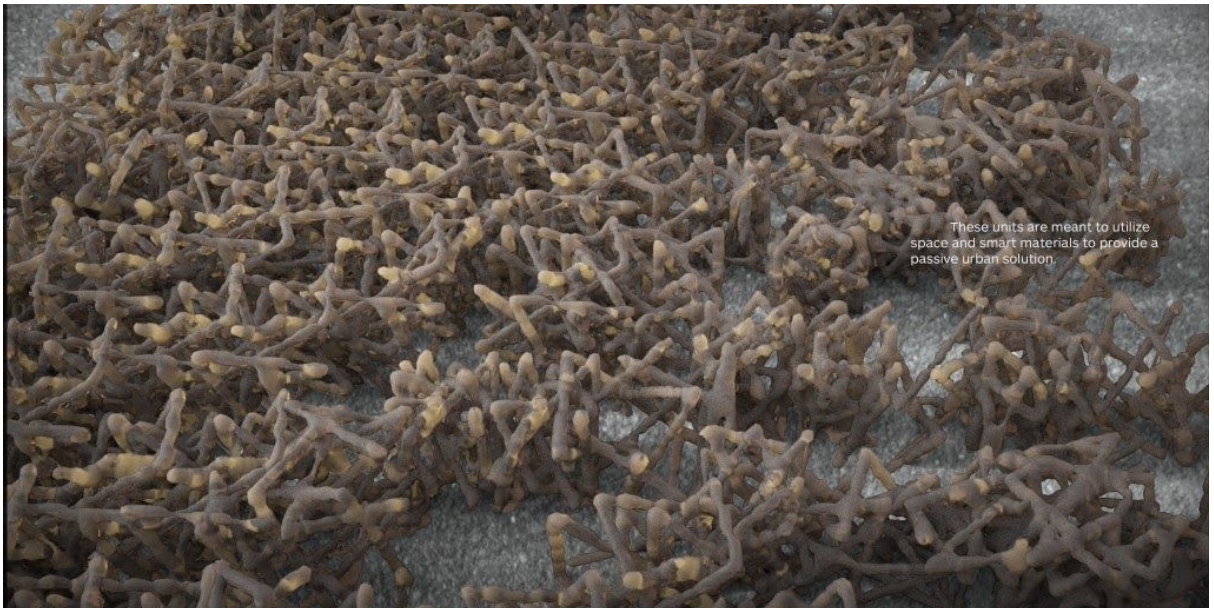
COMPUTATIONAL DESIGN I

Design Associativity

MAA01 program 2020/21



Computational design - Assig05 - Porifera, Urban Sponges - Mohamad Alchawa

Syllabus

In computer science, algorithms are habitually defined as fixed and often finite procedures of step-by-step instructions understood to produce something other than themselves. Structures of logics interfacing with Data, sourced from any computable phenomena.

In this course we'll focus on emergent design strategies based on algorithmic design logics. From the physical spaces of our built environment to the networked spaces of digital culture, algorithmic and computational strategies are reshaping not only design strategies but the entire perception of Architecture and its boundaries.

Main tool of the course will be McNeel's Rhinoceros v6 and Grasshopper3d. The adoption of Rhino as the main 3D tool is due to its ability to interface with many different file formats. In many ways Rhino will act as the bridge between many applications, 3D and 2D alike. As a complementary tool for Rhino we'll focus on the associative design platform of Grasshopper3d, a graphical algorithm

editor tightly integrated with Rhino's 3D modeling tools. Unlike RhinoScript, Grasshopper requires no knowledge of programming or scripting, but still allows designers to build form generators.

During the course we will adopt various plugins implementing Grasshopper's features and capabilities, in order to achieve full control of complex design strategies.

Learning Objectives

At course completion students will:

- Learn node based programming (visual scripting);
- Understand fundamental concepts of computational design;
- Learn how to create strategies to build algorithms;
- Have knowledge of basic concepts of generative design;
- Be capable of generating parameterized processes;
- Apply data driven design logics;
- Learn how to create dynamic modelling.

Hardware / Software requirements

Rhinoceros 6.0. The 90-day trial version can be downloaded from the website www.rhino3d.com/eval.html
Other software to be specified by session

Because Grasshopper 3D works best for the Windows operating system, we recommend students to have an installation of Windows (preferable Windows 10 x64). If you have an Apple computer, it is recommended that you install Windows on Boot Camp which will perform better than Parallels or VMWare. It is recommended that you max out the RAM potential on your computer.

Basic schedule: activities and faculty

TERM 01

Unit 01: Grasshopper fundamentals

1. *Wednesday, 7th of October (3 hours session)*
    a. Intro to Grasshopper
    b. Parameters and associativity
2. *Friday, 9th of October (3 hours session)*
    a. Lists
    b. Data matching
    c. Data management
3. *Wednesday, 14th of October (3 hours session)*
    a. Data trees management
    b. Data search and filtering
4. *Friday, 16th of October (3 hours session)*
    a. Conditional statements
    b. Attractor points

Unit 02: Logical Representations

5. *Tuesday, 10th of November (3 hours session)*
    a. Introduction to mesh topologies
    b. Data Visualization
6. *Tuesday, 17th of November (3 hours session)*
    a. Introduction to Animations
    b. Creating scenes
7. *Tuesday, 24th of November (3 hours session)*
    a. Camera control
    b. Custom animations
8. *Tuesday, 1st of December (final presentations)*

Assignments

- Assignment 01: Parametric facade (Monday, 19th of October, 10:00am)
- Assignment 02: Animated systems (Tuesday, 1st of December, 10:00am)

Deliverables

- Each assignment will have specific tasks relevant to its content.
- All assignments will include a PDF presentation (google presentation) and video.
- All assignments will have a blog post submission (IaaC blog post).
- All assignments will be uploaded to a specific Google Drive folder (specified on each assignment brief).

Students are requested to submit all the material on the IAAC Gdrive and a Blog post need to be curated on iaacblog.net for each project (see "IAAC | Publication Guidelines" https://drive.google.com/open?id=0B6cIj8JAKs2rVTNYNEg2c093M2s).

Grading System

• 0 - 4.9 Fail (submission of a supplementary work by January)
• 5.0 - 6.9 Pass
• 7.0 - 8.9 Good
• 9.0 - 10 Excellent/Distinction.

Evaluation, Assessment, and Final Grade

- 0 - 4.9 Fail
- 5.0 -6.9 Pass
- 7.0 - 8.9 Good
- 9.0 - 10 Excellent/Distinction.

On this basis, students will be evaluated on several aspects such as:

- 1 pt for submitting a complete assignment
- 1 pt for submitting on time
- 0 to 1 pt for presentation and graphical representation
- 2 to 7 pts for meeting assignment criteria, quality

Students who submit after the deadlines defined by the faculty and coordination will be subject to penalty and the grade will be automatically lowered by 0.3 point for every day of delay.
Incomplete submission is considered as missing submission.

References / Bibliography

IaaC Library

- The metapolis dictionary of advanced architecture. Manuel Gausa, Vicente Guallart, Willy Müller, Federico Soriano, Fernando Porras, José Morales. #1247a.
- Fractal Architecture, Harris. #1365.
- Geologics, Vicente Guallart. #1409.
- Architecture follows nature, biomimetic principles for innovative design. Mazzoleni. #1102.
- LAVA – Laboratory for visionary architecture, tomorrow never dies. #1087.
- The third industrial revolution. Jeremy Rifkin. #1086.
- Fabricating the future. Philip. F. Yuan & Neil Leach. # 1334.
- Shell structures for architecture: Form finding and optimization. Sigrid Adriaenssens, Philippe Block, Diederik Veenendaal, Chris Williams. #1350.

Online articles and papers

1. "Introduction to computational design", Danil Nagy.
2. "Learning from nature", Danil Nagy.
3. "The design space", Danil Nagy.
4. "Computational design in Grasshopper", Danil Nagy.
5. "Generative Design & Metric space analysis", Srihari Pramod.
6. "Nervi: The Master of Parametric Design and Construction", Zoë Henderson
7. "3D Printing And Antoni Gaudí", Jeff Blaylock.
8. "Why optimization is not generative design", Sivam Krish.
9. "Parametrics and Parametricism", Danielle Fountain & Alexander Mills.
10. "The Secret Life Of Parameters", Mathieu Huard.
11. "Creating the Chrysalis: Design", Frank Hecker.
12. "Parametricism as Style - Parametricist Manifesto", Patrik Schumacher, London 2008.
13. "What's wrong with parametricism", Richard Coyne.
14. "Swarm Intelligence in Architectural Design", Yuxing Chen.
15. "Swarm Urbanism", John Wiley & Sons Ltd.
16. "Design modeling terminology", David Stasiuk.
17. http://papers.cumincad.org/

Faculty



Rodrigo Aguirre is a Nicaraguan architect specialized in the fields of Algorithmic design, parametric tooling, digital fabrication and manufacturing. He obtained his bachelor in architecture at UAM (American University) in Managua, Nicaragua and completed the two year master in advanced architecture at the Institute for Advanced Architecture of Catalonia (IaaC) in Barcelona, Spain. He is a principal member of the computational faculty, and has acted as studio instructor for the masters program since 2014. His ongoing collaboration with the Institute´s REsearch + DEvelopment department and IAAC special projects has involved advanced form-finding and computational methods related to generative design. His labor as a 'Tallerista' has led to his involvement with workshops related to the translation of computational protocols to fabrication of physical prototypes.

Links:
https://www.linkedin.com/in/rodrigo-aguirre-38214740/?locale=en_US

Faculty Assistant



Ashkan Foroughi is an architect and researcher, interested in multidisciplinary and multi scalar approaches in architecture. He holds a bachelor of architecture, followed by a master of advanced interaction at (IAAC-2018) and a postgraduate degree in 3D printing architecture (IAAC-2019), where he specializes in robotic additive manufacturing and computational design. Since then he has been involved as a computational designer and roboticist at IAAC, collaborating in an array of seminars, workshops and projects.