SEPIA - Institute for Textile Arts

# WORKSHOP • TEXTILES IN ARCHITECTURE • 27 - 31 October 2013 • Cairo

## 1. Course Introduction

The project-based seminar spotlights energy-efficient buildings with the help of textiles (incl. environmentally sustainable and low-cost textiles) in the context of art & design. The essential question involves how artistic textiles enrich architectural scope in an aesthetic and functional way. In this regard investigations of how textile art &design can interact with buildings will be conducted relating to shading and cooling, heat and noise insulation. Basic textile principles relevant to architecture, the know-how about materials and various manufacturing methods will be introduced, such as traditional craft techniques or pure digital production processes, applied in analog exercises. State of the art digital textile simulation software is introduced; using parametric tools the participant shall be able to analyze the integrity of the textiles and design them according to structurally and environmentally sound principles. Participants will take part in simulating the structure and energy efficiency of textile architecture through easy to follow examples using Grasshopper's Kangaroo plugin, ranging from beginner to more advanced applications.

### Topics

- Textile principles, construction and materials
- Energy efficient design solutions with textiles
- Digital techniques for architecture visualization

### Course Questions

- How can textiles improve the energy performance of buildings?
- How can textile art & design improve the quality of urban spaces?
- How can the computer help to generate and simulate such designs?
- How can I present this ideas?

### Course Objectives

- Understanding the basic principles of textiles, knowing the possibilities of applications of textiles
- Having basic knowledge in parametric design software, being able to simulate textile structures
- Creating an innovative design for a textile application in architecture

## 2. Course Schedule

| | Sun 27 / 10 / 2013 | Mon 28 / 10 / 2013 | Tue 29 / 10 / 2013 |
|---|---|---|---|
| **09:00 - 10:00 am** | **Intro & Case Study** | **Idea panel & mentoring** | **Idea panel & mentoring** |
| **10:00 - 12:00 am** | **Textiles – Lecture 01**<br>• *Textile Fabrics in Architecture* | **Textiles – Lecture 02**<br>• *Textile Pictures in Architecture* | **Textiles – Lecture 03**<br>• *Textile Shapes in Architecture* |
| **12:00 - 01:00 pm** | **Exercise 01**<br>• *Drawing* | **Exercise 02**<br>• *Point Paper Design* | **Exercise 03**<br>• *Braiding local materials* |
| **01:00 - 02:00 pm** | Lunch Break | | |
| **02:00 - 03:00 pm** | **Archi-Lecture 01**<br>*Digi Tools in Architecture* | **Archi-Lecture 02**<br>*Textile Architecture I* | **Archi-Lecture 03**<br>*Textile Architecture II* |
| **03:00 - 06:00 pm** | **Digi Tools 01**<br>• *Rhino Modeling* | **Digi Tools 02**<br>• *Rhino / Grashopper*<br>• *Generative Architecture* | **Digi Tools 03**<br>• *Rhino / Grashopper*<br>• *Generative Architecture*<br>• *Kangaroo* |

| | Wed 30 / 10 / 2013 | Thu 31 / 10 / 2013 |
|---|---|---|
| **09:00 - 10:00 am** | **Idea panel & mentoring** | **Idea panel & mentoring** |
| **10:00 - 12:00 am** | **Textiles – Lecture 04**<br>• *Textile Art in Architecture* | **Draft in progress** |
| **12:00 - 01:00 pm** | **Exercise 04**<br>• *Drawing* | |
| **01:00 - 02:00 pm** | Lunch Break | |
| **02:00 - 03:00 pm** | **Archi-Lecture 04**<br>• *Formalizing Aesthetics* | |
| **03:00 - 06:00 pm** | **Digi Tools 03**<br>• *Rhino / Grashopper*<br>• *Generative Architecture*<br>• *Kangaroo*<br>• *3 ds Rendering* | **Presentation and Closing Session** |

## 3. 1 Course Modules

Sunday, 27 October

**• 09:00 - 10:00 am**

**Introduction & Case Study**

**• 10:00 - 12:00 am**

**Textiles - Lecture 01**
**Textile Fabrics in Architecture**
*After timber, stone, metal and glass, textile is the fifth most used material in architecture. For a first glance on this topic the book „Textile Fabrics in Architecture" presents a general survey about appearance of textile fabrics in constructions.*
*It begins with the first use of textile in architecture, like in the Velarium of the Colosseum, the Tipi and curtains from the Renaissance, and covers the whole spectrum up to examples of contemporary Textile Architecture like the Prada Transformer in Seoul from AMO Architects.*

**• 12:00 - 01:00 pm**

**Excersise 01**
*The exercise is to draw a draft working with the case study. The main focus here is to form a free and creative project using the newly acquired knowledge.*

**• 02:00 - 03:00 pm**

**Architecture - Lecture 01**
**Digi Tools in Architecture**
*The lecture gives an overview about current state of the art technologies in the digital process of architecture. The potentials and risks in presentation, parametric design approaches, the idea of building information modeling, the realization of design build/ fabrication processes and the basics of simulation tools in the architectural workflow is shown.*

**• 03:00 - 06:00 pm**

**Digi Tools 01**
*Introduction in basic and advanced modeling techniques using the latest Rhino-Software. Geometric shapes 2D and 3D, transformations and nurb-surfaces are explained.*

## 3.2 Course Modules

Monday, 28 October

**• 09:00 - 10:00 am** — **Idea panel & mentoring**

**• 10:00 - 12:00 am** — **Textiles - Lecture 02**
**Textile Pictures in Architecture**
*When observing facades and interior spaces there are pictures and ornaments with textile attributes frequently. To clarify the issue of „Textile Pictures in Architecture" the figurative composition of textiles is presented. Therefore the topic of weaving is explained more detailed.*
*Different kinds of materials and weaving techniques are described, from the ancient times through the Industrialism till modern times. The technique of how to design an ornament with repeating patterns is introduced.*

**• 12:00 - 01:00 pm** — **Excersise 02**
*The exercise is to internalize the principles of weaving by constructing ornamental structures by oneself. The objective is to create one's own pattern repeat for a weaved textile.*

**• 02:00 - 03:00 pm** — **Architecture - Lecture 02**
**Textile Architecture I**
*Architecture projects will be shown in which textiles act as key elements. Their geometrical and constructional basics get explained, like surface-line-point transformation, double curved surfaces and geometrical rules. Other applications of textiles are also shown.*

**• 03:00 - 06:00 pm** — **Digi Tools 02**
*Basics introduction in generative software is given using the grasshopper application for rhino software. The general concept and the elements of grasshopper definitions are explained, enabling the trainee to do first exercises in parametric software.*

## 3.3 Course Modules

Tuesday, 29 October

**• 09:00 - 10:00 am**

**Idea panel & mentoring**

**• 10:00 - 12:00 am**

**Textiles - Lecture 03**
**Textile Shapes in Architecture**
*The chapter „Textile Shapes in Architecture" expands the subject of textile structure in architecture. Contemporary examples of braided shapes, like the Spanish Pavilion at the Expo 2010, Shanghai, are presented and reviewed. Extending the weaving process, the issue of braiding is explained, which is able to rise from the flat surfaces of weaving to expand into the third dimension. For this various braiding techniques are visualized.*

**• 12:00 - 01:00 pm**

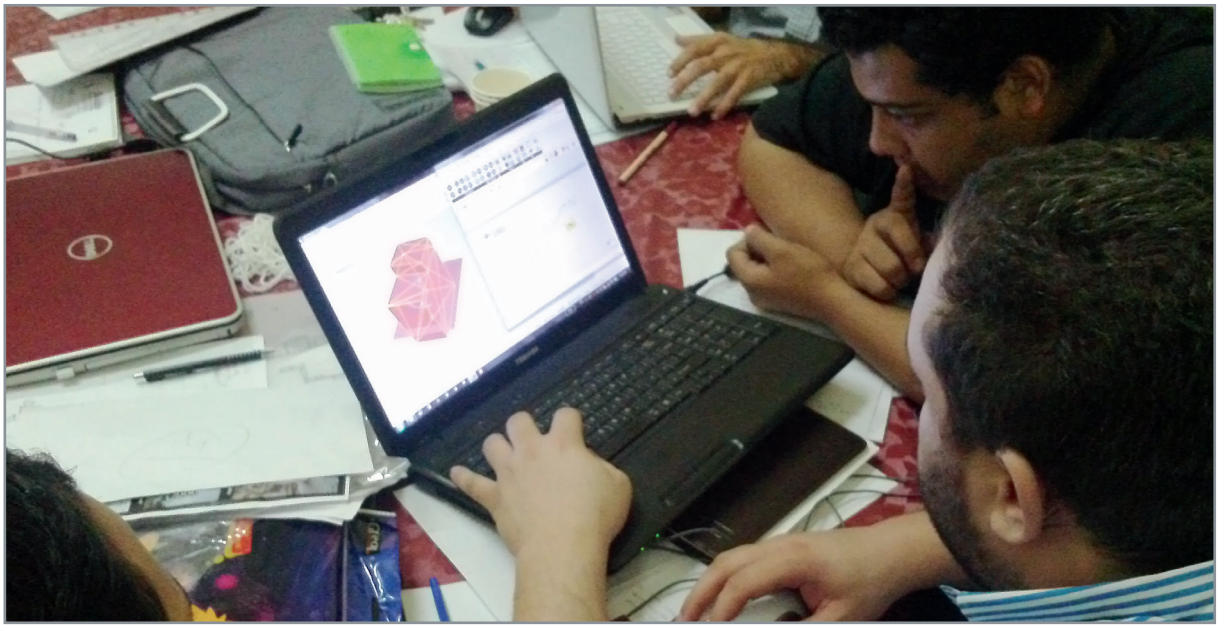
**Excersise 03**
*The exercise is to select sustainable or just creative materials to braid a model of a two or three dimensional object, which could be used for shading structures of the case study.*

**• 02:00 - 03:00 pm**

**Architecture - Lecture 03**
**Textile Architecture II**
*This lecture focusses on textiles in architecture and their materials. Anoverview of current technologies in this field is given and concepts for new inventions are shown.*

**• 03:00 - 06:00 pm**

**Digi Tools 03**
*Advanced introduction in generative software is given using the grasshopper application for rhino software. Further plugins for rhino like e.g. kangaroo or rhino-membrane are introduced with focus on the particular need of the in parallel developing projects.*



## 3.4 Course Modules

Wednesday, 30 October

**• 09:00 - 10:00 am**

**Idea panel & mentoring**

**• 10:00 - 12:00 am**

**Textiles - Lecture 04**
**Textile Art in Architecture**
*Often the frontiers of architecture and art are merged together so buildings can be seen as sculptures, pictures or art installations. The last chapter „Textile Art in Architecture" is an experiment to help transmit artistic principles to ideas on how to create a building. Applying this principles like colour, geometrical or organic forms, seen as an adaptation or conceptual art in architecture is an attempt to refine the sense of artistic aspects in architecture.*

**• 12:00 - 01:00 pm**

**Excersise 04**
*This time the exercise is a completely creative work using drawing material. The model can include the knowledge learned in the course, sketch another non-mentioned art principle and if desired, it can be part of the case study.*

**• 02:00 - 03:00 pm**

**Architecture - Lecture 04**
**Formalizing Aesthetics**
*Using Christopher Alexander´s the idea of formal rules in aesthetic structures is explained. A way to analyze these structures is given and the emerging basic properties are highlighted as well as rules for generation, especially for digital processes in architecture.*

**• 03:00 - 06:00 pm**

**Digi Tools 04**
*Basic rendering and presentation techniques are shown, parametric projects are further developed in a workshop setup, helping and instructing the trainee to develop and present their individual project.*

## 3.5 Course Modules

Thursday, 31 October

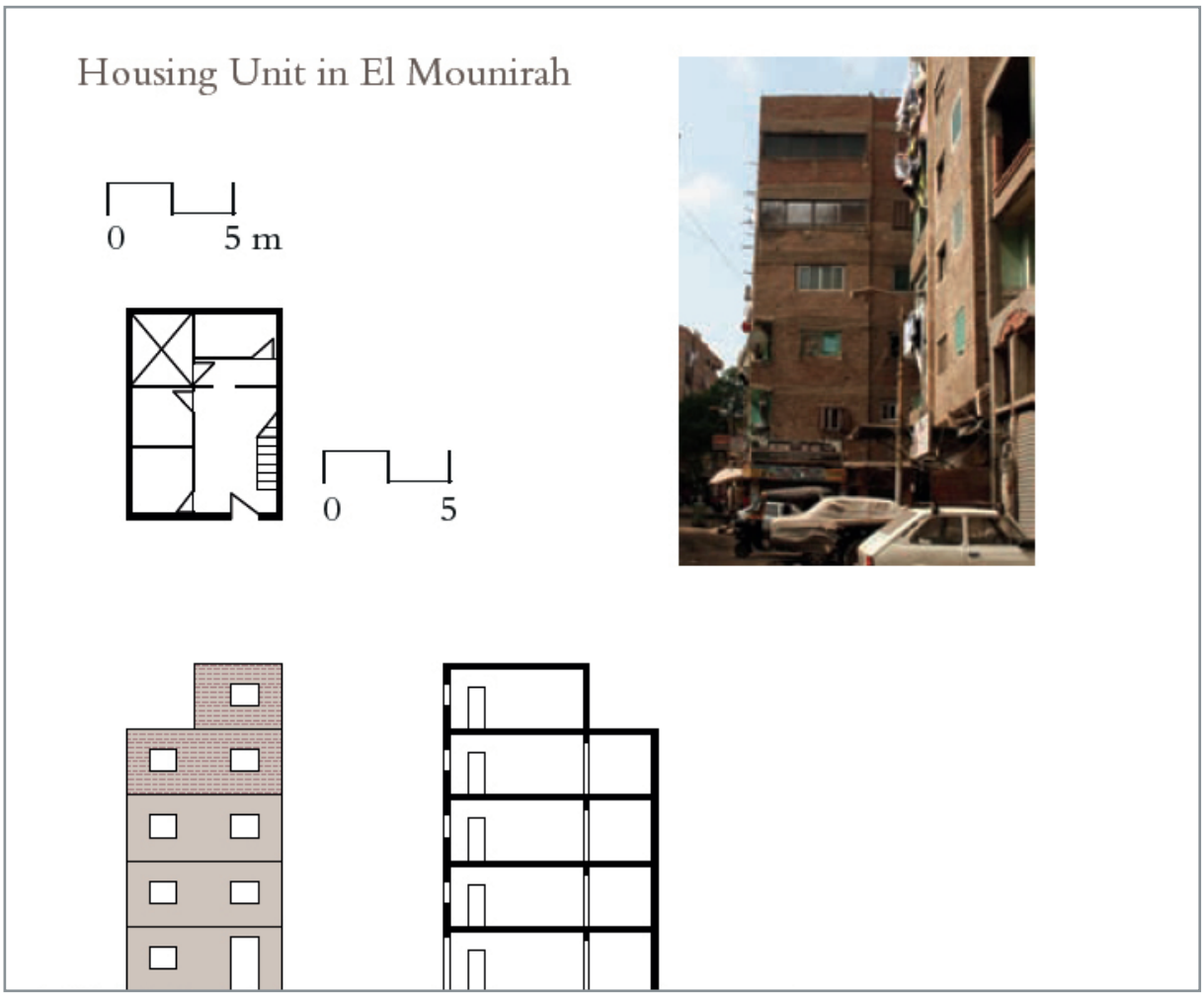
- **09:00 - 03:00 pm** **Drafts in progress & Finishing**
- **03:00 - 06:00 pm** **Jury Session & Presentations**

## 4. Base Case

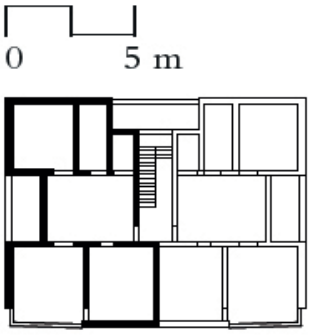
Three base cases will define the starting point of the workshop: An informal housing unit in elMounirah, a typical multi story project for public housing and a building in the "workers city". These base cases will be analyzed in group work and their problems will be defined on an aesthetical and functional layer.

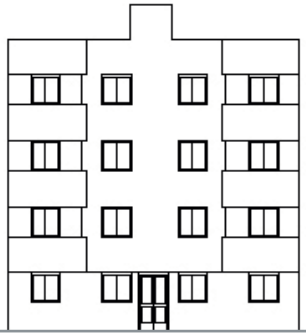
The outcome of this analysis will lead to first ideas and solutions using textile materials and techniques, which can range from small scale products to mid-scale building elements and even structures on an urban scale. Giving input with lectures, exercises, consultations and software courses the whole workshop program is designed to enable the trainee to develop his basic idea into a well presented and profound concept in pre-production state.

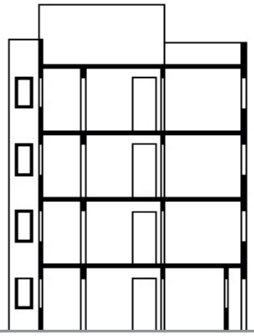
Source: IMBABA, Case Study 2010, Andre Perronet & Thomas Rodemeier, ETH Studio Basel, p.124-126



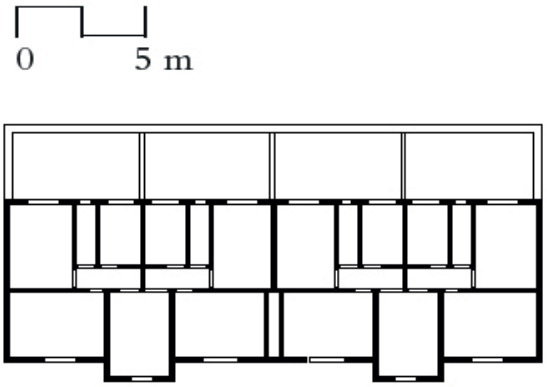
## Public Housing

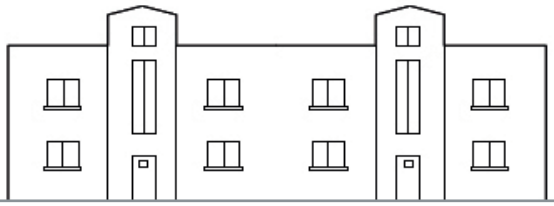


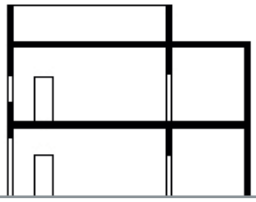





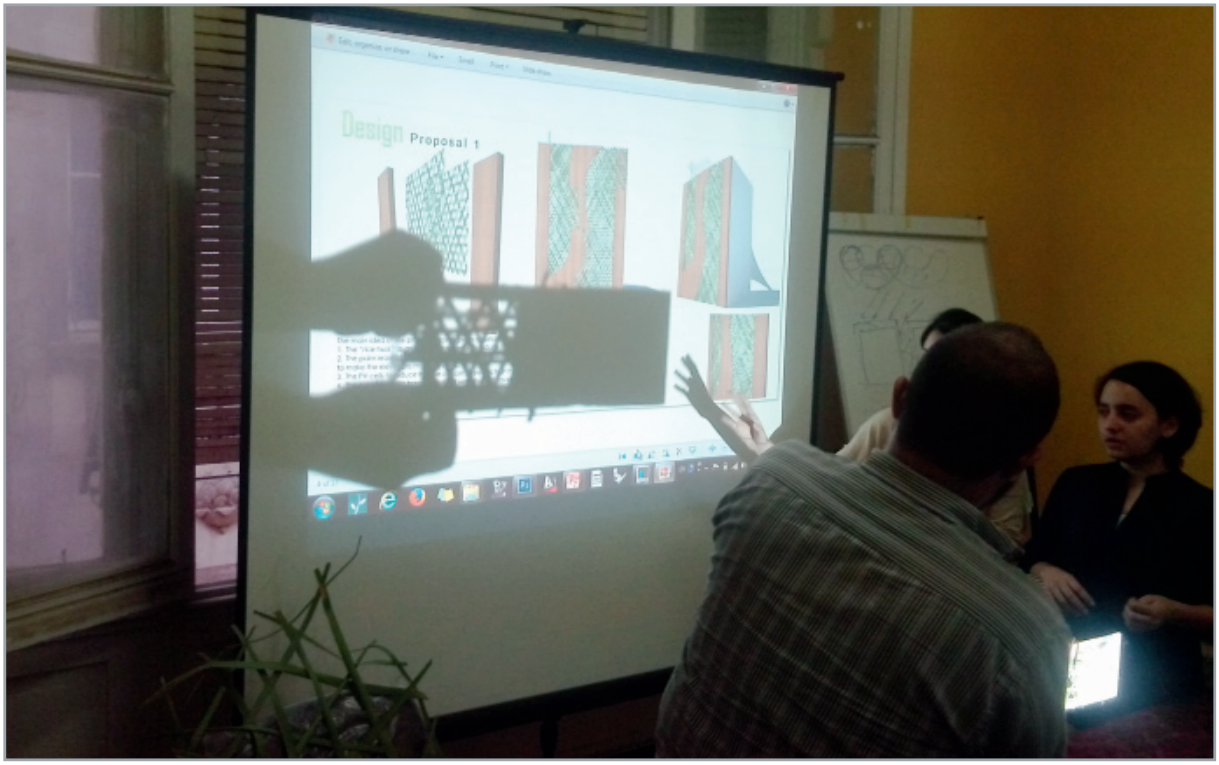
## "Workers City"



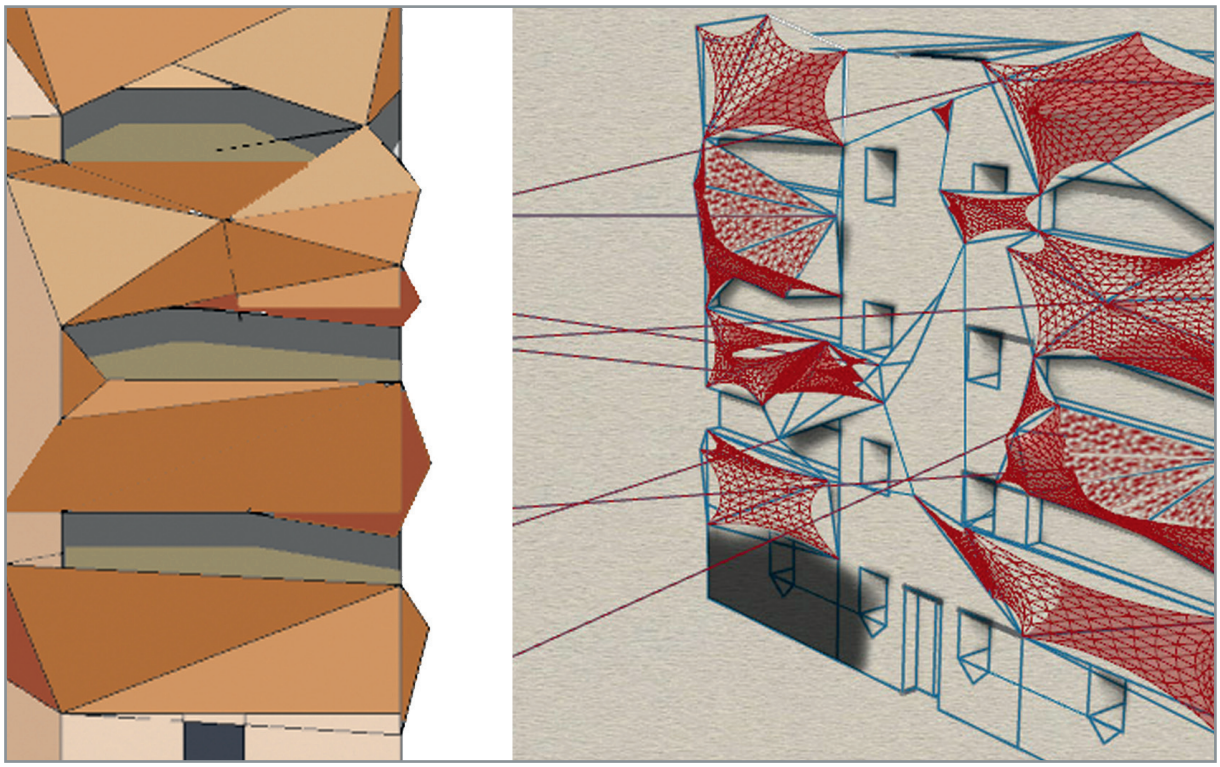


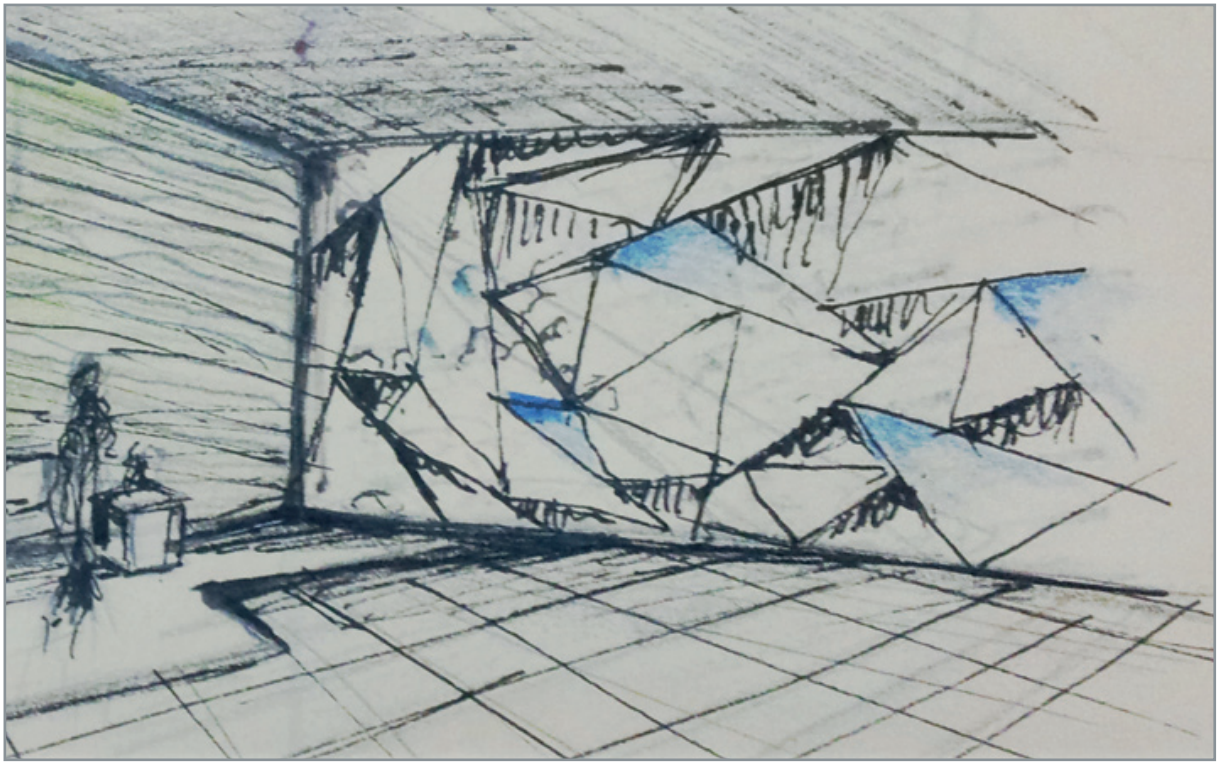
## 5. Outcome - Presentations

## 5. Group 01: Public Housing in IMBABA - Exterior & Interior Design Innovation

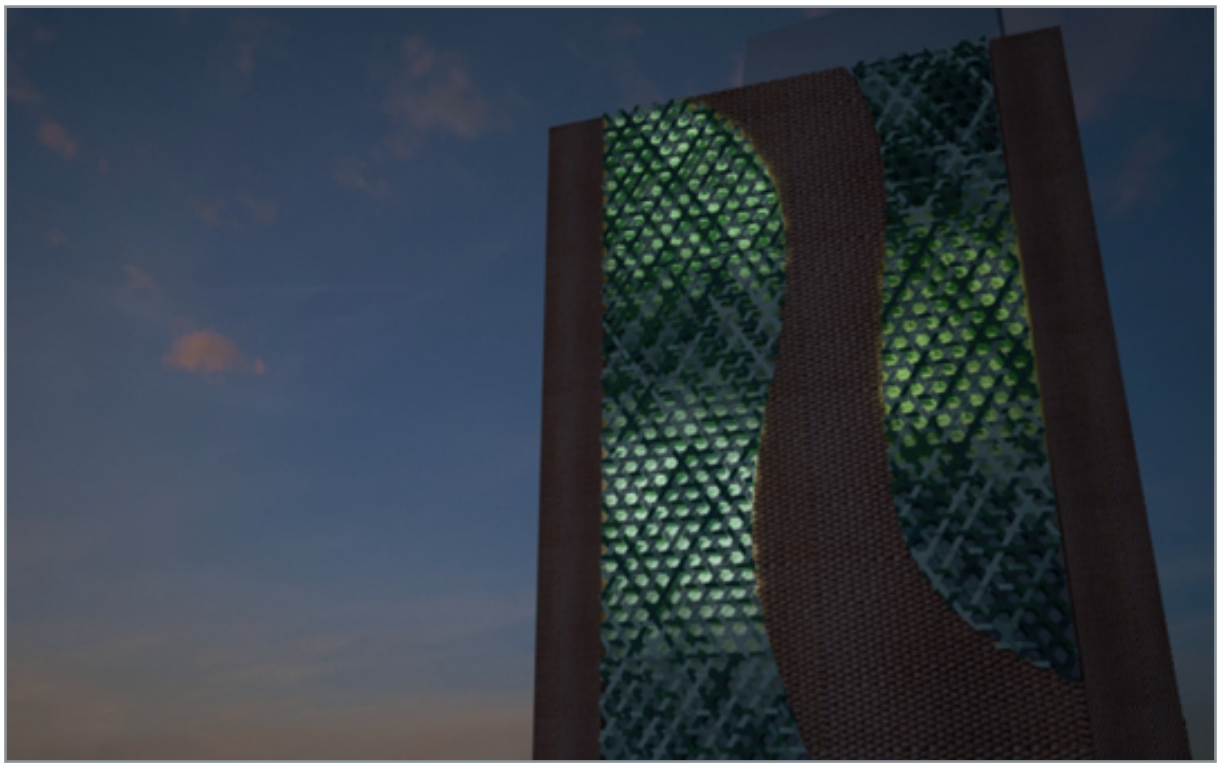
Participants: Sheeren Taha, Randa Al-Hakim, Lamia Sherif, Andrew Samaan





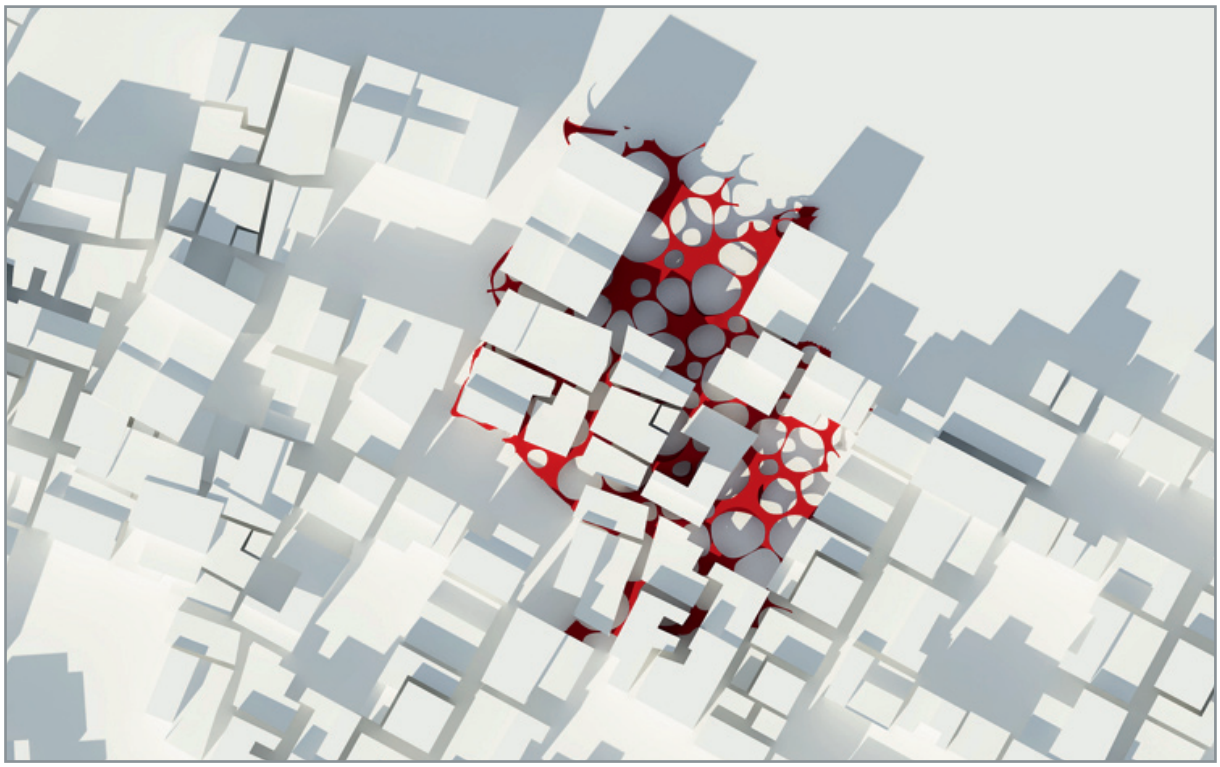
## 5. Group 02: Shading with natural grid

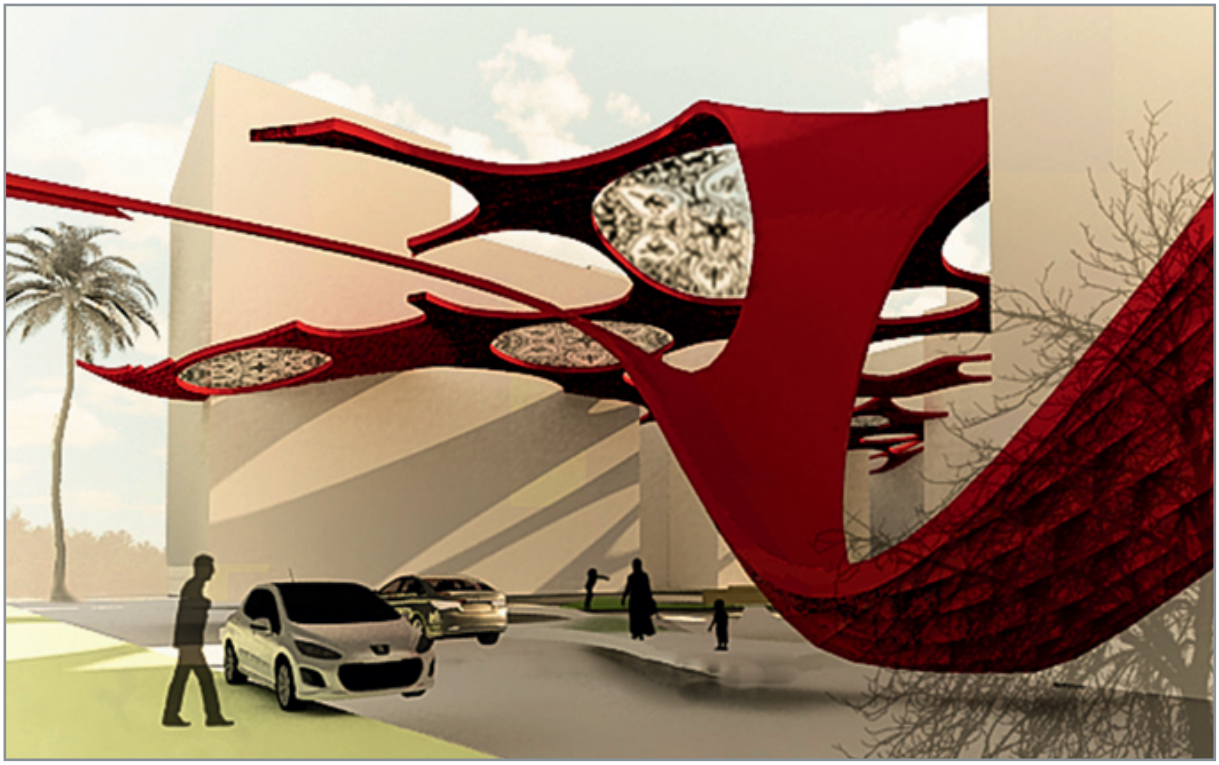
Participants: Hadeel Mahfouz, Karim Ghaleb, Muhammed El-Ballah, Omnia Magdy



## 5. Group 03: Visual Statement - We are here, we do exist

Participants: Abd ElRhahman ElQady, Ahmed A. Aziz, Karim El-Faramawy, Yahya Shaker

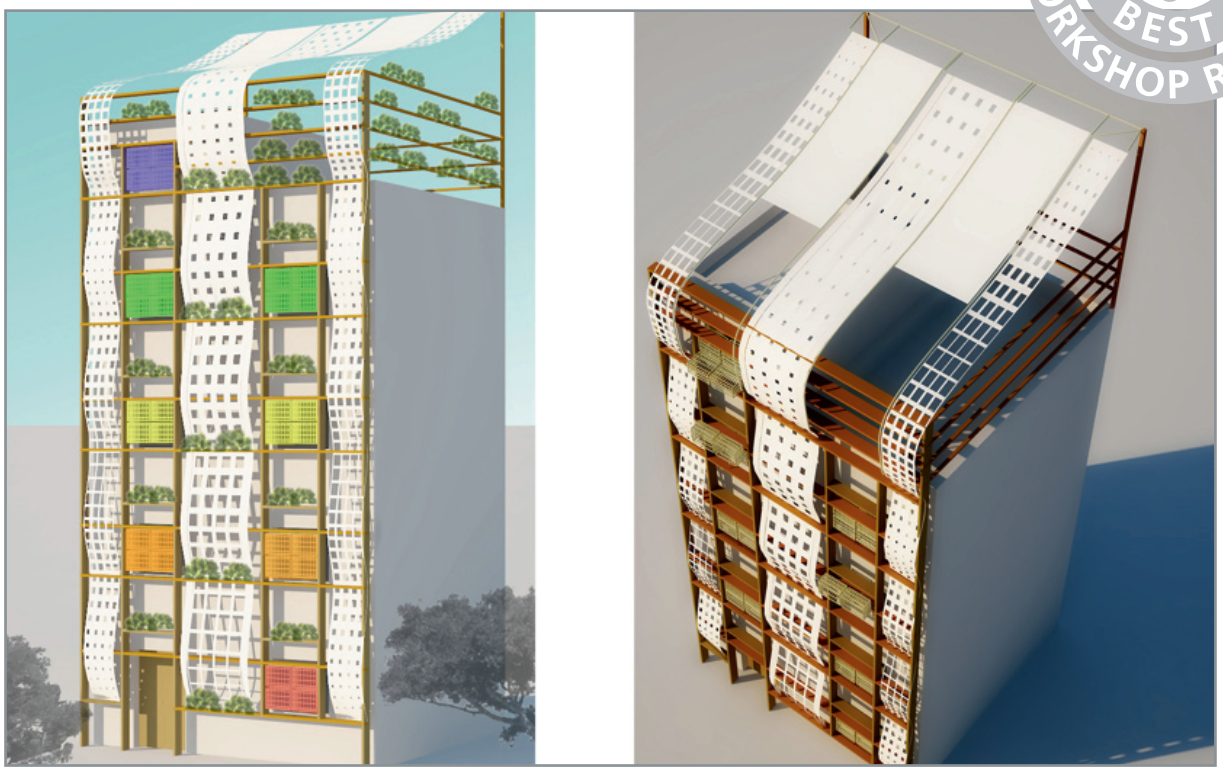


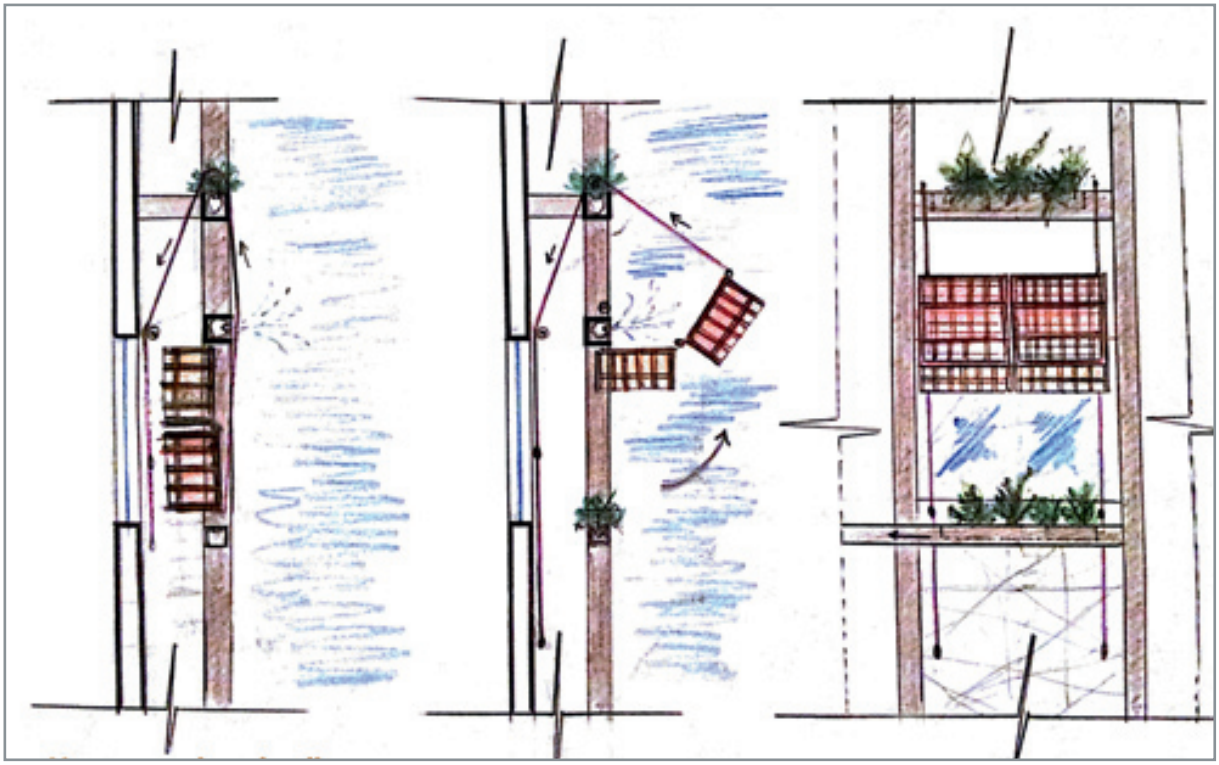


## 5. Group 04: Sustainable Housing

Participants: AbdAllah Saqr, Aya ElGandoor, Doaa ElShishtawy, Salma Alaa

SPECIAL MENTION BEST WORKSHOP RESULT





## 6. Reading Recommendations


• Chris v. Uffelen: Fine Fabric, Delicate Materials f. Architecture & Interior Design, Braun Publishing AG, 2009

• Silvie Krüger: Textile Architecture, jovis Publishing GmbH, 2009

• Knippers, J. e.a.: Construction Manual for Polymers and Membranes. Materials, semi-finished products, formfinding, design. Basel and Munich 2011.

• Seidel, M. : Tensile Surface Structures. A Practical Guide to Cable and Membrane Construction: Materials, Design, Assembly and Erection. Berlin 2009.

• Motro, R.: Flexible composite materials in architecture, construction and interiors. Berlin 2012.

• Bechthold, M.: Innovative Surface Structures: Technologies and Applications. New York 2008.

• Schock, H.-J.: Soft Shells: Design and Technology of Tensile Architecture. Berlin 1997.

• Drew, P.: New tent architecture. London 2008.

• Christian Gänshirt: Tools for Ideas, Birkhäuser, 2007

• Gramazio & Kohler: Digital Materiality in Architecture, Müller Publishers, 2012

• Christopher Alexander: Nature of Order I-II (from I-IV) and Pattern language, Oxford University Press Call No: NA2760 .A445 2002, NA2500 .A448 2002

• Matthew Frederick: 101 Things I learned in architecture school, MIT Press, Call No: NA2000.F74 2007

• Kostas Terzidis, Algorithmic architecture, Call No: NA2728.T47 2006

• Cecil Balmond : Informal, Call No: NA2750.B323 2007

• Michael Hensel, Achim Menges: Emergent Technologies and Design, Call No: NA2543.T43H46 2010

• Patrick Schumacher: Parametricism as Style - Parametricist Manifesto, www.patrikschumacher.com

• http://textile-blog.com/

• http://www.ifai.com/

• http://www.technicaltextile.net/

• http://www.architonic.com/

• Scales of Performance: fibres, yarns and textiles: http://www.digitalcrafting.dk/?p=1859

• Bending Active Membrane Structures: http://www.digitalcrafting.dk/?p=1897

• The Computational Perspective: http://www.digitalcrafting.dk/?p=1876

## 7. Team & Partners

**SEPIA - Institute for Textile Arts**
Neuwerk 11
D- 06108 Halle/ Saale
Germany

SEPIA – The Institute for Textile Art – is dedicated to the research, preservation and advancement of textile art and it transdisciplinary applications. In its quest to promote a new form of utilitarian art, the Institute has adopted a three-way approach – this includes the design and creation of textile works of art, the execution of highly complex architectureoriented projects and providing artistic intervention during the development of materials and products in close conjunction with the industry and relevant research centres.

Director: Prof. Ulrich Reimkasten
Executive Board Member: Tiemo Ehmke

**Lecturer/Instructor:**
Anna Maria Gawronski, Textile Artist, Berlin
Prof. Dr. Christian Bauriedel, University of Applied Sciences, Augsburg
Prof. Dr. Joachim Müller, University of Applied Sciences, Augsburg
Marwan Aboulsoud, Eng., American University, Cairo
Sherif Tarabishy, Eng., Amercian University, Cairo

**Coordinator:**
Tiemo Ehmke, SEPIA-Institut for Textile Arts, Halle
info@sepia-institut.eu

**Jury:**
Dr. Cornelia Redeker, Assoc. Prof., German University Cairo
Anna Maria Gawronski, Textile Artist, Berlin
Prof. Dr. Christian Bauriedel, University of Applied Sciences Augsburg
Mostafa A. Gabr, Eng., American University Cairo

**Partners:**
EEP - Green Jobs Initiative / GIZ Egypt
EECA - Egyptian Earth Construction Association
icecairo / icebauhaus

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AbdelHamid Salah Sayed (EECA)