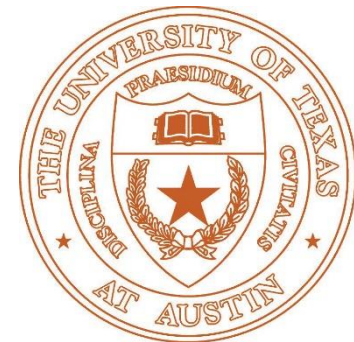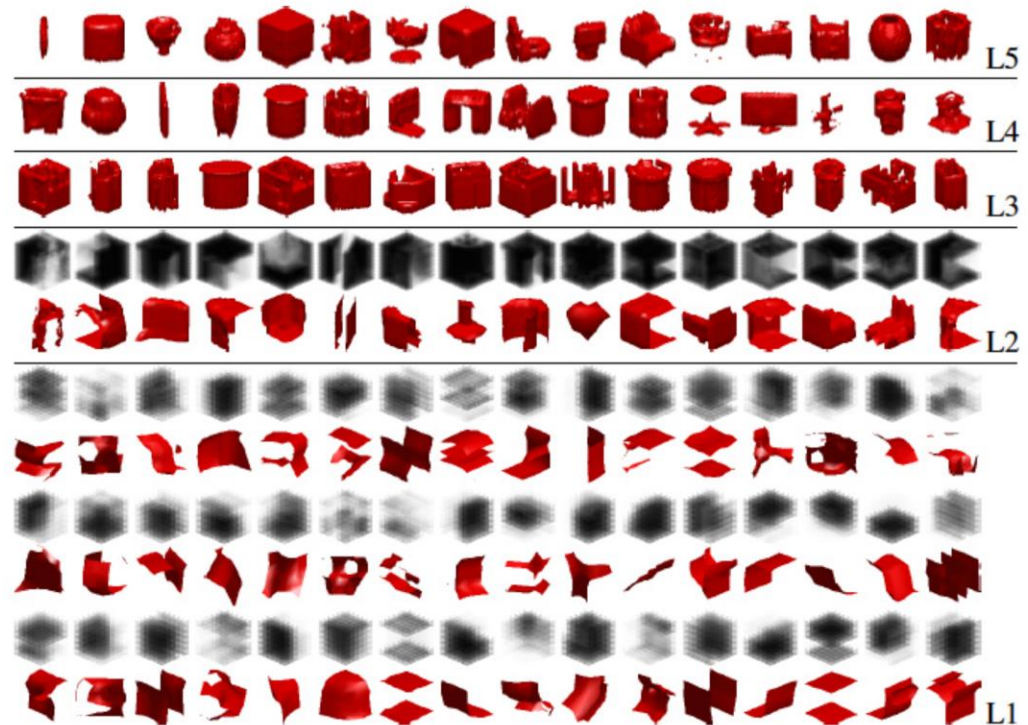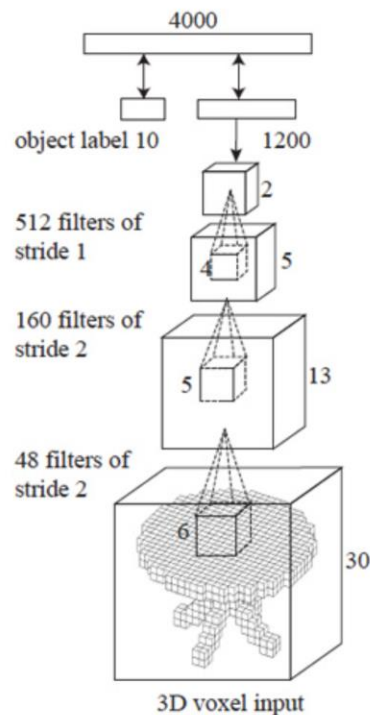# Overview of Shape Editing, Deformation Modeling, Synthesis and Fabrication
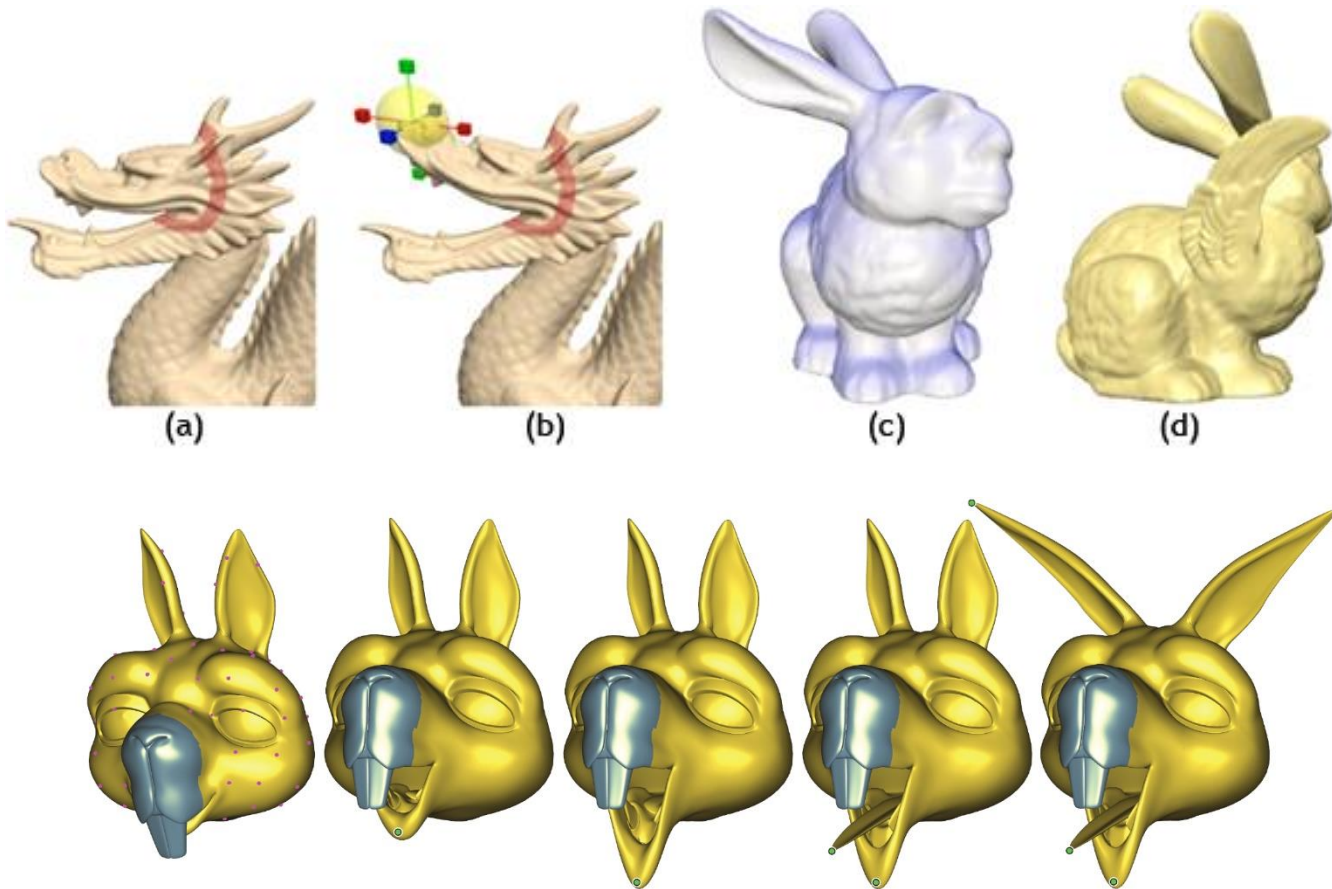
Qixing Huang

Janurary 26th 2017

Review the Last Lecture --- Shape Analysis

This lecture

Shape Editing
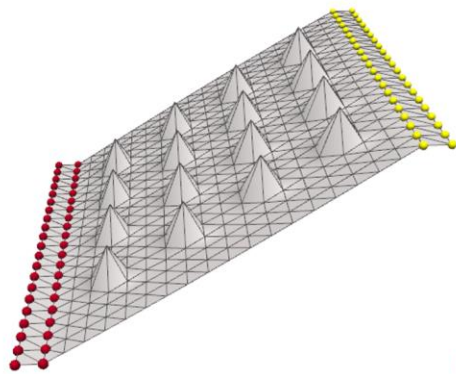
Laplacian Mesh Editing
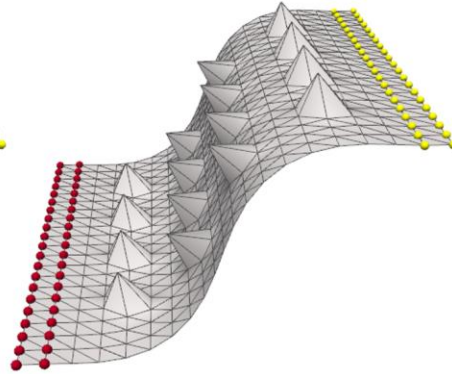
[Sorkine et al. 04]

Laplacian Mesh Editing

A short editing session
with the *Octopus*

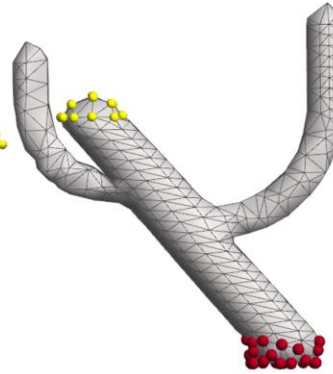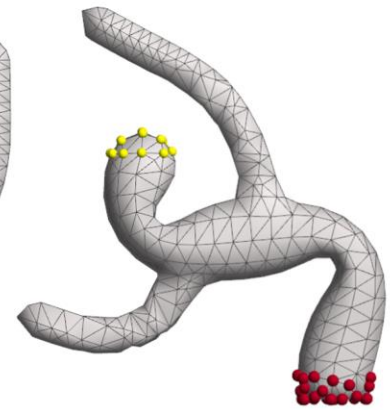# As-Rigid-As-Possible Surface Modeling

[Sorkine and Alexa' 07]

Poisson   our method   Poisson   our method

Mean-Value Coordinates

[Ju et al. 05,
Li et al. 13]

(a) (b) (c) (d) (e) (f) (g) (h)
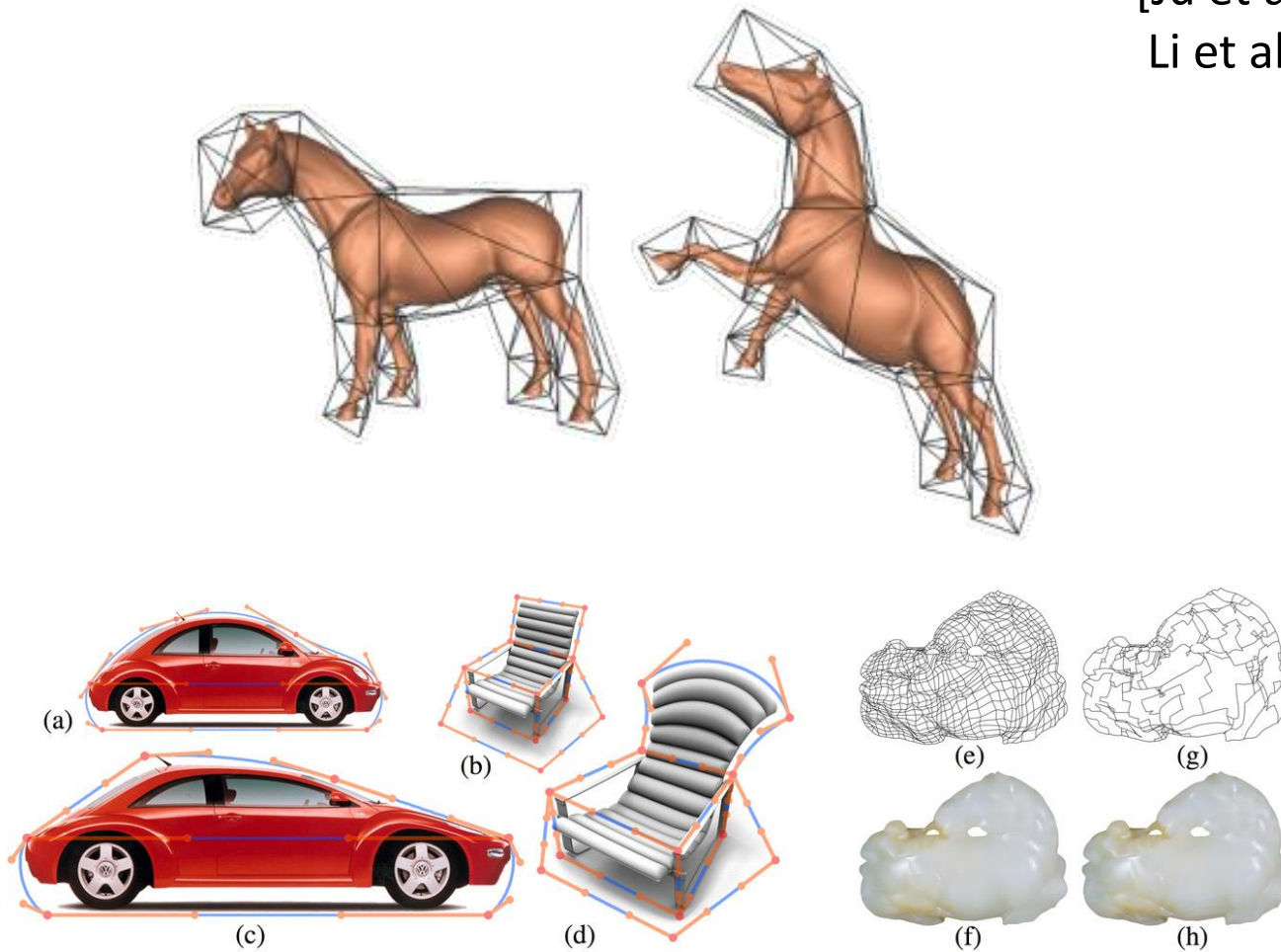
Green Coordinates

[Lipmann et al. 08]
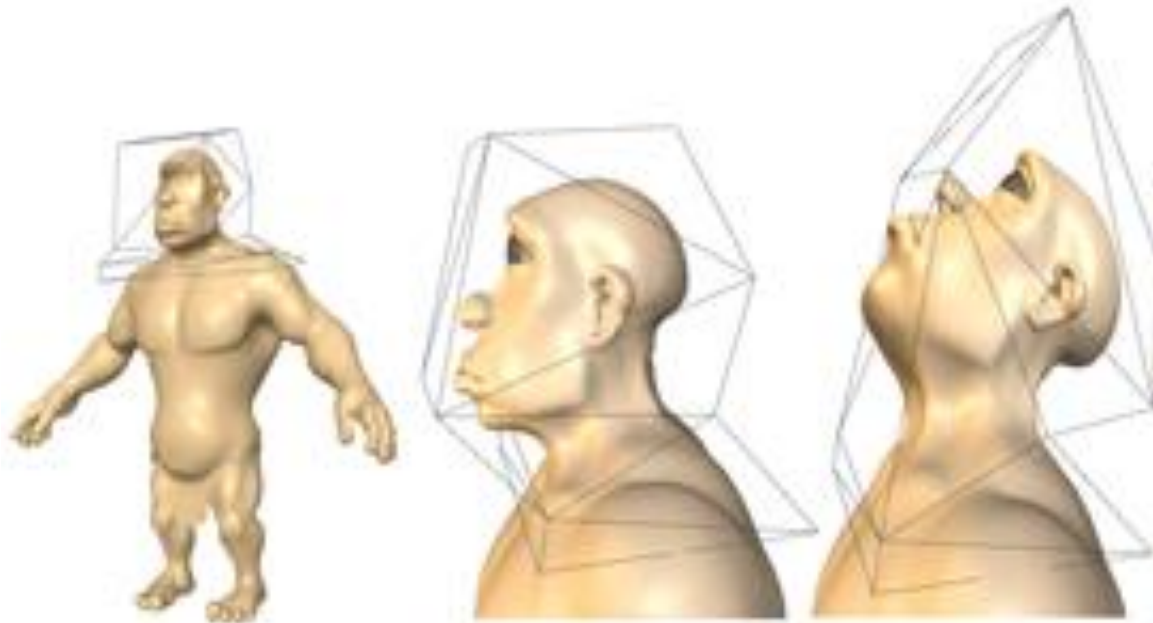
Semantic Shape Editing Using Deformation Handles

[Yumer et al. 15]

Semantic Shape Editing Using Deformation Handles

M.E. Yumer, S. Chaudhuri, J.K. Hodgins, L.B. Kara

SIGGRAPH 2015

Narrated by Jennifer Kara

Interactive Shape Modeling

Teddy System

[Igarashi et al. 99]

Teddy:
A Sketching Interface
for 3D Freeform Design

Takeo Igarashi
Hidehiko Tanaka
Satoshi Matsuoka

Fibermesh

[Nealen et al. 07]

FiberMesh
Designing Freeform Surfaces
with 3D Curves

Andrew Nealen
TU Berlin

Takeo Igarashi
The University of Tokyo

Olga Sorkine
TU Berlin

Marc Alexa
TU Berlin

IWIRES

[Gal et al. 09]

iWIRES
An Analyze-and-Edit Approach to Shape Manipulation

Ran Gal
Tel-Aviv University

Olga Sorkine
New York University

Niloy Mitra
Indian Institute of Technology

Daniel Cohen-Or
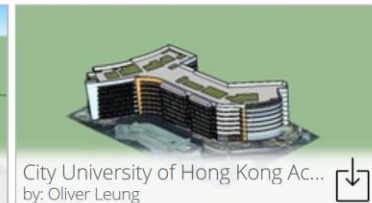**Tel-Aviv University**
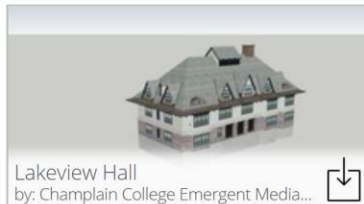
(The video contains voice over)

Google Sketchup

The Warehouse3D Data Set

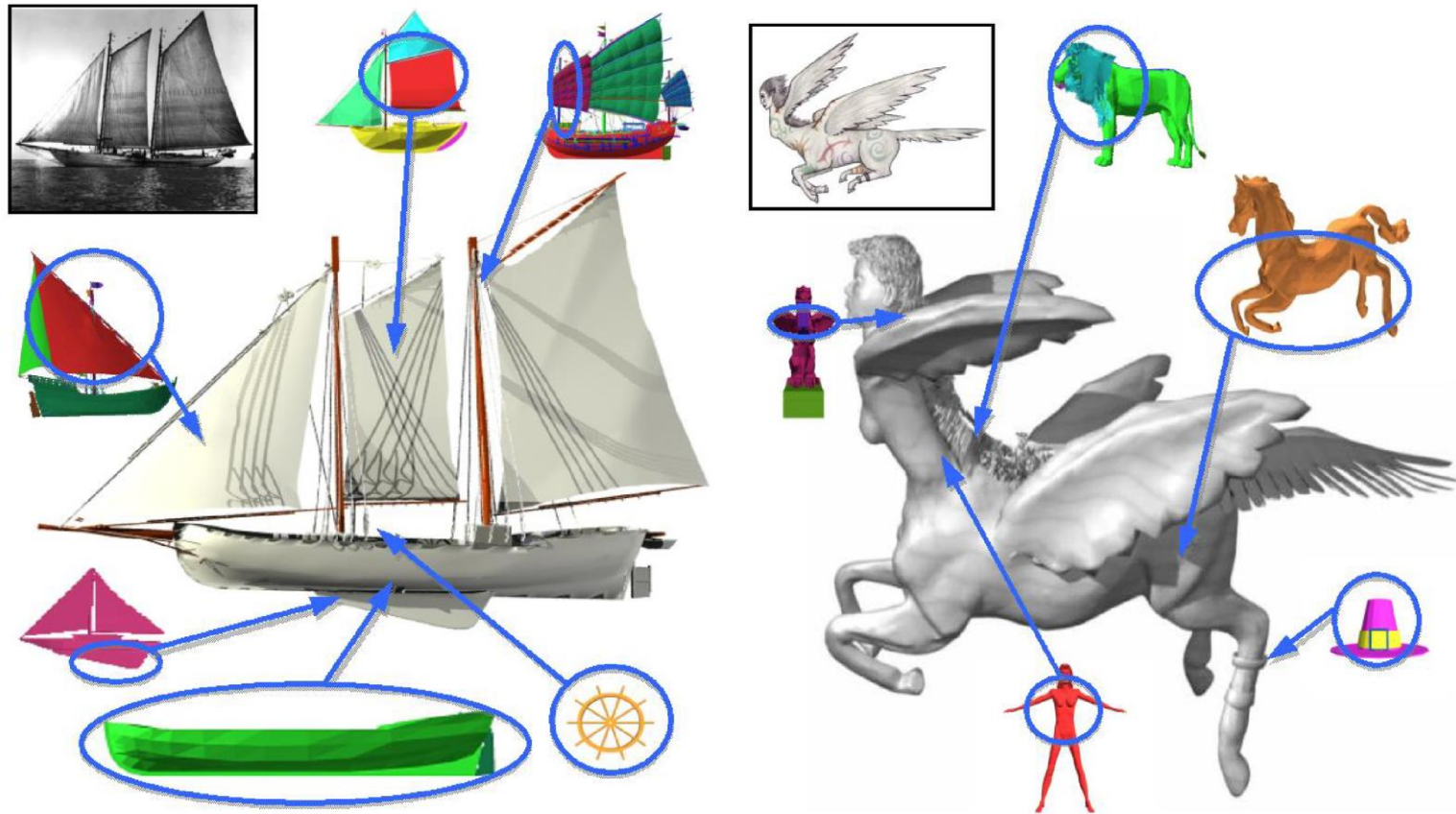# Modeling-by-Examples
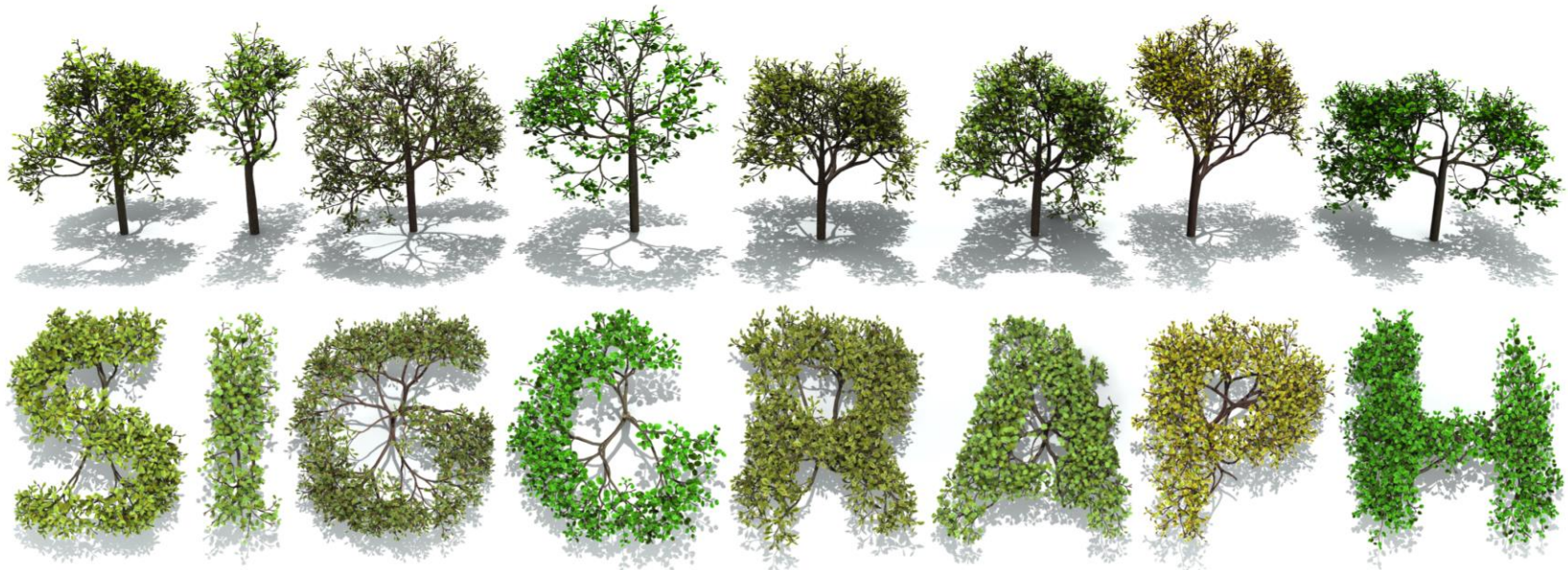
Modeling-by-Examples

Shape Synthesis

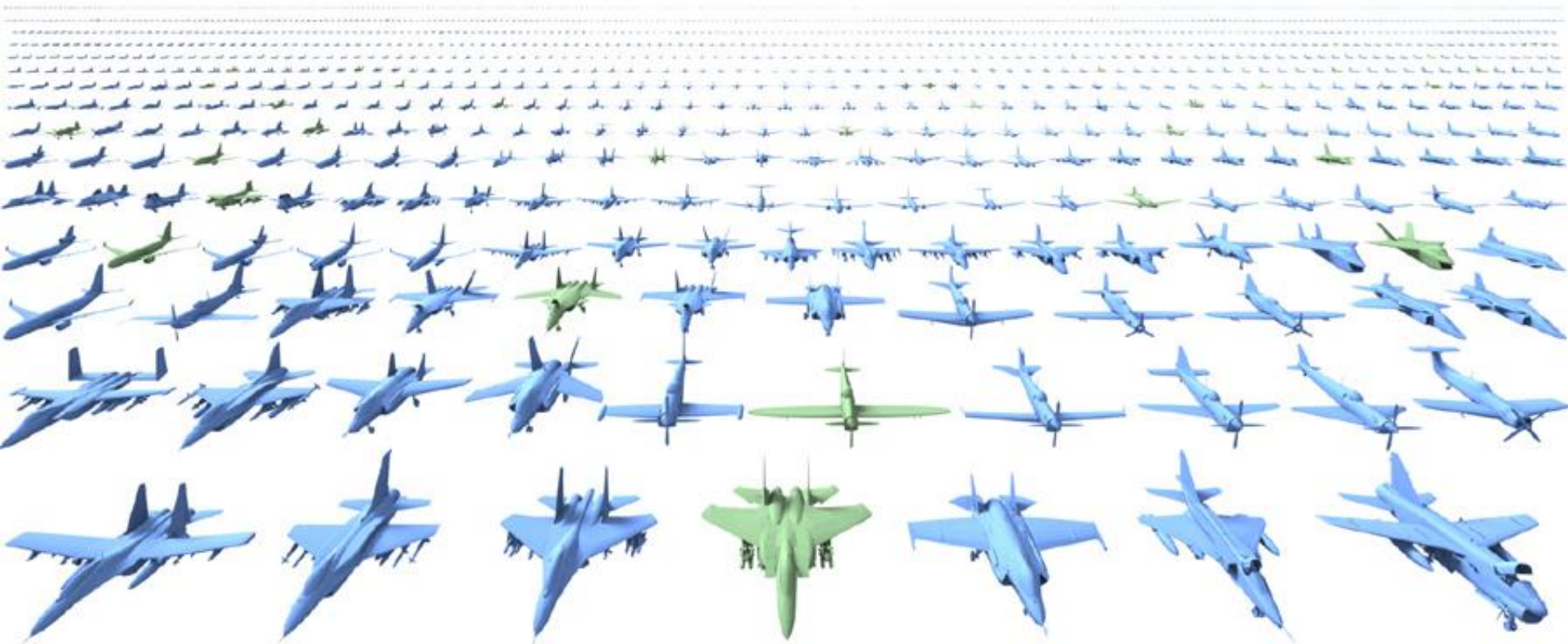# Tree Modeling in Parametric Spaces

[Talton et al. 09]

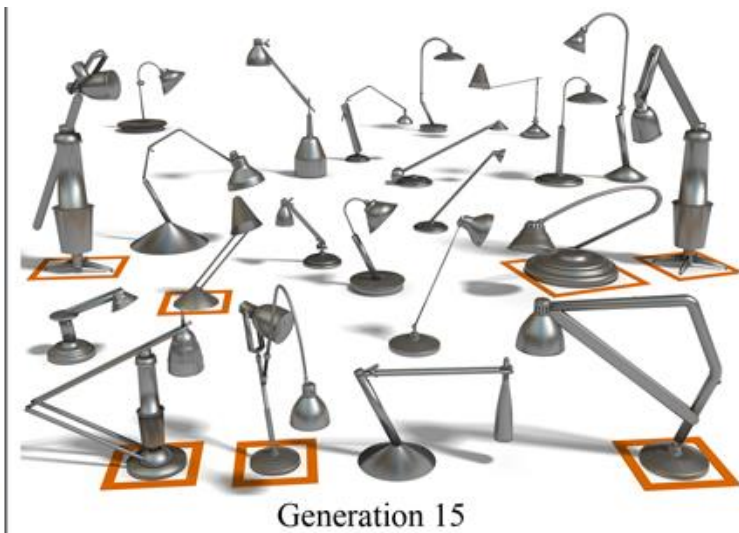# Tree Modeling in Parametric Spaces

[Talton et al. 12]

Shape Synthesis

[Xu et al. 12]

Shape Synthesis

[Xu et al. 12]

Input

Generation 10

Generation 15
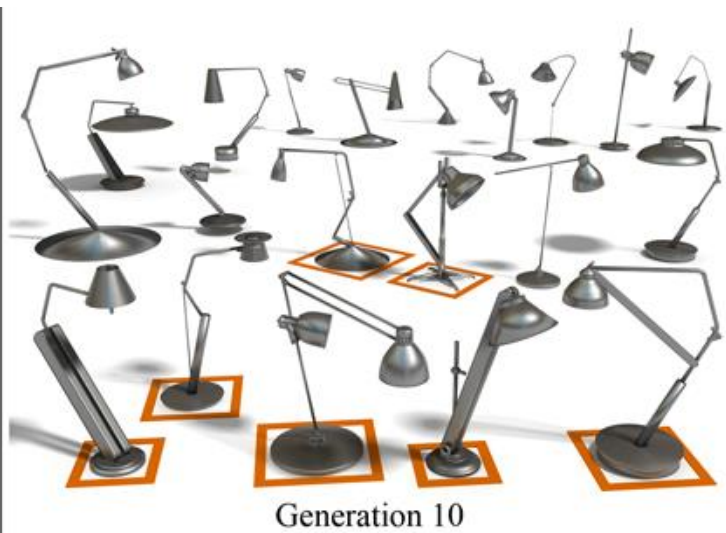
Generative Images Synthesis
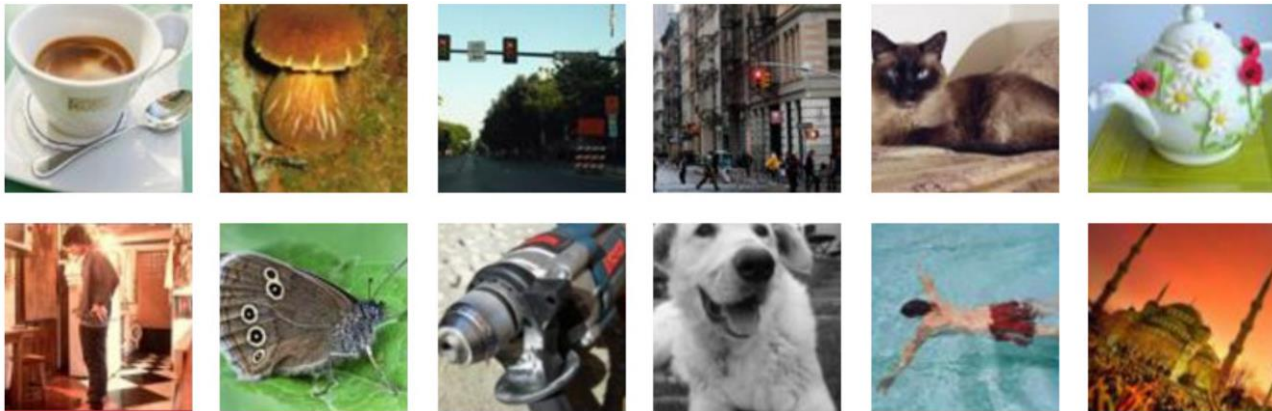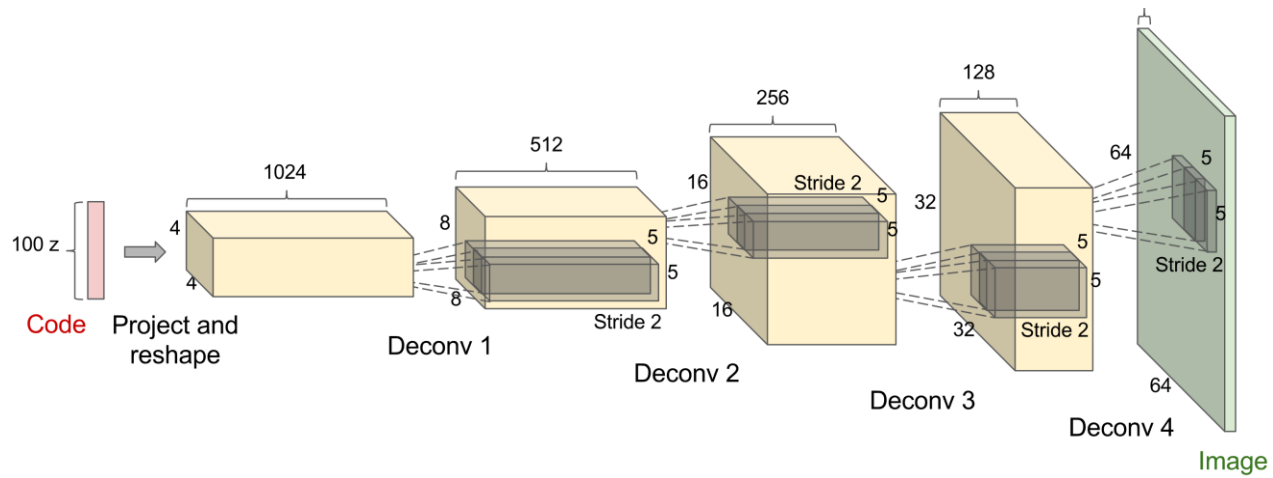
Generative Shape Synthesis (ECCV 2016)
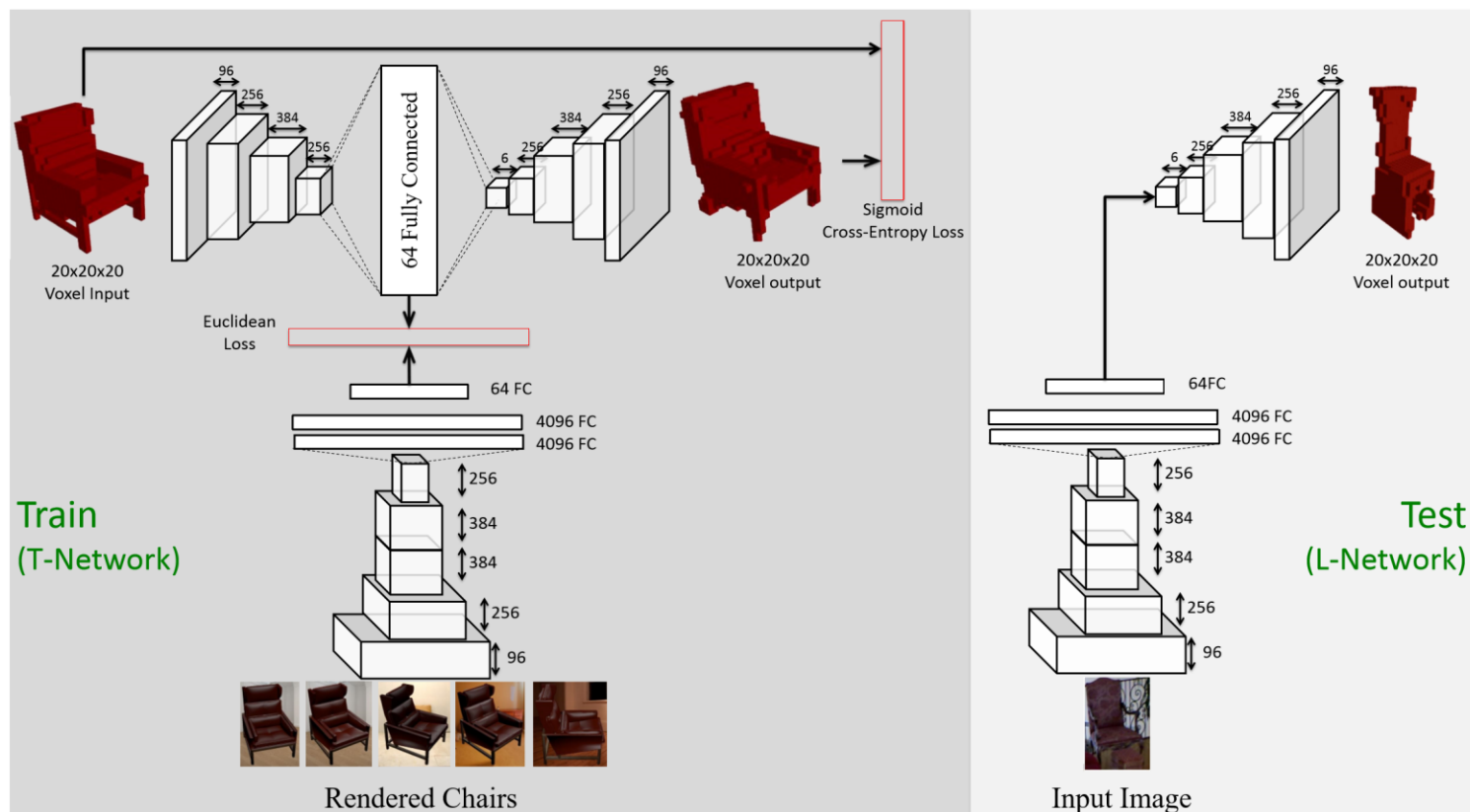
[Girdhar et al. 16]

Generative Shape Synthesis (NIPS 2016)
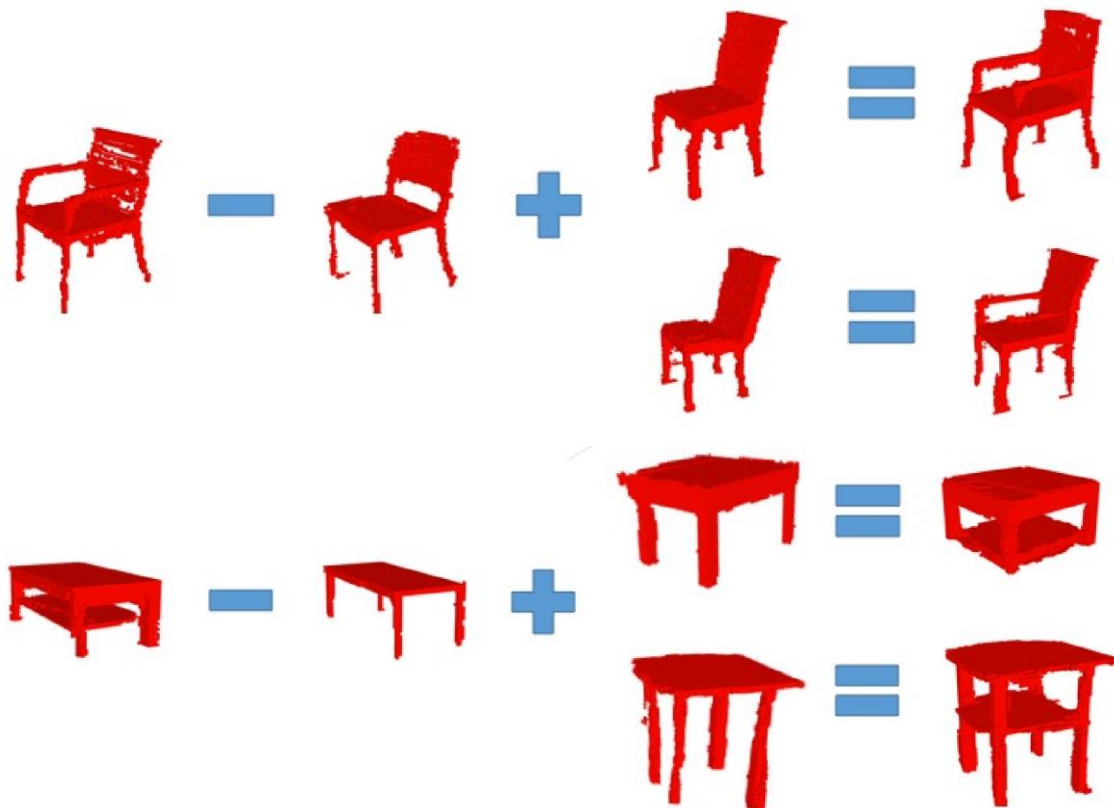
[Wu et al. 16]

512×4×4×4

256×8×8×8

128×16×16×16

64×32×32×32

z

G(z) in 3D Voxel Space
64×64×64

Generative Shape Synthesis (NIPS 2016)

[Wu et al. 16]

Scene Modeling from Graph Kernels (SIGGRAPH 2011)

[Fisher et al. 11]

Scene graph parent-child relationship ⟷ Surface contact relationship

Scene Modeling from Graph Kernels (SIGGRAPH 2011)

[Fisher et al. 11]
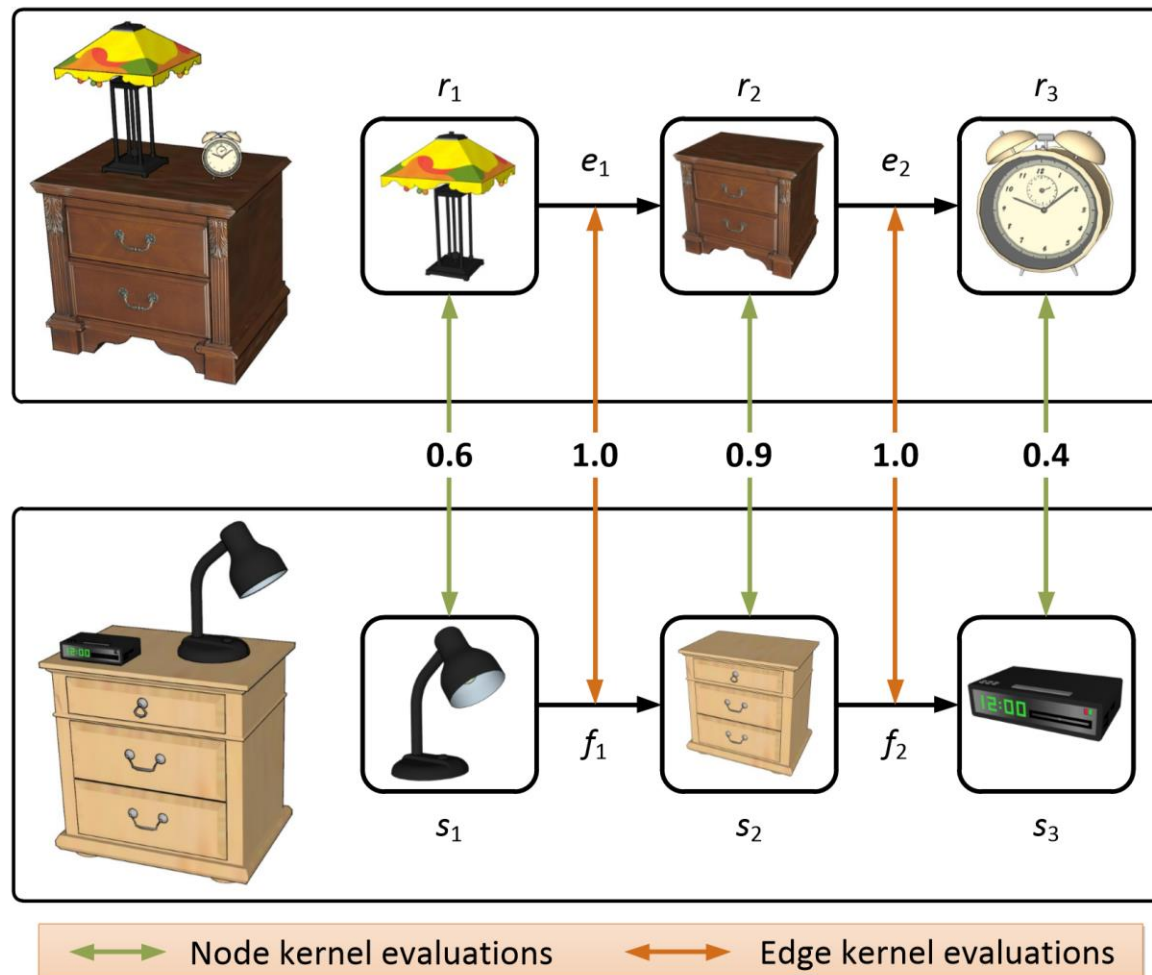
Language-Based Scene Modeling

[Chang et al. 15]

There is a bed and there is a nightstand next to the bed.

- There is a bed with three pillows and a bedside table next to it.
- The room appears to be a bedroom. A blue bed and white nightstand are pushed against the furthest wall. A window is on the left side.
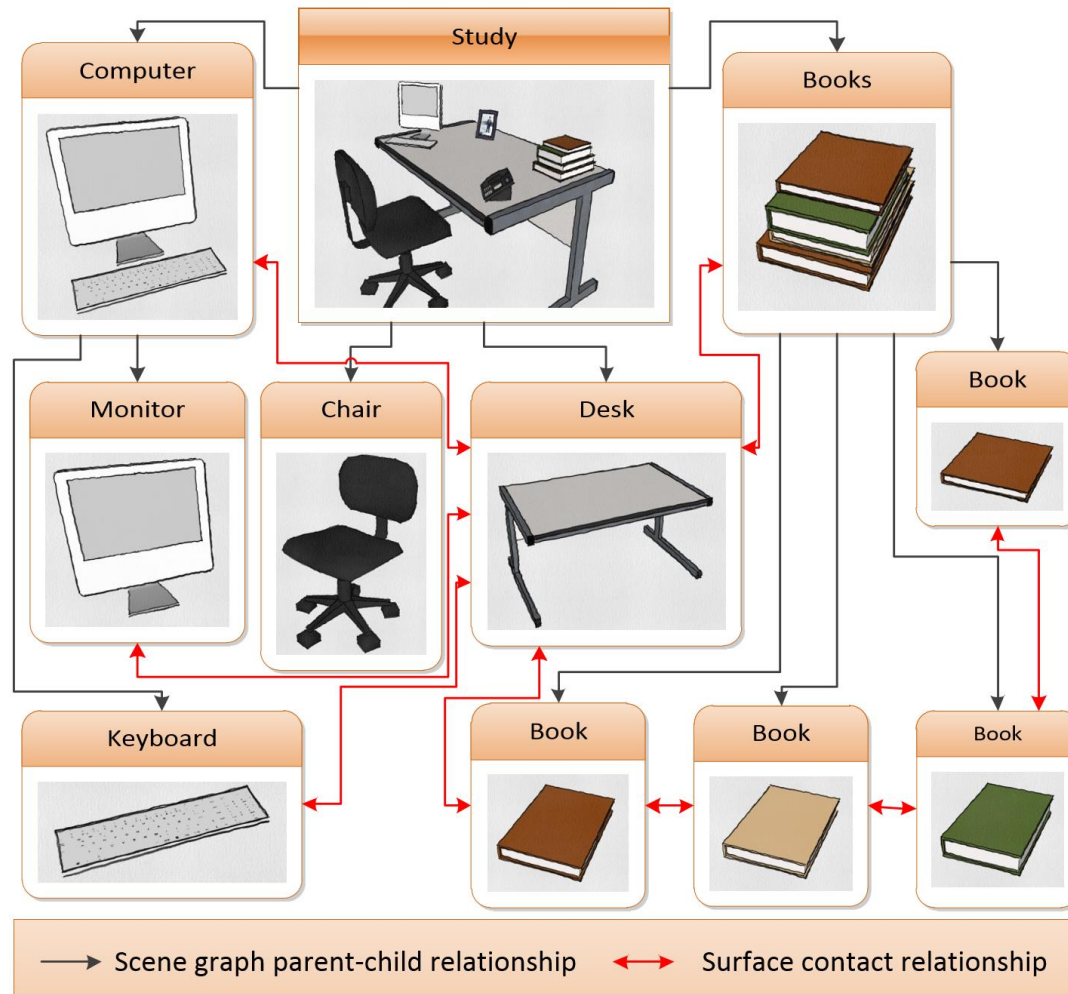- A dark bedroom with a queen bed with blue comforter and three pillows. There is a night stand. One wall is decorated with a large design and another wall has three large windows.

There is a chair and a table.

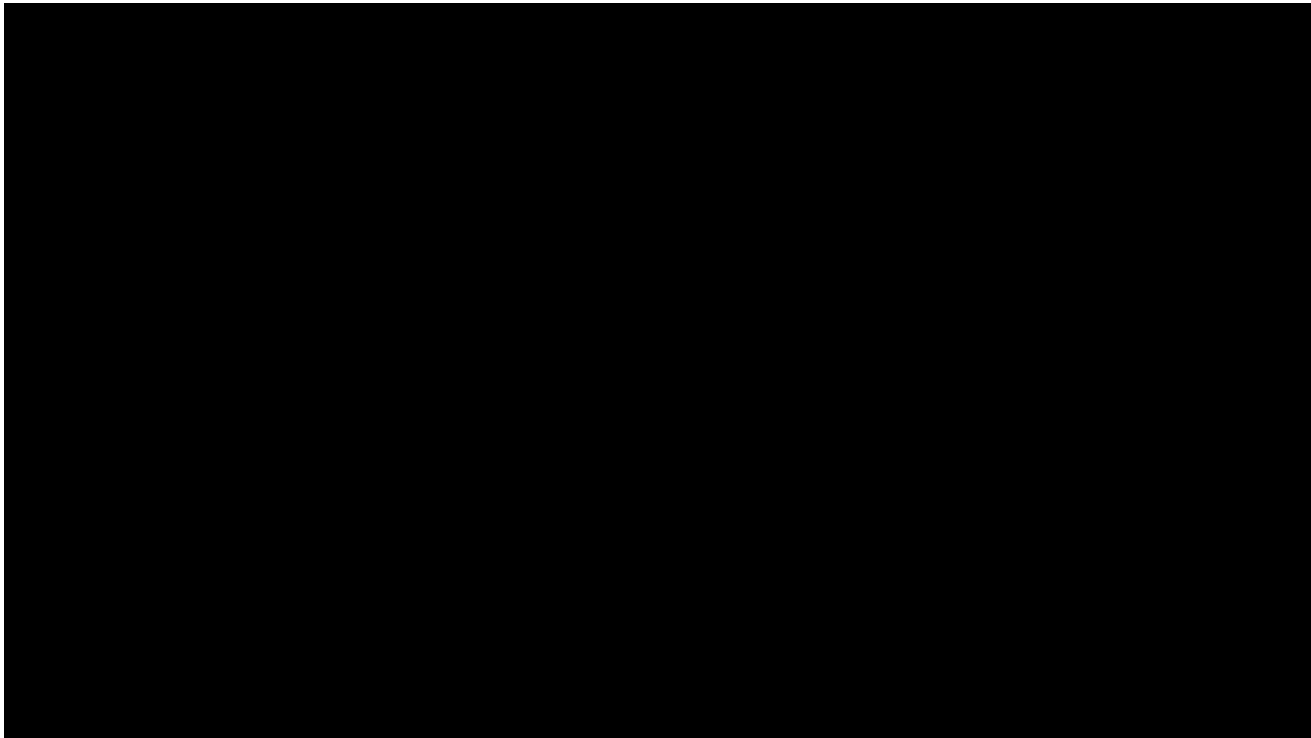- There is a chair and a circular table in the middle of a floral print room.
- a corner widow room with a a table and chair sitting to the east side.
- There's a dresser in the corner of the room, and a yellow table with a brown wooden chair.
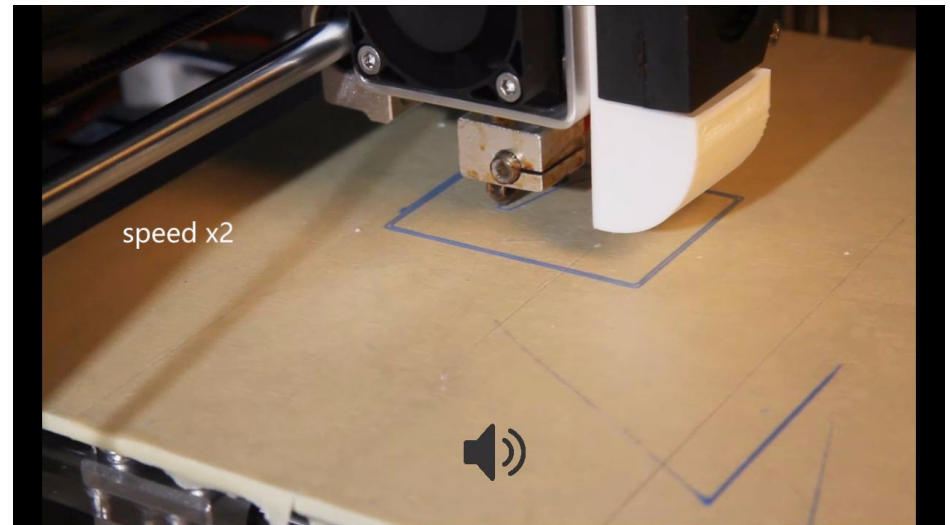
Discussion

3D Printing

3D Printing Demo

Fermat-Spiral

[Shen et al. 15]

- start point
- end point

speed x2
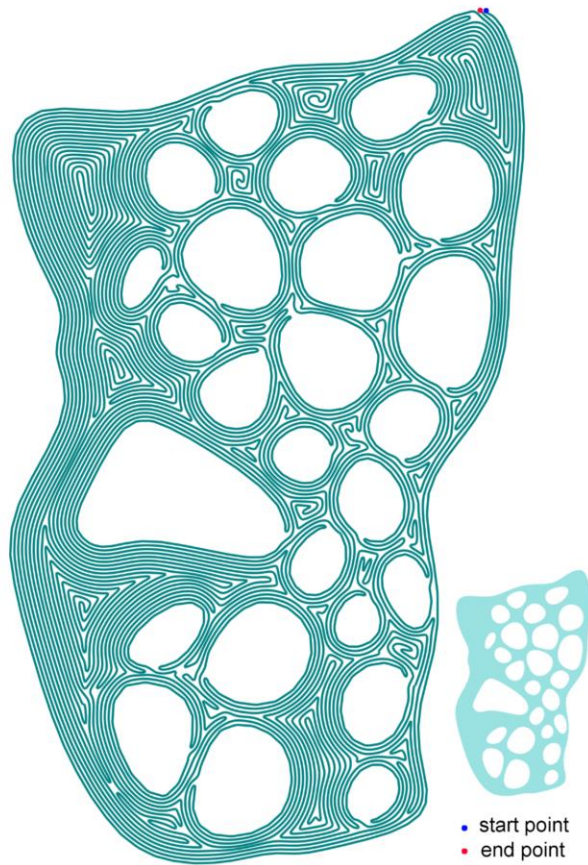
Decompose-and-Print

[Shen et al. 15]

Hybrid Structure

CofiFab: Coarse-to-Fine Fabrication of Large 3D Objects

ACM SIGGRAPH 2016

Peng Song[1], Bailin Deng[2], Ziqi Wang[1], Zhichao Dong[1], Wei Li[1], Chi-Wing Fu[3], and Ligang Liu[1]

[1] University of Science and Technology of China [2] UNIVERSITY OF Hull [3] The Chinese University of Hong Kong
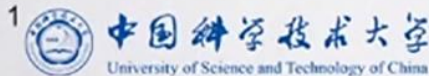
(This video contains voiceover.)

Network Structure

[Huang et al. 16]

(a) (b) (c) (d)
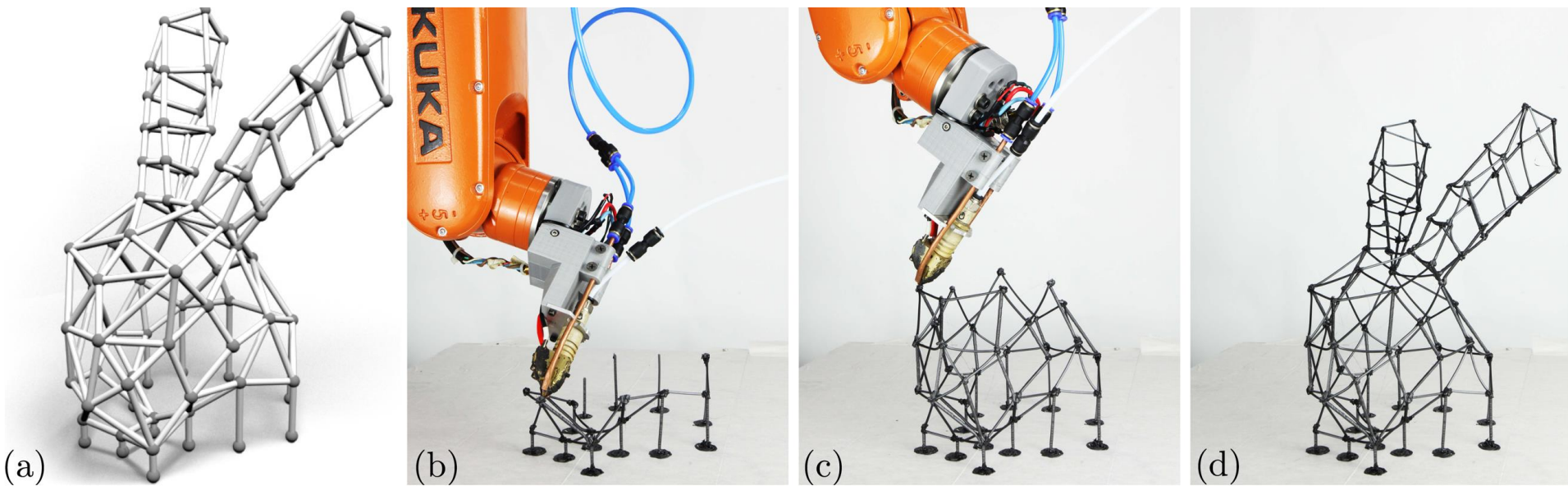
Graphics@AI

Graphics + Vision

Graphics + Robotics

Graphics + NLP

Render-for-CNN

Learning to Render

Image-2-Shape Texture Transfer

[Y. Wang et al. 16]

input image   image-to-shape texture transfer   shape-to-shape texture transfer   edited original image
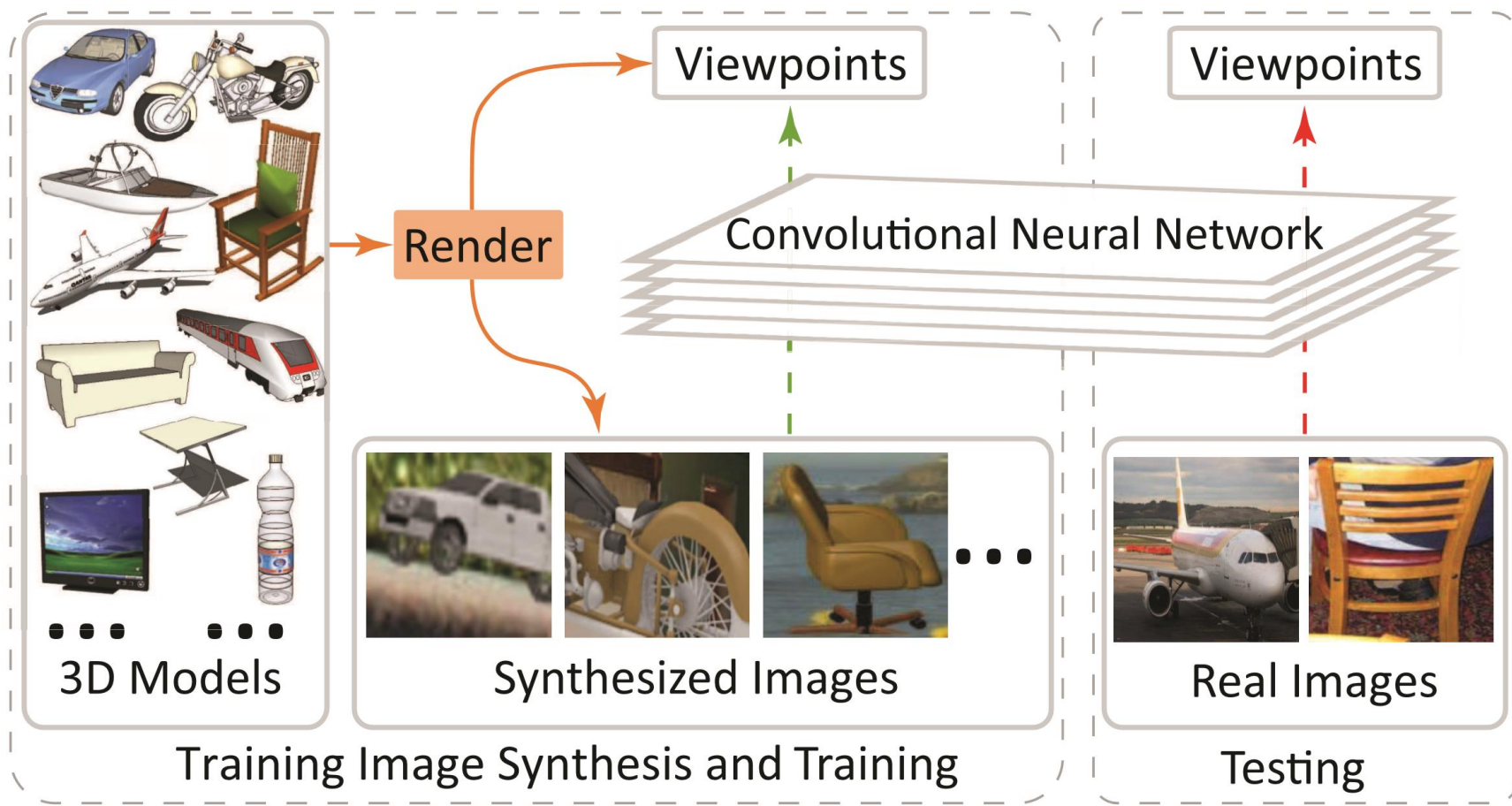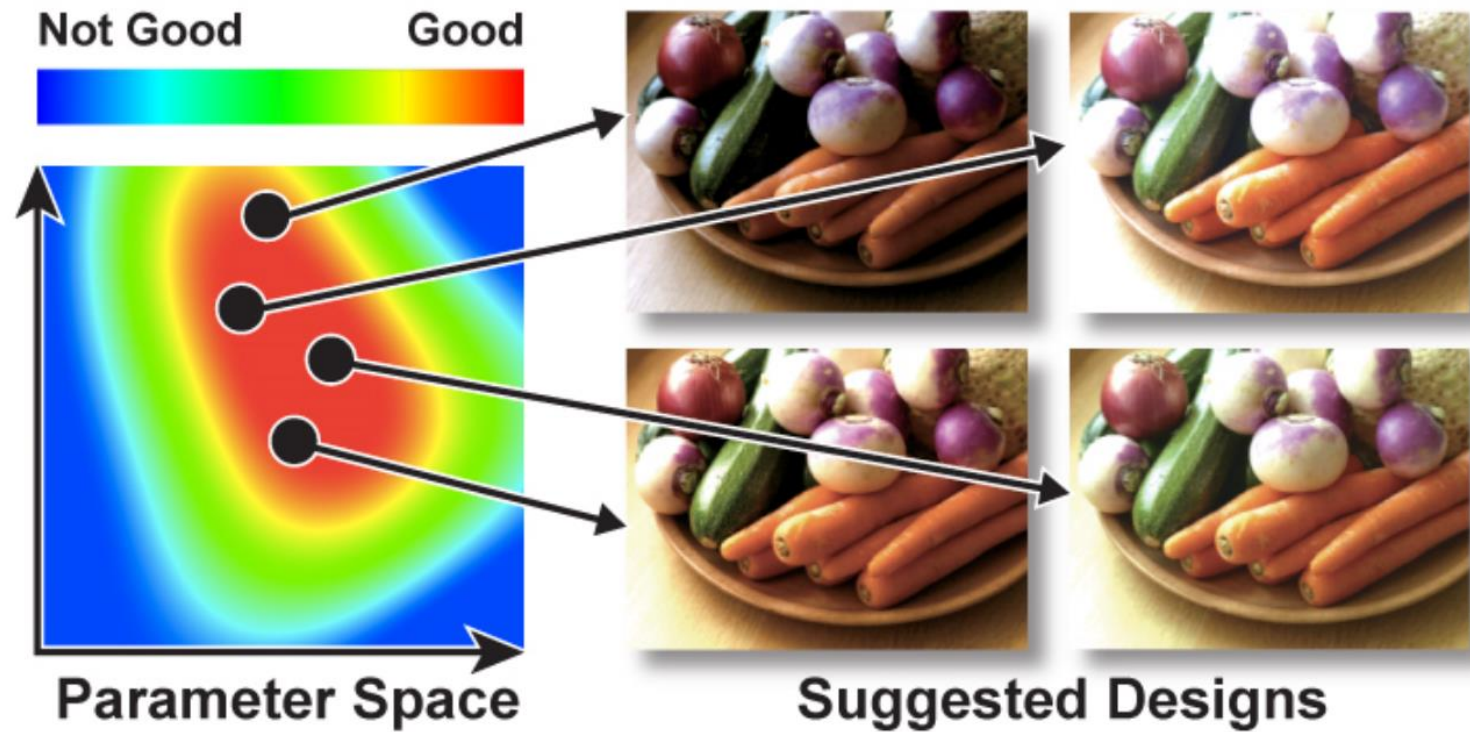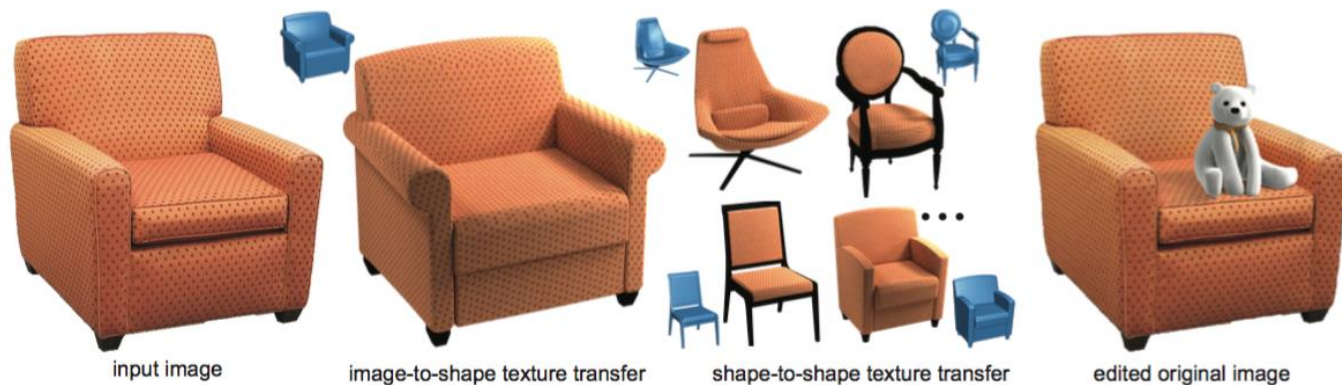
Text-2-Scene Modeling

There is a bed and there is a nightstand next to the bed.

There is a chair and a table.

- There is a bed with three pillows and a bedside table next to it.
- The room appears to be a bedroom. A blue bed and white nightstand are pushed against the furthest wall. A window is on the left side.
- A dark bedroom with a queen bed with blue comforter and three pillows. There is a night stand. One wall is decorated with a large design and another wall has three large windows.
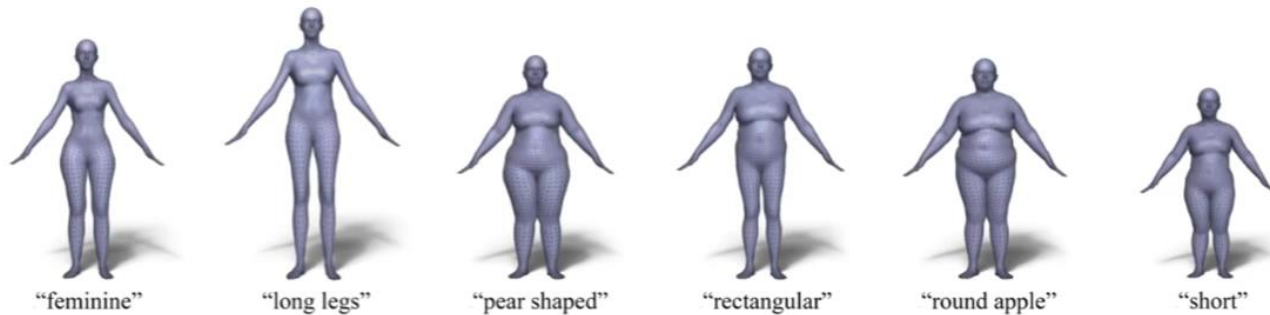
- There is a chair and a circular table in the middle of a floral print room.
- a corner widow room with a a table and chair sitting to the east side.
- There's a dresser in the corner of the room, and a yellow table with a brown wooden chair.

Body Talk

Body Talk
Crowdshaping Realistic 3D Avatars with Words

"feminine"   "long legs"   "pear shaped"   "rectangular"   "round apple"   "short"
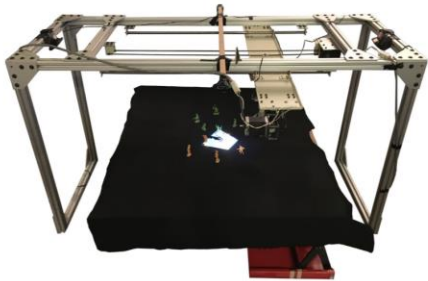
Render the Possibilities
SIGGRAPH2016

Stephan Streuber, M. Alejandra Quiros-Ramirez,
Matthew Q. Hill, Carina A. Hahn, Silvia Zuffi,
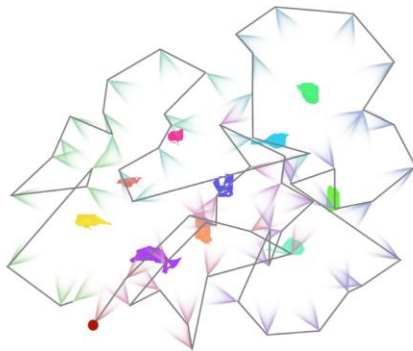Alice O'Toole, Michael J. Black

Automated View and Path Planning for Scalable Multi-Object 3D Scanning

[Fan et al. 16]

(a) System Layout   (b) View and Path Planning   (c) Structured-light Scanning   (d) Acquired 3D Models

Auto-scanning for Coupled Scene Reconstruction and Proactive Object Analysis

[Xu et al. 15]

(a) (b) (c)

Questions?

Candidate Project Ideas