3D information from their own photographs taken at the "to be" or existing construction site.

What participants can expect to learn in this workshop

First, the core theoretical underlying concepts of projective geometry will be explained in an informal way anchoring to the common knowledge the audience almost certainly have.

Second, the solution to the correspondence problem will be explained, i.e. finding the same location in left, right (or other images if more are available) in an automatic way.

Third, it will be shown how recent software, which fuses different views into a consistent 3D model. look like inside, including Google's Street View and Microsoft's similar tool Street slide (part of Bing).

Fourth, some of the aspects will be demonstrated on the results of speakers own research and results of his group.

Workshop presenter(s)

Vaclav Hlavac was born in 1956 in Praha. He is a professor at the Czech Technical University in Prague, Czech Republic where he leads the Center for Machine Perception, http://cmp.felk.cvut.cz. He received MSc. in 1981, and PhD in 1987 from the Czech Technical University Prague. His research interests are in 3D computer vision and in both statistical and structural pattern recognition. He is a co-author of the books Sonka M., Hlavac V., Boyle R.B.: Image Processing, Analysis, and Machine Vision, 3rd Edition, Thomson Learning, Canada 2007 and Schlesinger M.I., Hlavac. V.: Ten lectures on statistical and structural pattern recognition,Kluwer Academic Publishers, Dordrecht, The Netherlands, 2002.

INTRODUCTION TO GRASSHOPPER & LINKING TO ECOTECT VIA Geco

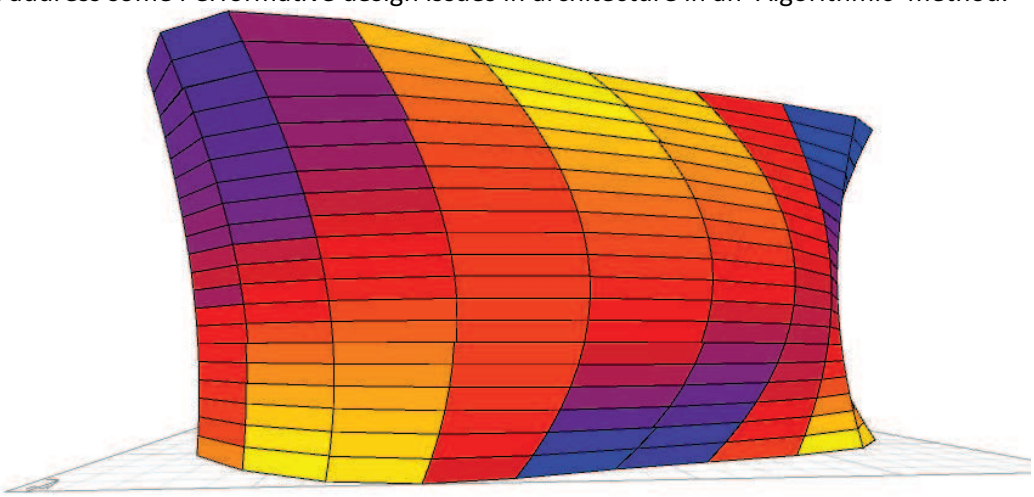
Mohamed Zaghloul
Faculty of Fine Arts - Alex. Univ. - Architecture Department

Workshop topic

For designers who are exploring new shapes using generative algorithms, Grasshopper® is a graphical algorithm editor tightly integrated with Rhino's 3-D modeling tools. Unlike RhinoScript, Grasshopper requires no knowledge of programming or scripting, but still allows designers to build form generators from the simple to the awe-inspiring. This workshop will provide an introduction to rhino and grasshopper and provide guidance on how to link rhino, grasshopper with other tools

In addition, the workshop will present how to integrate a criterion of design guided by evaluating performances of generating geometrics of architectural forms; the participants will construct a relation between building performance and building geometry.

Evaluating (Solar Radiation-Daylight Performance) performance will be simulated by sustainable design analysis software Autodesk Ecotect. Data feeding from Grasshopper to Ecotect is based on an interface developed by [uto] " http://utos.blogspot.com/ "which offers a direct link **"Geco"** between Rhino/Grasshopper. This plug-in has the automation spirit of transforming performances data which consequently enables to combine a generative and performative modeling into one criterion. So the workshop will combine geometrical subjects with algorithms and will address some Performative design issues in architecture in an 'Algorithmic' method.



What participants can expect to learn in this workshop

- A functional understanding to improve performance and the design of a building in the context of its environment.
- Generating free form surfaces based on Evaluation of daylighting performance- solar radiation-Sun path by Ecotect with Grasshopper.

Workshop presenter

Mohamed Zaghloul is a faculty member at the Faculty of Fine Arts-Alexandria University, Architecture Department. He has extensive experience with grasshopper and rhino and is an active memeber of the grasshoper community. Recently he developed a mathematica plugin for rhino dubbed Mantis.
http://zaghloul4d.blogspot.com

RECONSTRUCTION OF DIGITAL MODELS

Michael Hofer

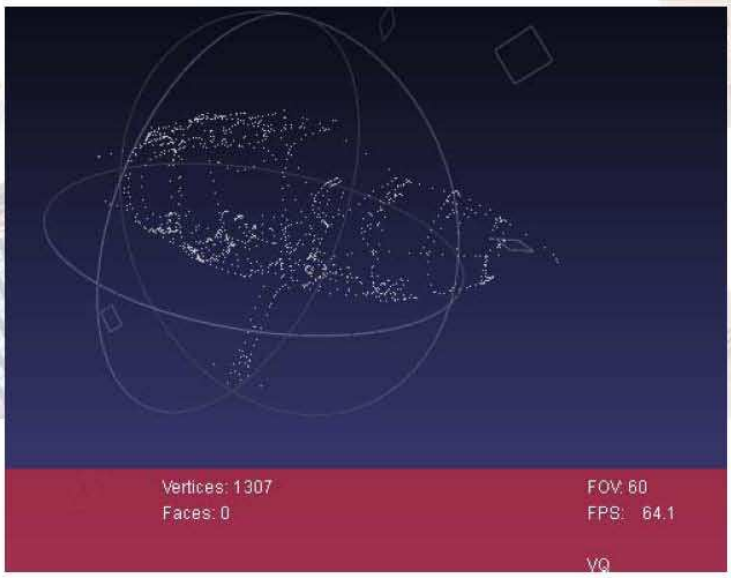
Vienna

Workshop topic

Spatial Reconstruction Re-construction of Digital Models

Automatic building reconstruction has interested the community for more than ten years and numerous works have focussed on this subject. A point cloud is a description of a set of points, usually specified by a 3-tuple, [x, y, z] defined on an orthogonal coordinate system representing 3-D space. Sometimes these points are referred to as vertices if they are to be used as corners of a polygonal mesh, but a mesh constructed from a point cloud does not necessarily include these points as vertices.

Point cloud data files are often simple text files, with each row containing a point. There are many variations; a set of header rows that describes the data, various characters separating the values (delimiters), other information (e.g. color, surface orientation), binary encoding of the coordinates, etc. This workshop will takle issues related to Spatial Reconstruction Re-construction of Digital Models



Workshop presenter(s)

Michael Hofer is a Lecturer, Vienna University of Technology, focuses on the solution of current geometric problems in the areas of geometric modeling and processing, computer aided geometric design, computer graphics, computer vision, and imaging science.

ARCHITECTURAL GEOMETRY: SELECTED TOPICS FROM THE ARCHITECTURAL GEOMETRY BOOK

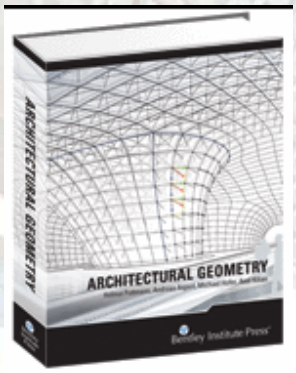
Mohamed Shalaby

KAUST, Saudi Arabia

Workshop topic

I am going to present a selected topics from the Architectural Geometry book which is intended as a geometry consultant for architects, construction engineers, and industrial designers.

Architectural Geometry is the first book to introduce a revolutionary new approach to design.



Geometry lies at the core of the architectural design process. It is omnipresent, from the initial form-finding stages to the actual construction. Modern constructive geometry provides a variety of tools for the efficient design, analysis, and manufacture of complex shapes. This results in new challenges for architecture. However, the architectural application also poses new problems to geometry. Architectural geometry is therefore an entire research area, currently emerging at the border between applied geometry and architecture.

Written for students, architects, construction engineers, and industrial designers – Architectural Geometry is a source of inspiration for scientists interested in applications of geometry processing in architecture and art.

What participants can expect to learn in this workshop

Participants will be introduced to the advanced ar architectural geometry. How geometry can provide varityies of tools for efficient design?

They will get in-depth understanding of geometric principles and their integral relationship to the world of design.

They will learn more about freeform curves and surfaces

Workshop presenter(s)

Mohamed Shalaby, senior research scientist at the Geometric Modeling and Scientific Visualization Research Center at KAUST.

http://gmsv.kaust.edu.sa/people/research_scientists/shalaby/shalaby.html

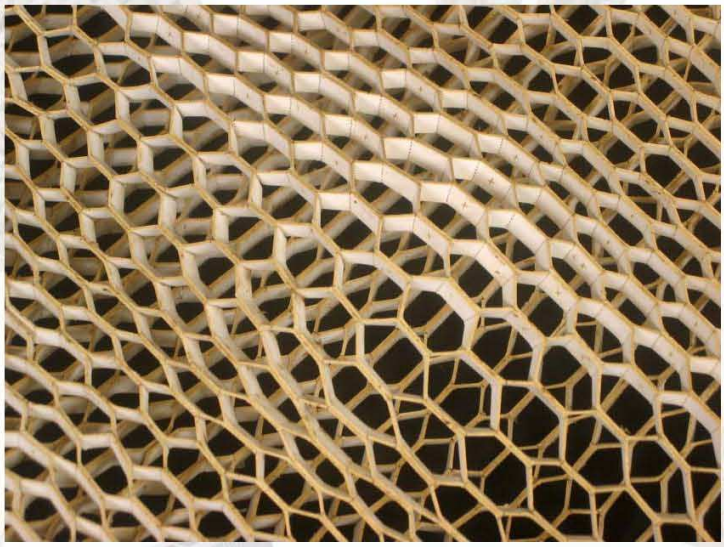
DIGITAL FABRICATION IN ARCHITECTURE AND CONSTRUCTION

Khaled Nassar

The American University in Cairo

Workshop topic

Digital Fabrication and emerging technology in the discipline of construction and architecture is gaining a more prominent role in everyday practice. This workshop introduces the concepts and practices of digital fabrication and construction and offers an insight into innovating standard, accessible materials and machinery to achieve a new kind of construction.



What participants can expect to learn in this workshop

1. List methods of various digital fabrication
2. Develop method statements for various types of digital fabrication techniques such as tessellating, sectioning, folding, contouring, and forming.
3. Utilize the latest cutting-edge technology in rapid prototyping and digital fabrication by using AUC's 3D-printers and laser cutters.
4. Schedule and plan construction projects with digital fabrication
5. Identify design limitations of digital fabrication
6. List cost items of digital fabrication

Workshop presenter(s)

Dr. Khaled Nassar is an associate Professor at the department of construction and architectural, The American University in Cairo

DESIGNING PANELIZATIONS OF ARCHITECTURAL FREEFORM SURFACES USING SUBDIVISION MODELING AND OPTIMIZATION

Alexander Schiftner and Mathias Höbinger

Evolute GmbH and TU Wien

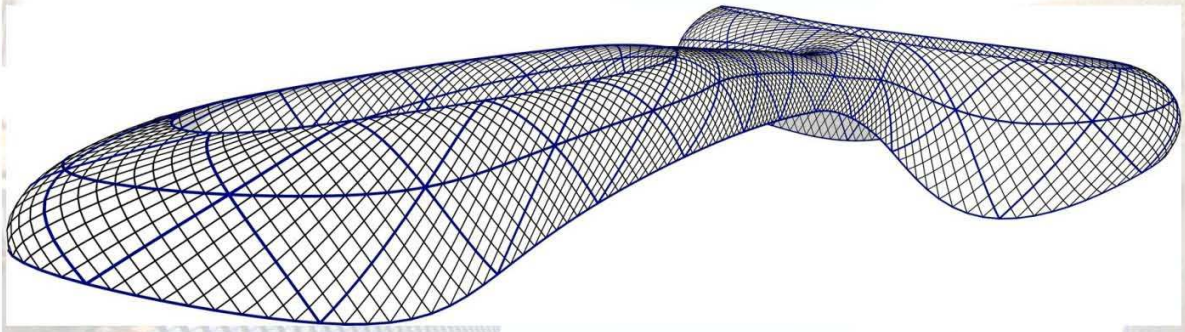
Workshop topic

Subdivision modeling is an approach commonly used in architecture for designing freeform surfaces. Common subdivision modeling tools provide the designer with intuitive design handles. The workshop will show how the popular concept of subdivision modeling can be generalized and carried over to the

- design of panelisations (meshes or seams) on given freeform surfaces and the
- design of panelised freeform surfaces from scratch.

Furthermore it will introduce the participants to the application of sophisticated optimization methods to be used in conjunction with subdivision modeling or standalone in order to add construction awareness to the design process. Examples of such optimization methods are described in [1] and [2] for planar quad meshes respectively circle packing triangle meshes.

The approach of subdivision modeling combined with optimization has been successfully used by the workshop presenters working at Evolute on prominent real world examples like the Yas Island Marina Hotel Gridshell by Asymptote Architecture or the metal facade of the Dongdaemun Design Plaza and Park in Seoul by Zaha Hadid Architects.



What participants can expect to learn in this workshop

Participants will be introduced to the principle of subdivision modeling and its generalisation (combining different global and local subdivision rules). They will be thoroughly introduced to the concepts of mesh optimization and how it can be applied for construction aware design of panelisations. Throughout the whole workshop a newly developed plugin for Rhino which includes the necessary functionality will be used by the participants for hands-on examples and exercises. Participants can bring their own designs (freeform surfaces) to be panelised.

Workshop presenter(s)

Alexander Schiftner (http://www.geometrie.tuwien.ac.at/aschiftner/) and Mathias Höbinger (http://www.geometrie.tuwien.ac.at/hoebinger/), consultants and developers at Evolute GmbH (http://www.evolute.at), research assistants at the research unit for Geometric Modeling and Industrial Geometry of Vienna University of Technology.