Design Computation

#1
Structural Weaving

Dates: 25-27 June

Location: Universidade de Lisboa, Portugal

Organizers: Mine Özkar (Full Prof., PhD), Istanbul Technical University
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Duration: 2,5 days
number of contact hours: 21 ECTS credits: 1,5

Maximum number of participants: 16
Minimum number of participants: 9

Summary:

Any haptic procedure such as bending, stretching, twisting a physical object does not only require technical know-how but also sensory engagement and personal connection with the material. The sensory and personal aspects often remain incommunicable and tacit in traditional craft practices, such as basket weaving.

In basket weaving, the exact final form is rarely definable in advance. Rather than being *imposed on the material*, the form comes into existence during weaving, a process that involves bending and twisting of thin linear strips of flexible material. The strips perform as a physical system in shaping the final woven form.

Although the final forms cannot be fully *designed* in advance, the formal relations of the physical system that anticipate these forms can be defined. In the workshop, we will first formalize basket weaving by developing a basket weaving grammar that uses *abstract shapes* and *material shapes* in tandem. The aim is to cover as much of its full sensory breadth as possible. The grammar will be used 1) to discover the underlying rules and relations in existing woven artifacts, and 2) to generate new ones. In the second stage, we will translate the basket weaving grammar into a parametric weaving algorithm in Rhinoceros 3D and Grasshopper. The aim of the second stage is to explore the use of the grammar in the design and fabrication of self-standing gridshell structures.

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Objectives:

- To understand how material manipulation for design can relate and translate to shape computing,
- To decipher the causal links between the interventions on the material and shape making so that both can be integrally represented for computing,
- To engage in a materially informed process with shape rules and to understand that these rules can be applied creatively to explore the physical character of the material,
- To translate the shape formalism into a digital parametric model and explore fabrication strategies.

Schedule:

June 25 (whole day) - *MAKE - COMPUTE - MAKE*:

- Introduction to the basket weaving grammar, and computation with *abstract* and *material shapes*
- Hands-on exploration of basket weaving rules
- Analysis of existing artifacts: identifying patterns, defining rule sets, designating physical parameters
- Generation of new artifacts: defining rule sets, designating physical parameters, representing computation
- Discussion

June 26 (whole day) - *DESIGN - COMPUTE - DESIGN*:

- Introduction to parametric weaving algorithm in Rhinoceros 3D and Grasshopper
- Exploration of the parametric weaving algorithm
- Digital reproduction of existing artifacts: exploring form, defining rule sets, designating digital parameters
- Generation of new designs for gridshell structures: exploring form, defining rule sets, designating digital parameters
- Exploration of digital fabrication strategies
- Discussion

June 27 (half day) - *REMAKE*:

- Working on improvements and alternatives
- Digital fabrication of strip units
- Fabrication of gridshells
- Revising the rule sets, if necessary
- Discussion and Final Wrap-up

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Prerequisites:

Basic knowledge on Rhinoceros 3D and Grasshopper.

Requirements:

Projector, computers with pre-installed software or USB sticks with virtual machine installations. Drawing/sketching instruments, cutting instruments, digital fabrication tools (laser-cutter, CNC milling machine) visual documentation devices, safety items (goggles, gloves, etc.)