Topology Optimization: Assignments

Jun Wu

Design Engineering, TU Delft

j.wu-1@tudelft.nl

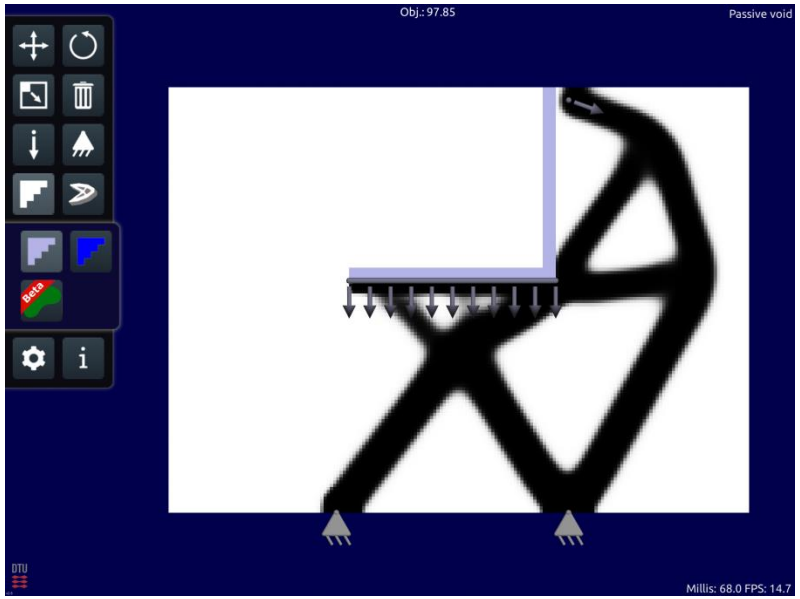
Purpose

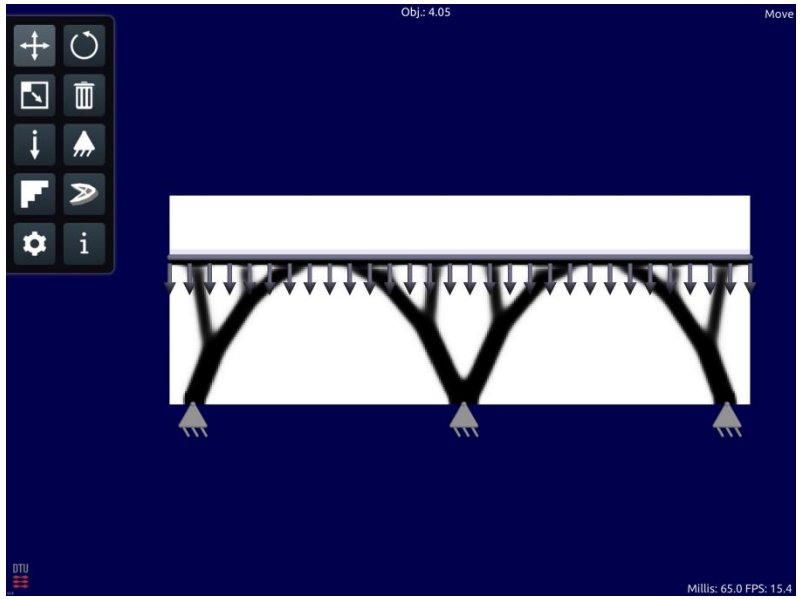
- To apply topology optimization in design practice

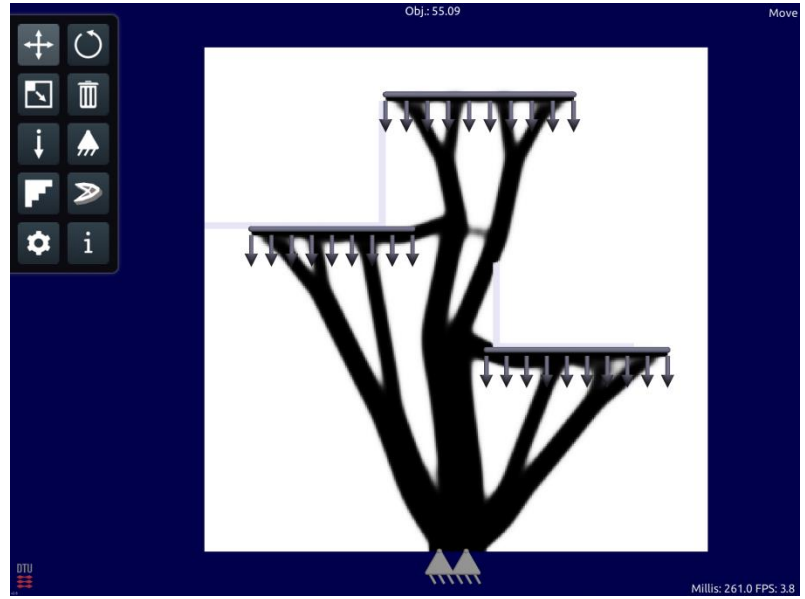
- Optimization: TopOpt App
- Post-processing: Modelling software (e.g., Rhino & Grasshopper)
- Fabrication: 3D printing, or laser cutting

Warmup: To optimize a 2D item

- Examples

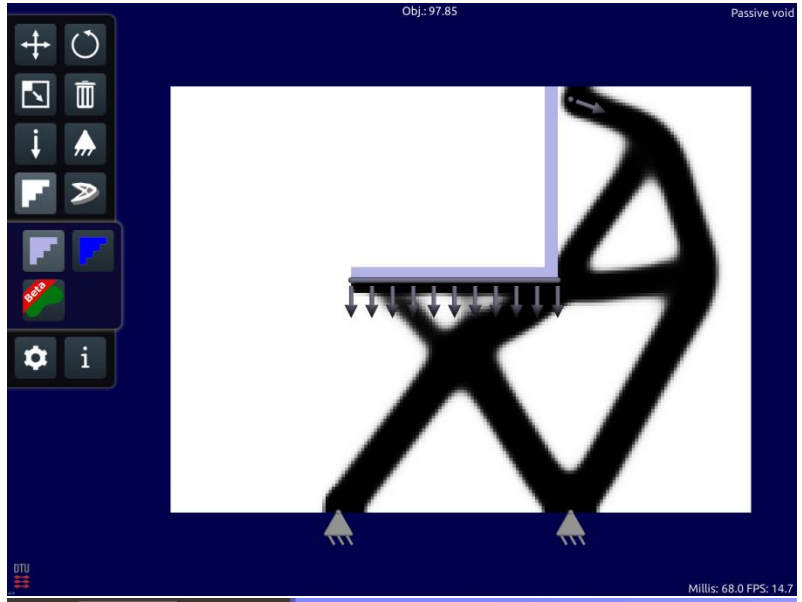


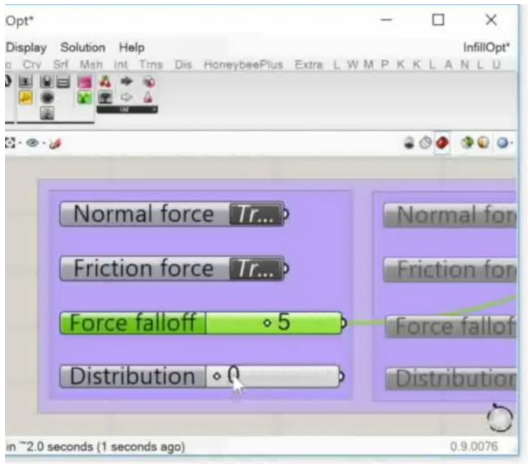


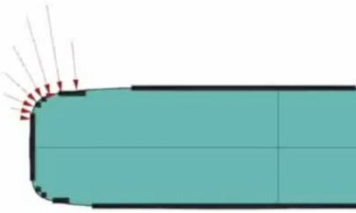


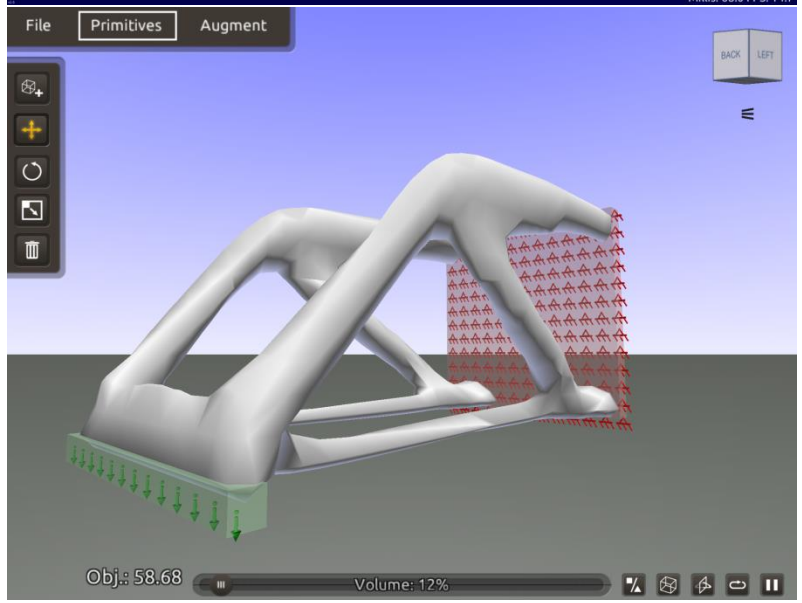
Assignment: To optimize and fabricate a 3D item

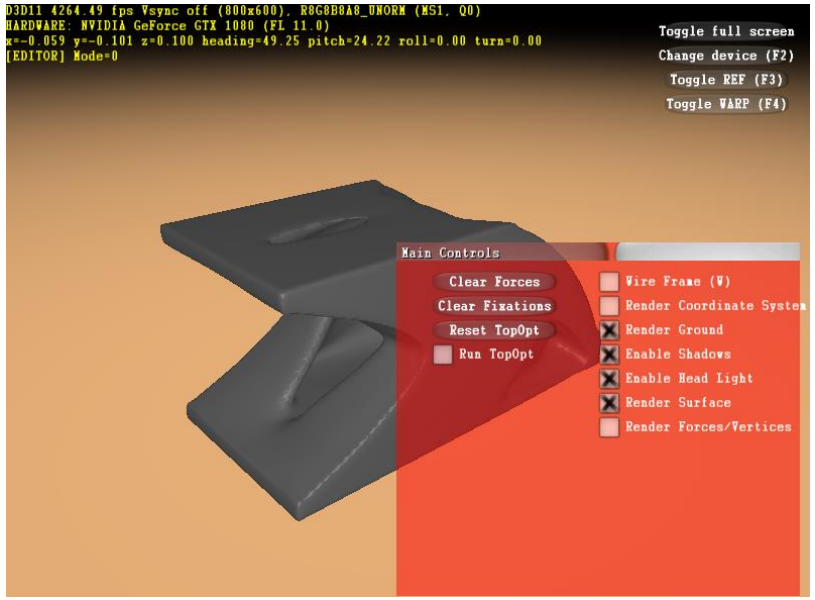
- Approaches
  - TopOpt 2D
  - TopOpt 3D
  - InfillOpt
  - GPU-TopOpt





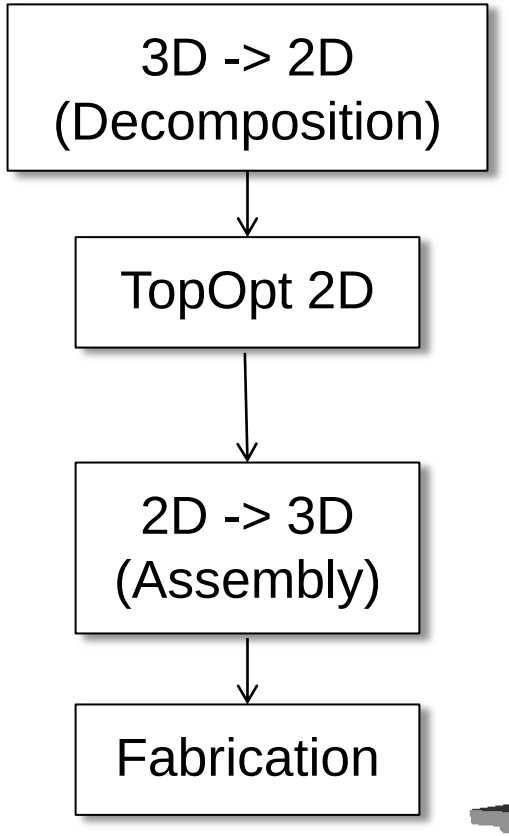


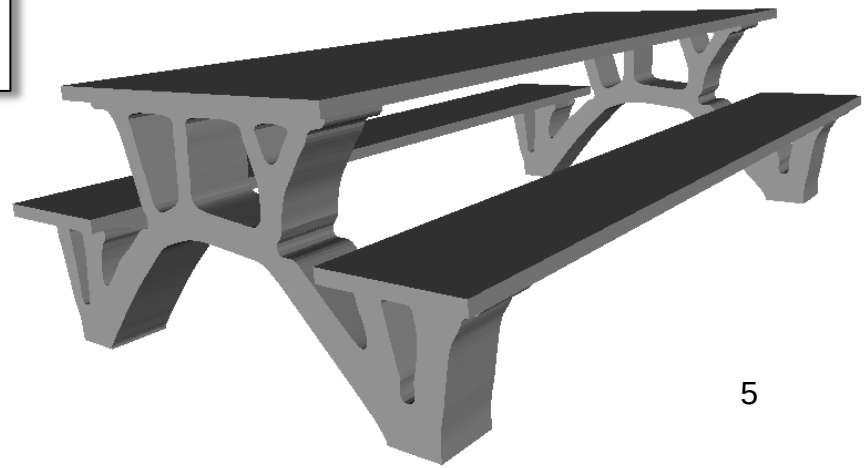




Approach 1: TopOpt 2D

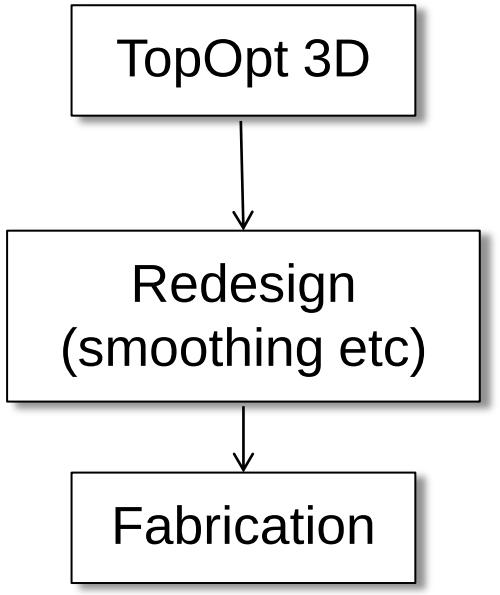
- Optimize 2D contours
- Assemble 3D models





Approach 2: TopOpt 3D

- Pros: 3D shape, no assembly
- Cons: Low resolution



- www.TopOpt.dtu.dk
- Applets and Software -> TopOpt 2D or TopOpt 3D

- For Windows machine, update the dll
- www.jun-wu.net/data/libacml_dll.dll

Approach 3: InfillOpt

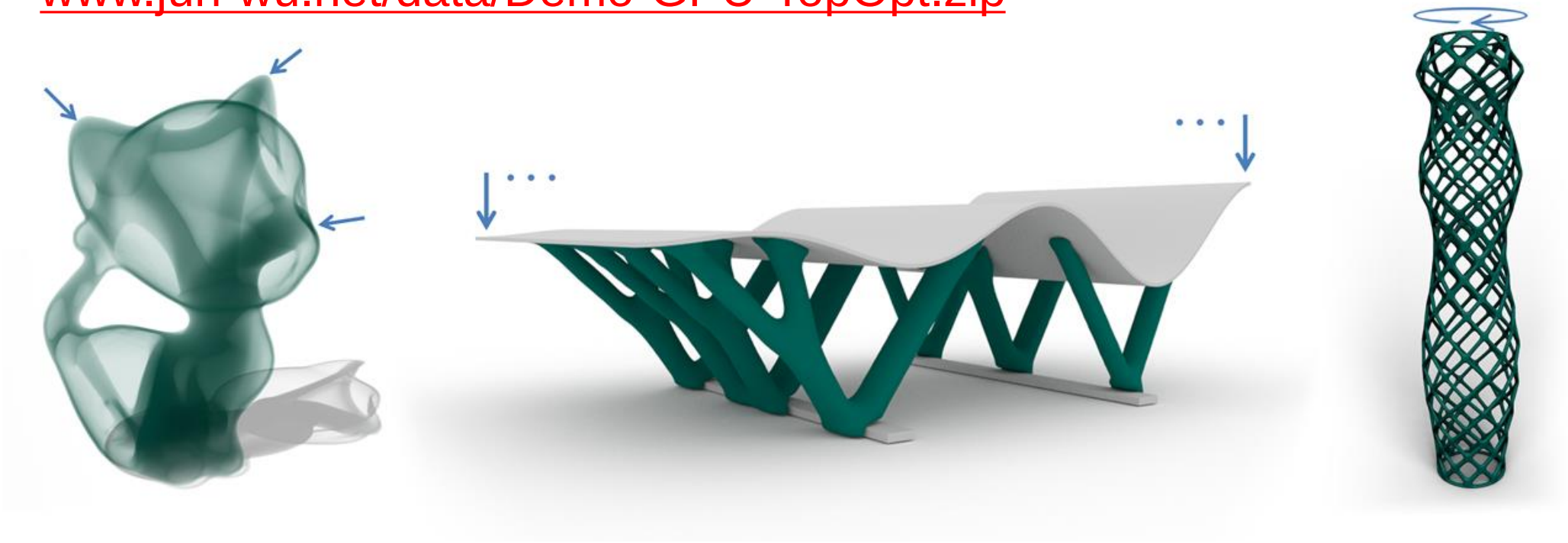
- Pros: Porous details, arbitrary design domain
- Cons: Installation
  - Requires Matlab, Grasshopper, WeaverBird

- www.jun-wu.net/data/InfillOpt.zip

Approach 4: GPU-TopOpt

- Pros: High-resolution 3D model
- Cons: Graphics card, Nvidia GTX 780

- www.jun-wu.net/data/Demo-GPU-TopOpt.zip



Deliverables and Timeline

1. PowerPoint slides
   - Your name and student id
   - (Multiple) Rendering of your 3D design
   - Explanation of functionality (mechanical loads and fixations)
2. Digital model (.stl or .obj)
3. Fabricated model
   - Don’t forget your name and id

- Tuesday (19 December 2017) 10 am
  - PowerPoint slides and digital model -> j.wu-1@tudelft.nl, by wetransfer
  - Physical model -> mailbox (Wu) on the 3rd floor, Depart. of Design Engineering

Questions?

Jun Wu

Design Engineering, TU Delft

j.wu-1@tudelft.nl

Slides can be downloaded at

- www.jun-wu.net/data/TopOpt_assignment2017.pdf