Explorations in Subtractive Fabrication

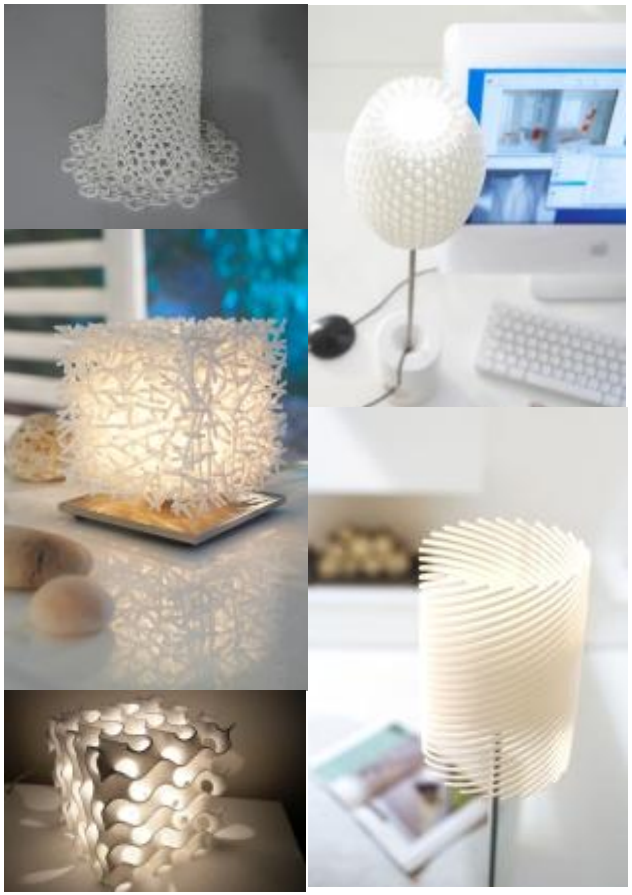
Capstone Project

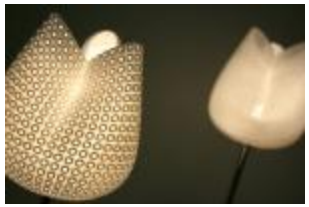
Inspiration

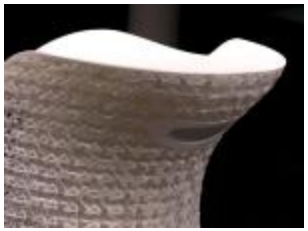
- Creating forms which are
  - illusive
  - not imaginable for viewer
  - not easy to understand how they have been fabricated

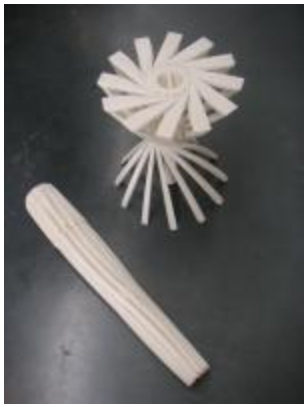
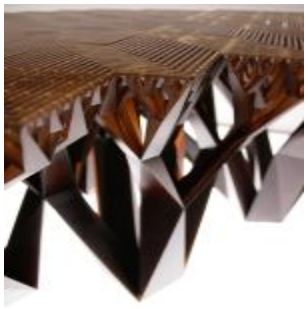
Materialise

- .MGX by Materialise works with innovative 3D printing techniques and some of the top designers, architects and artists from around the world to produce architectural models, art pieces and other custom projects, as well as a range of exceptional lighting objects, furniture, and accessories – all with a degree of detail, complexity and speed that cannot be offered by other production techniques.







Where is the problem?

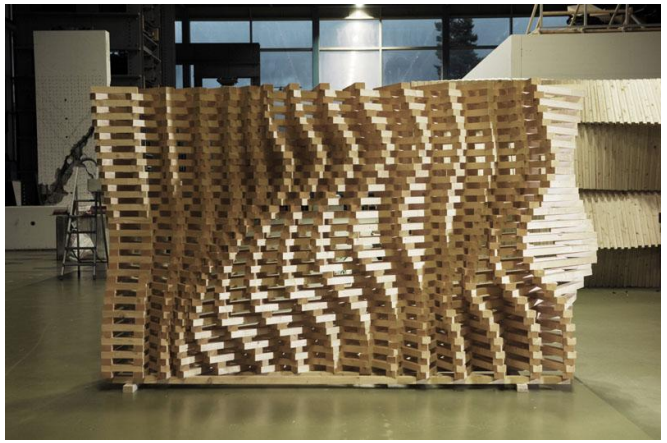
- Linear Design Process
  - Concept (Generative Algorithms)
  - Modeling
  - Fabrication (3D Printer)
- Additive & Subtractive Fabrication
  - Limitations
  - Time
  - Cost
  - Product (Materiality)

Solutions for Subtractive Fabrication

- Design Based on Fabrication Limitations
  - Assembled Form
  - Pre-Computed Form
  - Tool-Based Form
  - Layered Form (Negative Form)

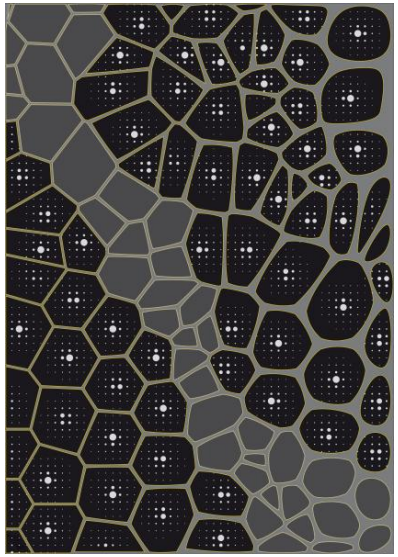
Assembled Form

- Creating forms by assembling prefabricated elements.
- It is very common in history of architecture.
- It limits the final form to designed elements capabilities.
- Fabricating final form is somehow additive.



Pre-Computed Form

- Creating forms based on a generative or an interactive algorithm then checking the possibility of fabricating it or adopting the code based on fabrication limitations such as geometrical limitations
- It is:
  - computationally expensive
  - unpromising



Tool-Based Form

- Creating form by simulating tool effects on base material
- In this case simulating movement of CNC router or milling robot based on a generative or an interactive algorithm

Layered Form (Negative Form)

- Creating layered molds then casting into the assembled molds
- It could be expensive and laboring yet very promising.

Tool-Based Form Approach

- Create a base form in GH
- Create a milling robot model in GH and Processing
- Connecting GH and Processing model
- Exploring forms created based on generative codes that controls Processing model

Layered Form Approach

- Create a generative form in GH or Processing
- Create numbered molds by slicing the form
- Analyzing molds for reusability

OR

- Exploring generative algorithms which create layered geometries
- Create molds based on those algorithms

Questions and Suggestions?