4.s56 Special Subject: Shape Grammars

SUPERSEDING PARTS, COMPUTING WHOLES
Re-thinking part-whole relationships for advancing computational design innovation

Spring 2020 | 3-0-9 or 3-0-6 units
Course meetings: Wednesdays, 6-9 PM, Room 1-134
Instructor: Onur Yüce Gün, PhD
Creative Manager of Computational Design, New Balance Athletics Inc.
TA: Alexandros Charidis

This class aims to employ computational design with a critical inquiry of conventional part-whole relationships: the goal is to discover new definitions for parts and arrive at out of the ordinary wholes. Parts exist only for purposes of figuring and describing and thus, don’t directly compose the whole.* Novelties in design and arts happen when established part-whole relationships are challenged: bladeless fan by Dyson, 3D-printed unibody midsoles by New Balance and Shape Grammars enterprise, all emerge through constant re-definition, re-configuration and even removal of parts.

Offering both technical and theoretical teachings, this class will empower students to develop experimental computational designs along with supporting hypotheses. While hypotheses will help define new parts, the designs will emerge as embodied wholes: as objects, drawings, systems, processes or interfaces. The class will advance with readings, discussions and skill-building sessions. Advanced 3D and volumetric modeling techniques will be taught.

LEARNING OBJECTIVES
- Developing computational design skills: How to master digital design work
- Critical thinking on and with computational design: How to be persuasive and relevant
- Advanced skills in 3D printing: How to be ahead of the curve in manufacturing
- Strategies for Design Innovation: How to become more innovative, how to be influential

Deliverables
3-0-6 A design and a written 1-page description.
3-0-9 A design/family of designs and a hypothesis in the form of a short paper.

Tools & Methods
Computational design and visualization: Rhino, GH, Volumetric modeling, Rendering, Shape studies
Digital manufacturing: SLS, SLA printing, DfAM
Excerpts from foundational readings
### Evaluation Criteria

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<thead>
<tr>
<th>Track</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>“Presence”</td>
<td>10%</td>
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<td>“Function”</td>
<td>15%</td>
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<td>“Quality”</td>
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<td>“The Whole” (+Final Assignment)</td>
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<td>Presence in Class</td>
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-OR-

You give 100% and get 100%

### Bibliography


### Academic Integrity + Honesty

MIT’s expectations and policies regarding academic integrity should be read carefully and adhered to diligently: http://integrity.mit.edu
Tentative Schedule

“PRESENCE”
[W01] 02.05
Class: Theme: Parts & Wholes, Function vs Presence
Course structure
Assign: Presence I, De-part & Reconfigure, 2D whole \(\rightarrow\) part \(\rightarrow\) whole

[W02] 02.12
Class: Visual Composition and Language
Lab: Shape studies
Assign: Presence II, Rules and Descriptions, Variations
Read: Scape

“FUNCTION”
[W03] 02.19
Review: Presence II
Class: Data-to-Design, Discretization & Unification
Lab: Subdivision, Pressure
Assign: Function I: De-part: Discretize, Part-Function analysis for working things

[W04] 02.26
Review: Part-Function analysis
Class: Generative & Volumetric Modeling
Lab: Forcefield, Aggregation (Agent-Based)
Assign: Function II: Re-configure parts or make a whole
Read: Wiggliness

[W05] 03.04
Review: Function II
Class: Volumetric modeling, Unification, DfAM, 3D print optimizations
Lab: Iso-surfaces: Math to Form
Assign: Function III: Revisions

“QUALITY”
[W06] 03.11
Review: Function III
Class: Revising and Iterating for Quality (Design Space): Dana Maringo
Quality – Practical and Theoretical understanding
Assign: Quality I: Design Space. How to assess?: Performance, quantitative, qualitative, significance

[W07] 03.18
Review: Student presentations on Quality, Design Space proposals (Skype Meeting)
Read:
Think: The Whole: Presence, Function & Quality

[W08] 03.25
Spring Break

“THE WHOLE”
[W09] 04.01
Class: Achieving quality in various disciplines: Diego Pinochet
CrashC: The whole and its hypothesis
Assign: The Whole: Presence, Function & Quality Proposal

[W10] 04.08
Class: The Whole Proposal Review
Lab: Visualization

[W11] 04.15
Class: Presentation: Sawako Kajima
The Whole: Project Review + Individual work + In class development
ASSIGNMENT I:

Pick a 2D image.
Find or define parts in it (de-part, decompose). Explain why those parts are... parts.
Make a 2D image by using the parts you have found/discovered/defined.
Describe why your 2D image makes up a whole.
Tell if your final whole has any visual lineage with the original image you picked.

Methods:
Any analog or digital method is allowed:
Cut, paste (physical or digital)
Collage
Any sort of photo editing
Bitmap processing
Machine Learning
Any technique you can imagine

Hint:
The significance is in the parts and the delivered whole, not in the technique for this assignment.