Int 13
Computational Ornamentation
Taught by Soomeen Hahm
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Introduction

"Architecture has, with some difficulty, liberated itself from ornament, but it has not liberated itself from the fear of ornament." Sir John Summerson, 1941

Ornamentation in architecture has long been debated on the basis of its suitability, its ability to be measured or controlled or on the distinction between functional and non-functional ornamentation. Intermediate 13 aims to challenge these traditional notions of ornament by looking at the way its shape, geometry and spatial qualities are driven by structural principles and architectural use – i.e., ornament which is inhabitable, functional and rich in information, or in other words, intelligent.

In examining these ideas, the underlying conceptual methodology will be one informed by computational design thinking, in particular shifts in contemporary design paradigms towards non-standardised architectural production, the avoidance of serial repetition and for mass customisation. In particular, by looking at the evolution and constant development of digital fabrication processes – such as 3D printing and robotic fabrication – which enables us to work at a pace and resolution unimaginable just a few years ago. However, the manner in which these techniques have traditionally been utilised does not address the fixity of architectural space, the linearity of the building process and the complexity of fabrication procedure. With this in mind, Intermediate 13 will research into systematic, yet delicate and complex fabrication methods which can not be simply produced by the generic robotic process but intelligent in its fabrication principle through the integration of material behaviour and the thought-through human-machine relationship. Ideally, the proposed prototypes should be able to continuously automate and reproduce into different architectural or non-architectural elements.

Through a series of 1:1-scale prototypes, the unit will investigate a number of design and fabrication techniques, driven by material behavior as well as by specific crafting techniques, both digital and analog. We will be constantly investigating the role of human, role of material and the role of computational power in design and fabrication process. Through a focus on geometry and materiality, we will constantly look to pursue unique spatial formations, where both interior and exterior experiences are informed by the specificity of applied processes. This will be achieved by using a number of computational and algorithmic design techniques, each corresponding to a unique material system. It is hoped that the resulting digital simulations will operate in constant feedback with the development of parallel material systems – an integrated model allowing computational techniques to be a fundamental part of the design process, rather than merely a representation tool.
THEME
Generative Design Strategy

Similar to nature’s evolutionary process, we believe that the form is a mere result of a series of processes. Enabled by the increasing exposure to object oriented programming, designers can now control the shapes and form through controlling the series of rule sets of their bottom up logic. Unit 13 will be developing series of small to large projects through the use of generative computational design strategy, heavily relies on computational and algorithmic design techniques. For this, apart from learning the basic CAD and 3D modeling software, students will be taught and expected to gain basic to advanced coding skills. During the year, we will be using multiple platforms for computational design – with focus on scripting in Processing/Java, as well as 3D modeling techniques in Maya, ZBrush and Rhino/Grasshopper. The goal is to introduce students to techniques and methodologies of algorithmic design and procedural modeling.

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The manner which current digital fabrication techniques have been utilized does not incorporate complexity of the crafting process. In this unit, we will be investigating how digital fabrication, latest machines, and material technology can be inspired by material behavior and traditional crafting methods in order to achieve complexity out of simplicity.

Images on the right show our last year student projects as selective examples of materials and crafting techniques we have been dealing with. The "material" ranges from digital material to physical material. The "method/technique" includes a hybridized mixture of digital fabrication and hand crafting methods. The main idea is to experimenting on certain provocative ways of human-data, the human-machine collaboration which requires creative thinking and deep understanding of ongoing research in computational design field and digital fabrication industry. This process also requires creative ways of considering the role of human, role of material and the role of computational power in design and fabrication process.

**Crafting**

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ORNAMENTATION THEME III

Ornamentation in architecture has long been debated on the basis of its suitability, its ability to be measured or controlled, functional or non-functional. Intermediate 13 aims to challenge these traditional notions of ornament by looking at the way its shape, geometry and spatial qualities are driven by structural principles and architectural use – ie, ornament which is inhabitable, functional and rich in information, or in other words, intelligent.

In our unit, we are interested in the geometry/form/structure which is based on structural principle as well as providing other needs - such as atmospheric or aesthetic - which is hardly measurable. We will be investigating on the discussion regarding the discrepancies and harmony of the notion of “functional” vs “non-functional”, looking at the combination of highly functional elements and ornamental elements and try to seek for the meanings and measurable values of ornamentation.

ZHA Code 3D Printed Chair

Zaha Hadid Architects Culture and Art Center of Qingdao City

Zaha Hadid Architects Sleuk Rith Institute, Cambodia

Joris Laarman Bone Chair

Img: examples of harmonious existence of ornamentation in traditional vault structures

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CONTEXTUAL THEME
TEMPORAL STRUCTURE  THEME IV

Temporal vs Permanent

It is not surprising to know that a majority of our spatial experience we are gaining in an urban environment is through temporal structures. Such as signage, scaffold, pavilion, temporal installation, pop-up store, markets... they are all playing a very important role within a city responding to the needs of flexibility in an urban environment.

Apart from meeting programmatic requirements, a temporal structure often gives an opportunity of creative experimentations. Also by the nature of the temporariness, it is often light in building mass and low in impact to the environment which makes it sustainable. However, the ways in which this type of structures is currently constructed within our cities are often under designed, the provided spatial experiences are limited. This year, we will be focusing on the issue of the temporariness of physical structures which can provide flexibility in social programs as well creative architectural and urban spaces.
Together with the shifting notion of the basic structure of a corporate body and family based on the changing trend of how people live and work nowadays, there has been massive shift recently on the need for flexibility in working and living environment. Responding to these needs, co-working and co-living facilities such as wework, Hackspace, Fablab, Hyundai smart house, share house LT Josai etc. has been evolved.

In this unit, we are going to look into issues about co-working and co-living through a deeper understanding of the shifting trend in the fundamental concept of a corporate and a family structure. We will be looking at the issues of individuality vs community in working and living environment to see whether individuality can be expressed through mobility or temporariness of an actual space/actual physical structure.

For more over, we will be also looking into the relationship between living and working environment to understand the differences and similarities between the two and to see how to respond to the needs of flexibilities between the two types.
London

London is one of the most economically active international cities in the world where attracts a lot of young practices and individuals developing their career. It's a unique city where individuality and multiplicity of cultural dynamics are well accepted and received. London has also been an utmost incubator of young and creative businesses.

Today, under the unique historic situation with Brexit, with the massive shift in the notion of understanding of the structure of traditional economic and social structure, we will be questioning where London's economy and cultural structure is shifting towards and how it is going to affect the way people live and work, and how architects and urban planners should respond to this shift.
COURSE STRUCTURE
MODULES & SCHEDULE

//Design Tutorials

Project #1 Multi-functional Object
Weekly Design Tutorials
Weekly Design Assignments
Midterm and Final term crit

Project #2 Spacial Proposal
Weekly Design Tutorials
Weekly Design Assignments
Midterm and Final term crit

Project #3 Urban Proposal
Weekly Design Tutorials
Weekly Design Assignments
Midterm and Final term crit

>> Outcome
Series of Design Projects

//Theoretical Tutorials

Module #1 Theory Class
Bi-weekly Reading and Writing Assignment
Bi-weekly Seminar and Discussion
Writing Hackathon

Module #2 Film Evening
Bi-weekly Film Evening (lecture, tutorials, films)

>> Outcome
Series of short papers
Series of presentations and discussions

//Skill Tutorials

Module #1 Computational Tooling up
3D modeling, Scripting, VR & Interaction

Module #2 Scripting Workshop
Processing

Module #3 Digital Fabrication Workshop
3D printing, CAD to Robotic workshop

Module #4 Compatible Crafting Technique Workshop
Basic Crafting (Casting, Vacuum Forming etc)

>> Outcome
Series of physical & digital prototypes

Programmes

Digital Fabrication

Processing

Generating

Rhino + Grasshopper

Maya

KeyShot

ZBrush

Human Data Interaction

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EXPECTED OUTCOME

//Project Outcome

Project #1 Multi-functional Object
Transformable Element (no aggregate & combine)
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

Phase Changing Material
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

Generative Form
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

Digital Fabrication
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

>> Outcome
1:1 Physical model
Digital model illustrating transformation of the unit (e.g. Commercial to Residential)
Digital model illustrating aggregation and combination of units
Descriptive animation
Descriptive portfolio

Project #2 Spacial Proposal
Transformable Spatial Unit (before aggregation & combination)
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

Combinatoriics (Aggregation, Combination)
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

>> Outcome
1:1 physical model
Digital model illustrating transformation of the unit (e.g. Commercial to Residential)
Digital model illustrating aggregation and combination of units
Descriptive animation
Descriptive portfolio
Short paper (1500 ~ 2000 words)

Project #3 Urban Proposal
Synthesis
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

>> Outcome
1:1 partial physical model
1:1000 representative physical model
Set of architectural drawings
Digital model illustrating transformation of the unit (Commercial to Residential)
Digital model illustrating aggregation and combination of units
Descriptive animation
Descriptive portfolio

//Seminar Outcome

Reading & Writing
Computational Design History
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

Digital Fabrication & Performative Architecture
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

Urban Reading
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

>> Outcome
1500 ~ 2000 Short Paper For Project #1
1500 ~ 2000 Short Paper For Project #2
1500 ~ 2000 Short Paper For Project #3

//Skill Outcome

Part 1. 3D Modeling
AutoCAD Maya
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

Rhinoseros 3D
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

ZBrush
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

>> Outcome
1:1 partial physical model
1:1000 representative physical model
Set of architectural drawings
Digital model illustrating transformation of the unit (Commercial to Residential)
Digital model illustrating aggregation and combination of units
Descriptive animation
Descriptive portfolio

Part 2. Generative Scripting & Procedure Modeling
Processing (JavaScript)
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

Grasshopper + Python
The contemporary design paradigm has shifted towards non-standardised architectural production, avoiding serial repetition of parts and allowing for mass customisation. The ideal scenario suggests a file-to-factory digital.

>> Outcome
1:1 partial physical model
1:1000 representative physical model
Set of architectural drawings
Digital model illustrating transformation of the unit (Commercial to Residential)
Digital model illustrating aggregation and combination of units
Descriptive animation
Descriptive portfolio

Soomeen Hahm
Computational Ornamentation
FIELD TRIP

New York & Boston

The field trip destination is New York City and Boston. We will be visiting academic institutes including Harvard GSD, MIT & Columbia University and get exposed to cutting edge ongoing research projects. We will also visit ACADIA conference which will be hosted by MIT this year where a lot of researcher and architects gather and present their work.

As part of this academic visit, we will also visit New York City and explore the lively urbanized modern city to experience the conving social environment and shared urban spaces.

BIBLIOGRAPHY

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Ian L. McCaug, Design with nature
Christopher Alexander, The nature of Order (book 1 to 4)
Michio Kaku, The future of the mind, February 25 2014
Steve Johnson, Emergence, the connected live of ants, brains, cities and software, 2001

Theoretical Readings
Donella H. Meadow, Thinking in system
Joel de Rosnay, The macroscope toward a global vision
Antoine Picon, SmartCities : A spatialised intelligence
Tom Verebes, Masterplanning the adaptive city
Christopher Alexander, Notes on the synthesis of Form, 1974
Matthew Pook, Manuel Shvartzberg, The politics of parametricism : digital technologies in architecture

Technical Readings
Daniel Davis, Modelled on software engineering : flexible parametric models in the practice of architecture, PhD paper
Rick Smith, Technical notes from experiences and studies in using parametric and BIM architecture software, Virtual Build Technologies, 2007
Selected Final Jury Panels

List of students
Yulia Bykova
Alister Low
Agi Permatasari
Luke Drickey
Gordon Chan
Igor Gola
Karolina Lewkowicz
Pierre Vaubourg
Natasha Ng
Setin Arsal
Anna Aleshkina
Kyungjoo Min
PHOTO SNAPSHOTs INT13 2016-17

Public events

AA INT13 FINAL JURY
ARCHITECTURAL ASSOCIATION AAU
SCHOOL OF ARCHITECTURE
LECTURE HALL
31 BIRDMARKET LONDON
TUESDAY, 16TH MAY 2017, 11AM

JURY LIST
THEODORO SPYROPULOS
Director of AAU
GILLES PETIT
Director of Bartlett PL
GILIAN LEE
Dierctor of UCLAA
NILS FISCHER
Associate Director of Zaha Hadid Architects
IGOR PAVIC
Faculty of Architecture, University of Zagreb
JAKUB KLAsA
Associate of Zaha Hadid Architects

Time Schedule
1st session: 10:00 - 12:00
Lunch break: 12:00 - 15:00
2nd session: 15:00 - 17:30

AA Intermediate Unit 13

Img: From INT 13 2016-17 Final Jury & Project Review Exhibition
COMPUTATIONAL ORNAMENTATION

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