3D Printing Oriented Design: Geometry and Optimization

Siggraph Asia 2014 Course

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SIGGRAPH ASIA 2014 SHENZHEN

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Web: http://staff.ustc.edu.cn/~lgliu/Courses/SigAsia_2014_course_3Dprinting/index.html

Part 5: Future Problems

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- Collected from everyone
- Amazingly good (and hard) problems:
  - Efficiency
  - Structures and multi-materials
  - Modeling
  - Customization
  - Scale

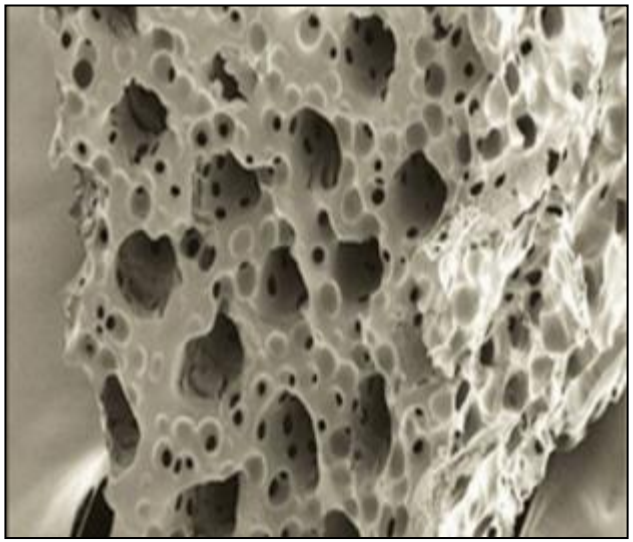
Efficiency

- Hierarchical representation for efficient 3D printing
- Adaptive Slicing
- Path planning
- Shape decomposition

- …
- Efficient non-linear simulation
- Fast Computation of FEM

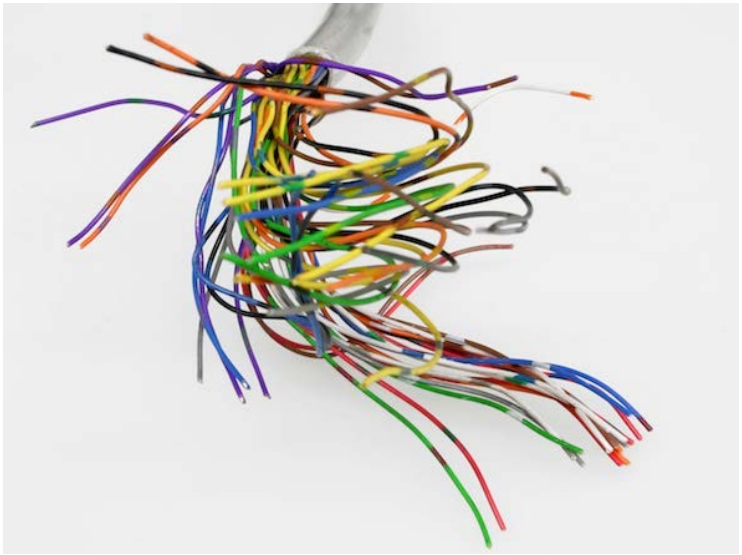
Solid Material Structures

- Complex volumetric structures exist in natural
- How to represent these complex structures in geometry?
- How to analyze and synthesize them?



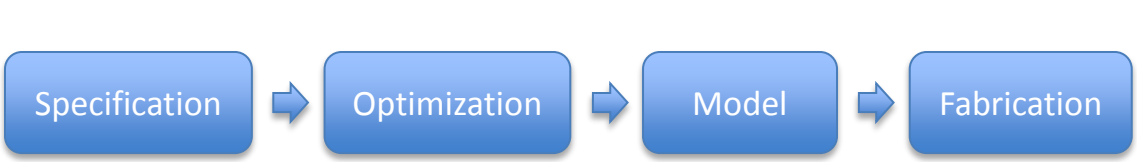
Designing Multi-Materials Objects

- Typical constructions are a combination of poured concrete and steel reinforcement.
- Electronics have wires and insulating materials



Specification Based Design

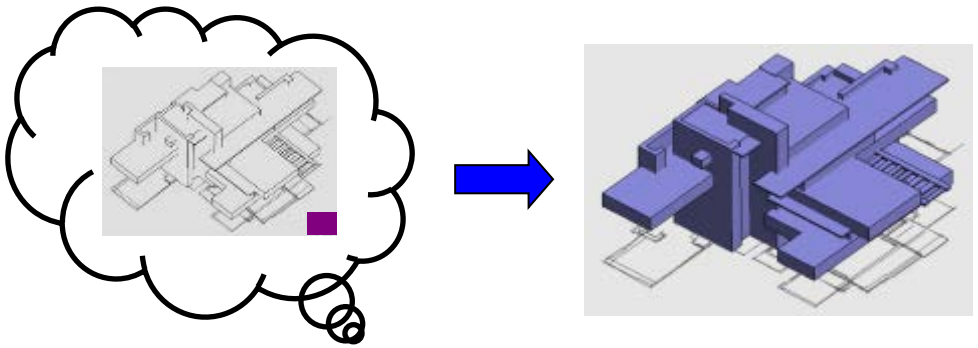
- Design object shapes according to more complex constraints and specification in physics, motion, and other functionality (sound?).



Interactive Design

- How to let home users create 3D contents easily and intuitively?

- More friendly UIs?
  - Sketch-based UI
  - Photo based
  - Big data (data driven)



Customization

- How to design an object that is not mass manufactured and is only defined by its specific functionality?

- How to design and represent a family of objects that are fabriceable (valid)?

Scale

- Large scale 3D printing for architectural construction?
- The mechanical problem: printers that can print objects larger than themselves? (both in surface area and height)

“Closing the Loop”

- Physical simulation of 3D printing?

- We already have a program that can print itself…

```
char *p="char *p=%c%s%c;main() {printf(p,34,p,34);}";main()
{printf(p,34,p,34);}
```

- A printer that can print itself?

Thank you!

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Comment and feedback via course webpage