Digital Geometry -Motivations

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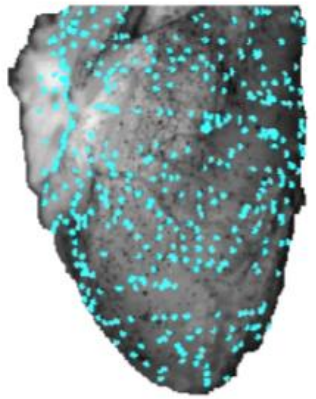
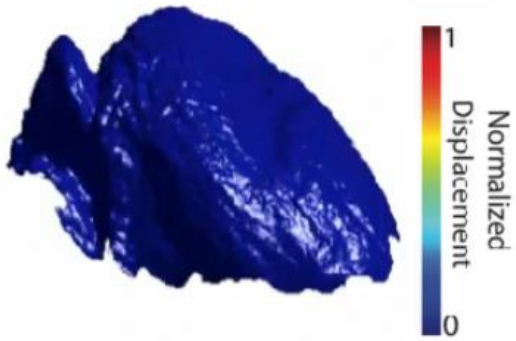
http://jjcao.github.io/digital-geometry/

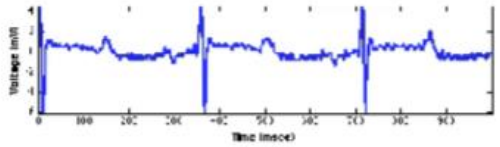
Pleasure may come from illusion, but happiness can come only of reality.

Impacting Science

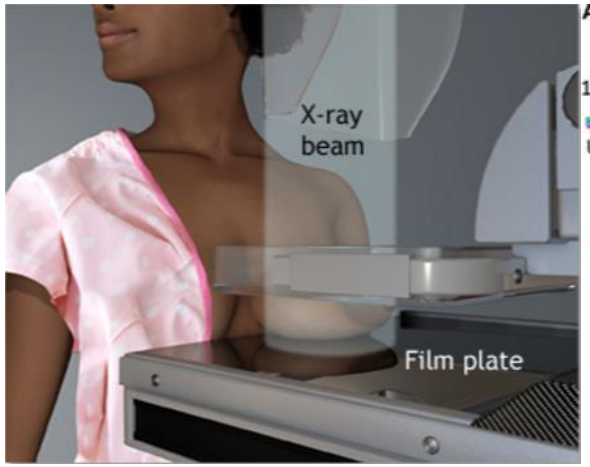
Cardiology

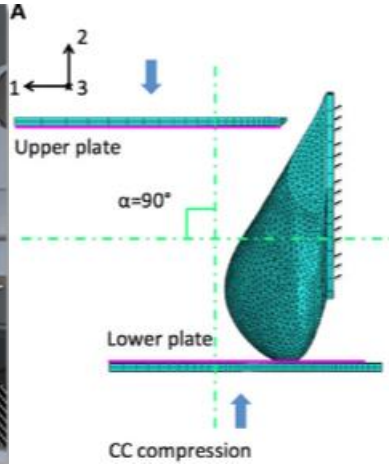


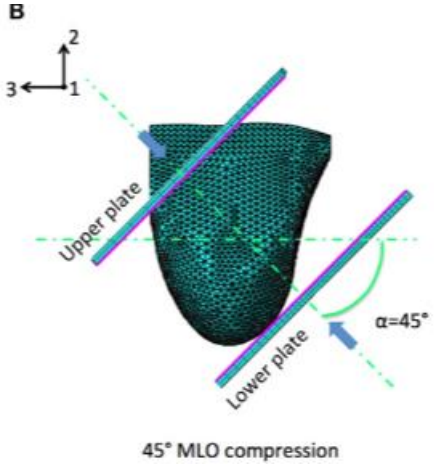


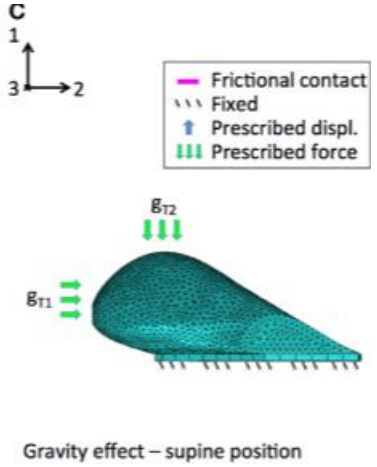


Mammographic



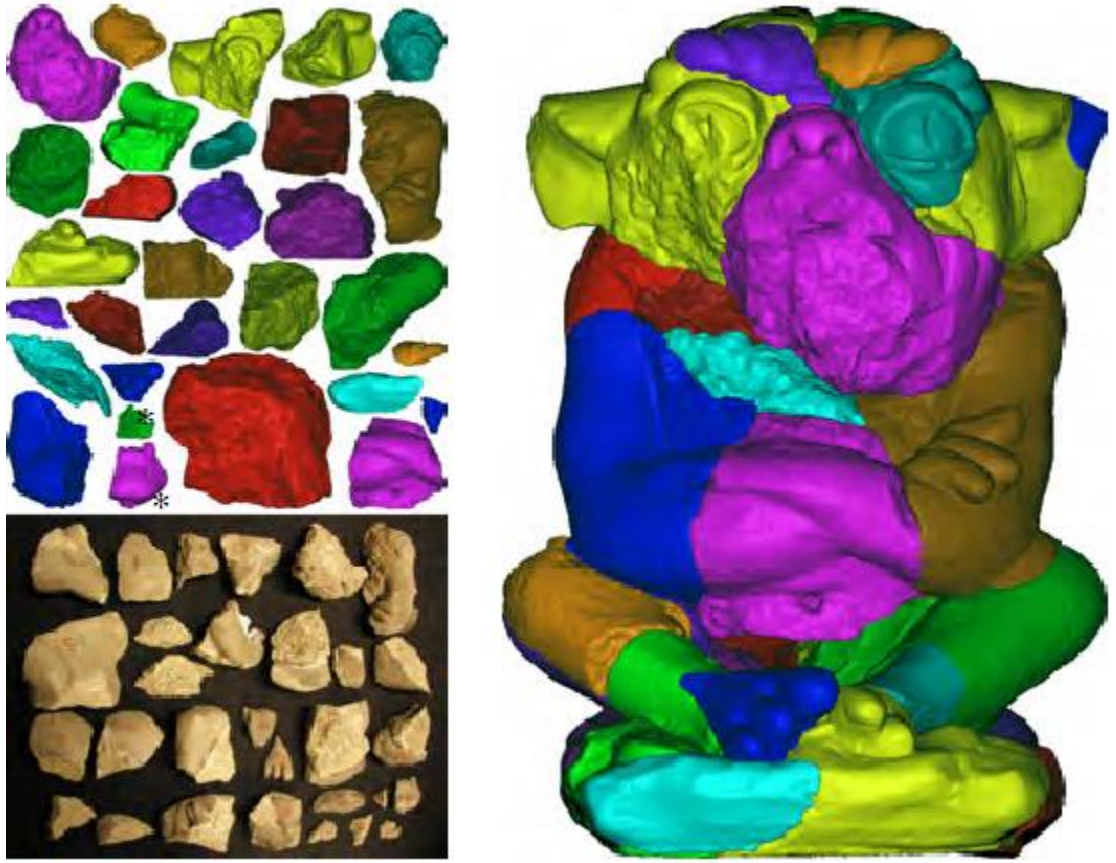






Computational archaeology

Eg14_Content-Aware Surface Parameterization for Interactive Restoration of Historical Documents



Reassembling a gargoyle statue: photo (bottom left) and 3D models (top left) of the fragments, final assembly (right).

Multi-View Stereo

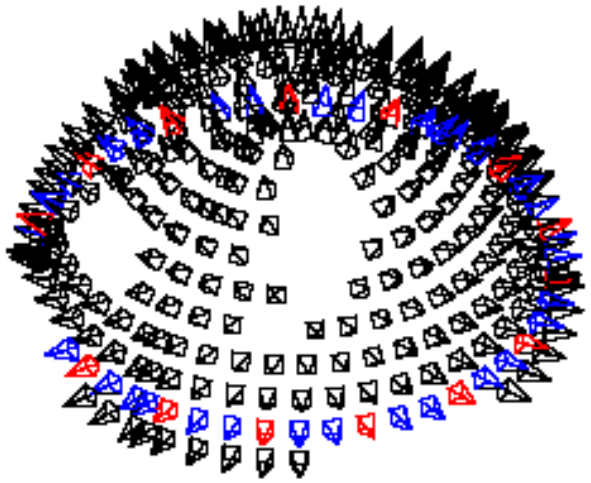
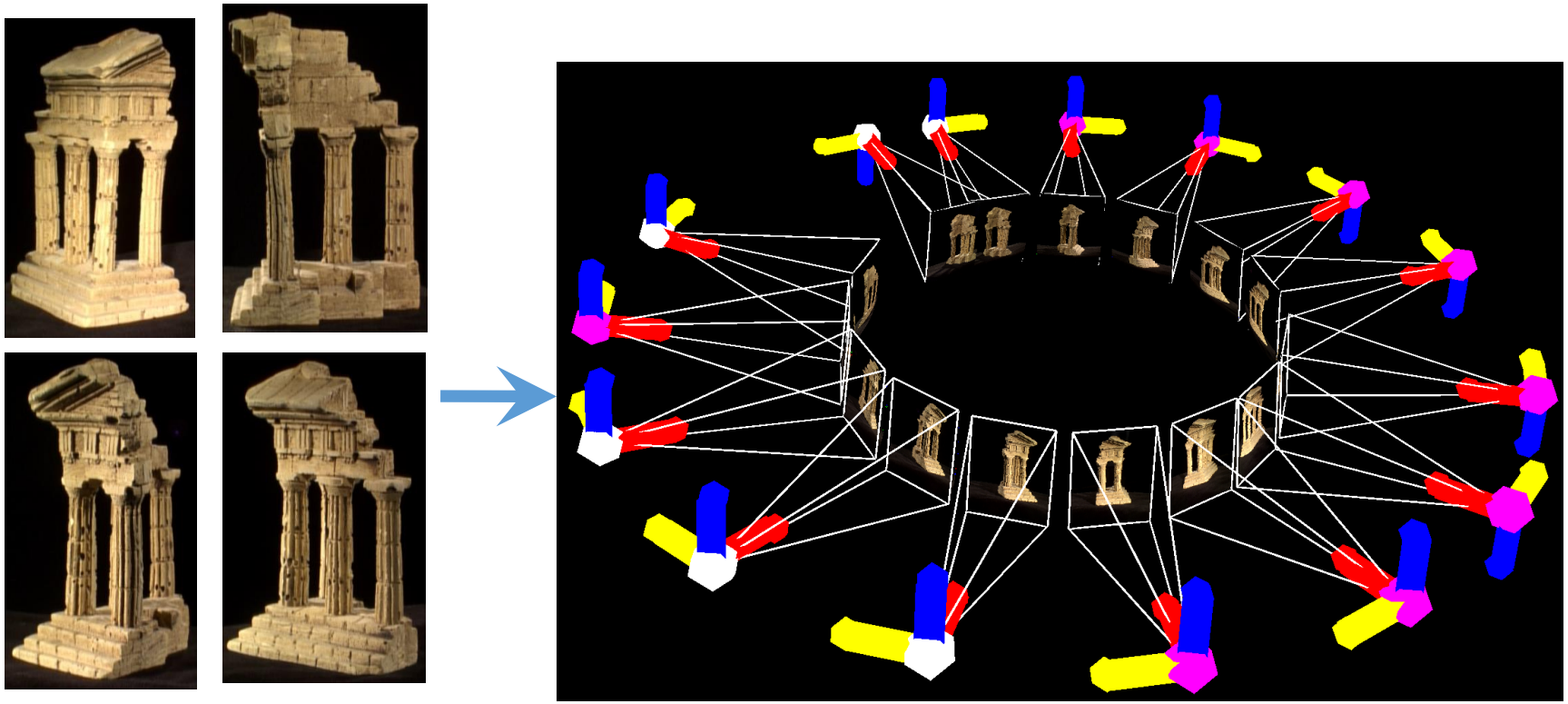
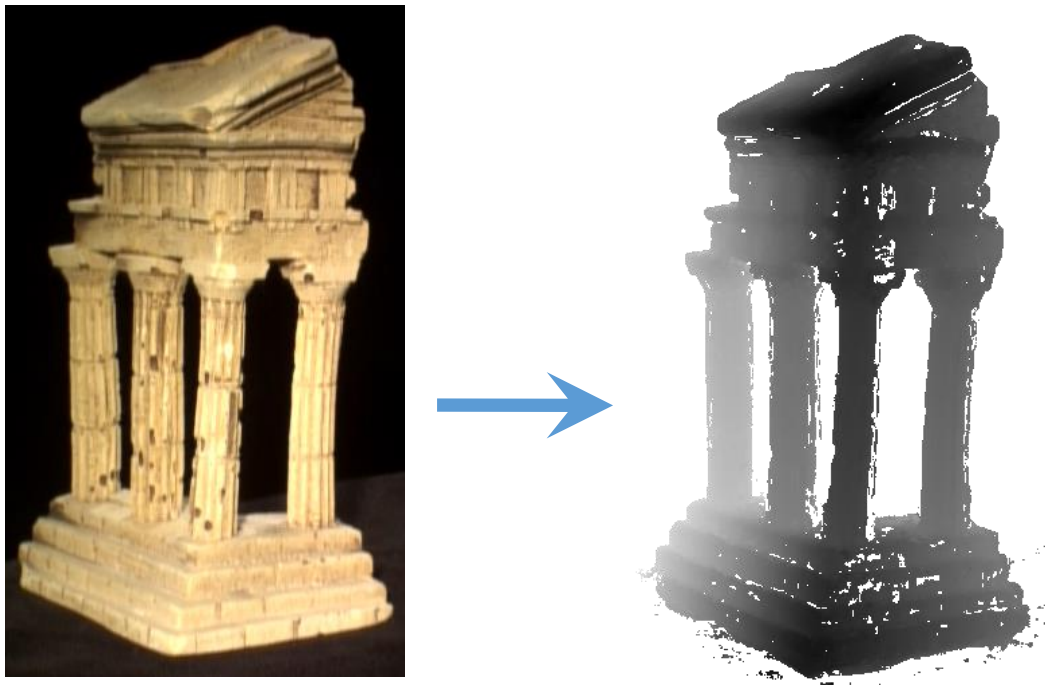


Image Calibration



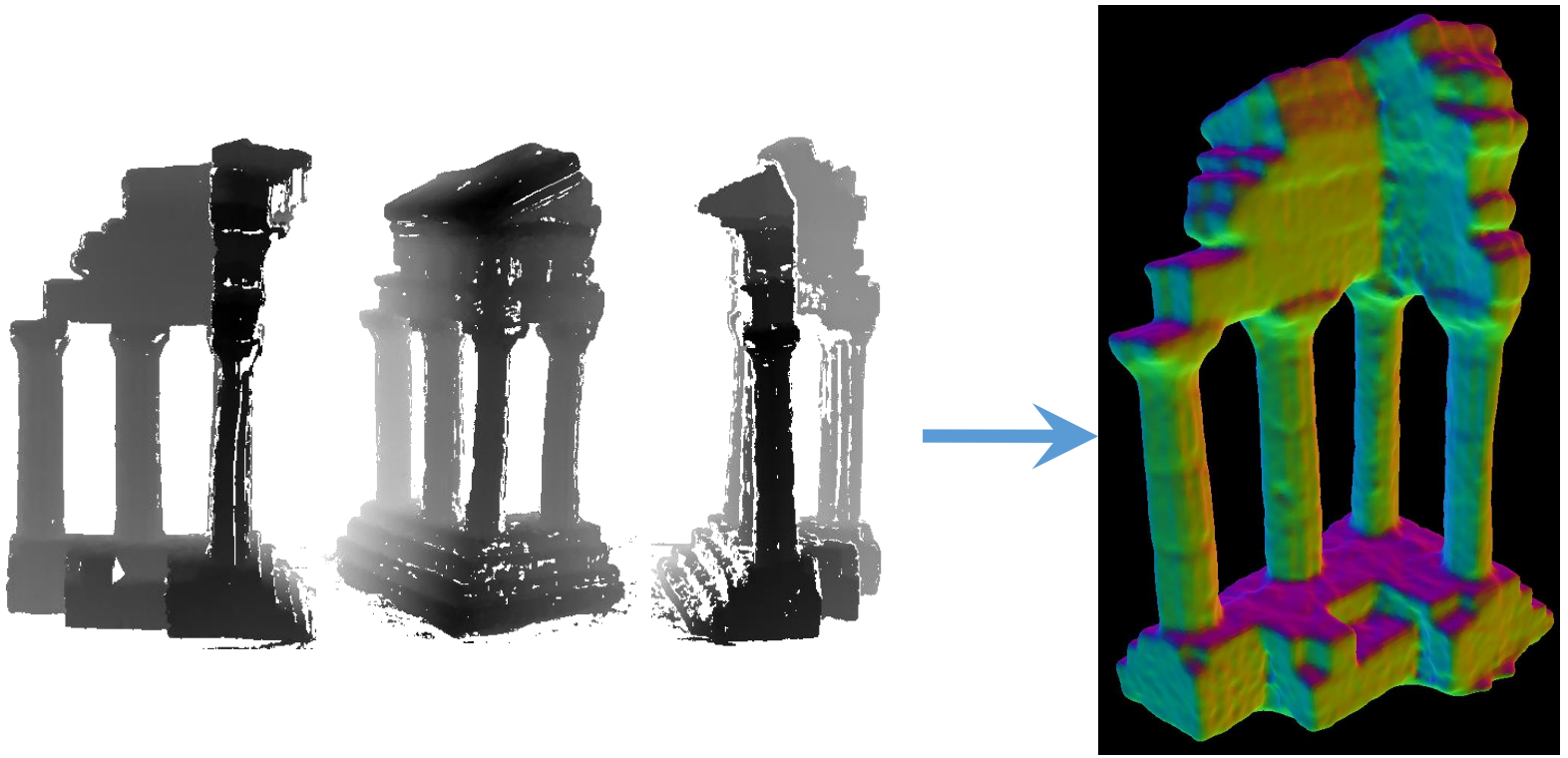
- Input: set of pictures
- Output: camera position, orientation, intrinsic parameters (focal length, optical center)

Depth Map Construction



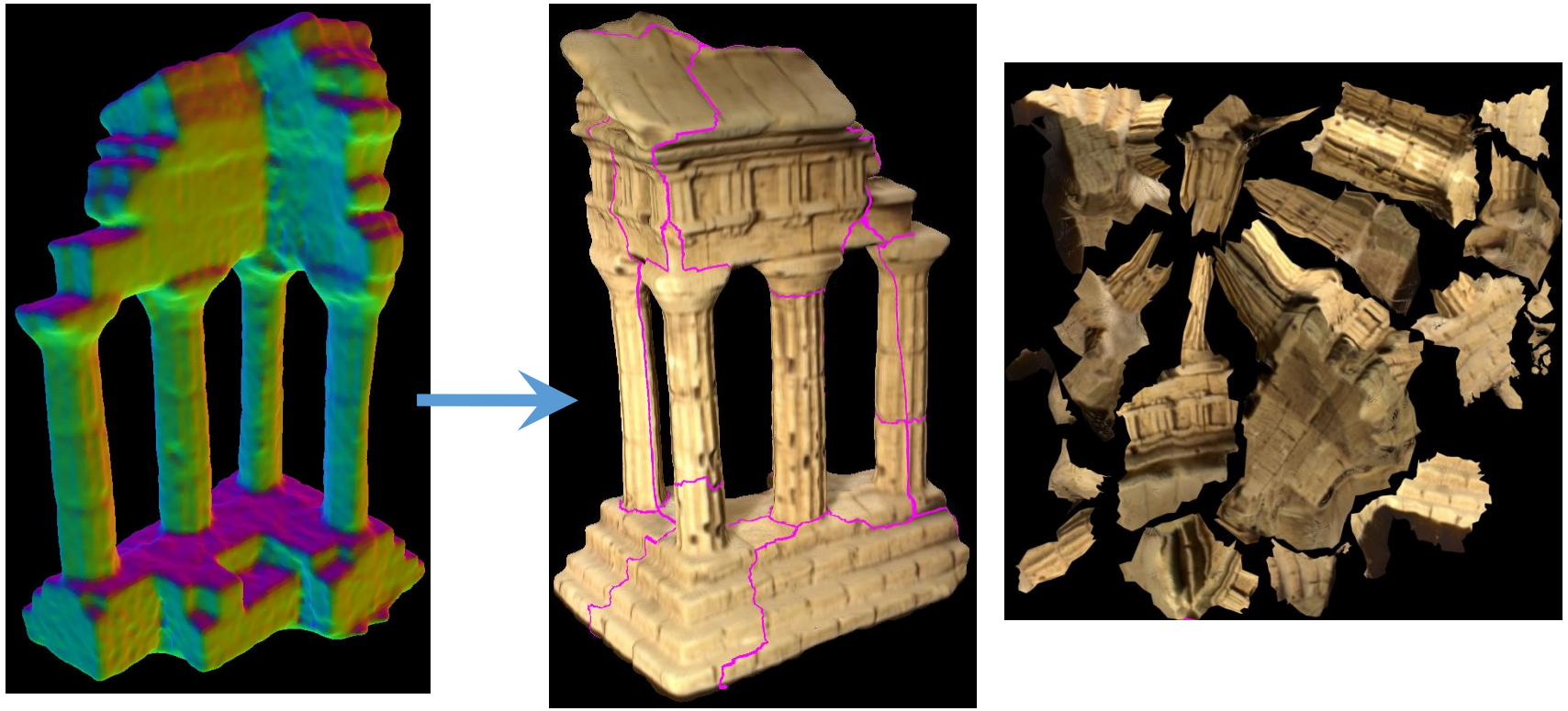
- Input: set of calibrated images
- Output: distance to object for each pixel in the image

Mesh Registration & Reconstruction



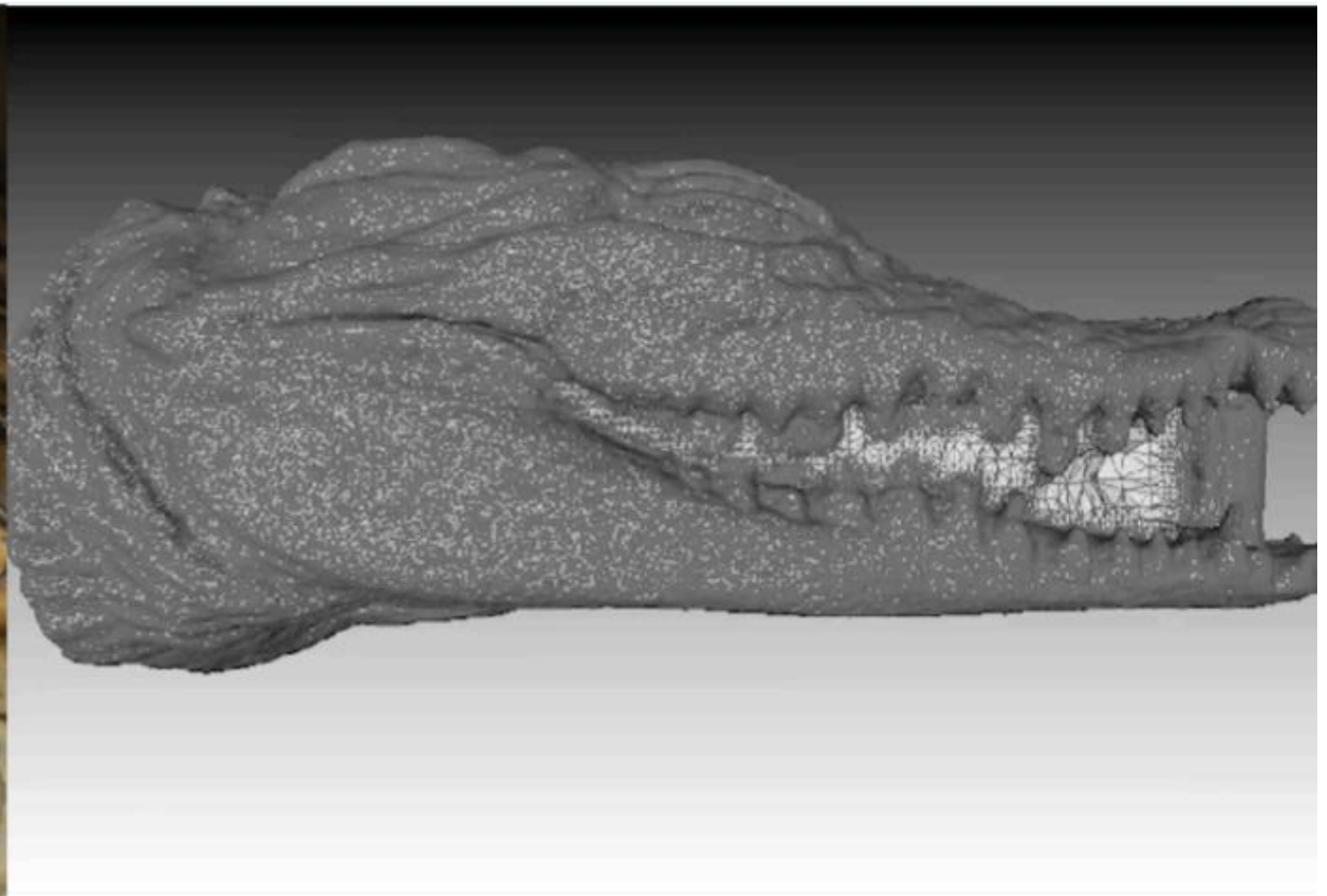
- Input: set of calibrated images & depth maps
- Output: mesh of object

Texture Generation

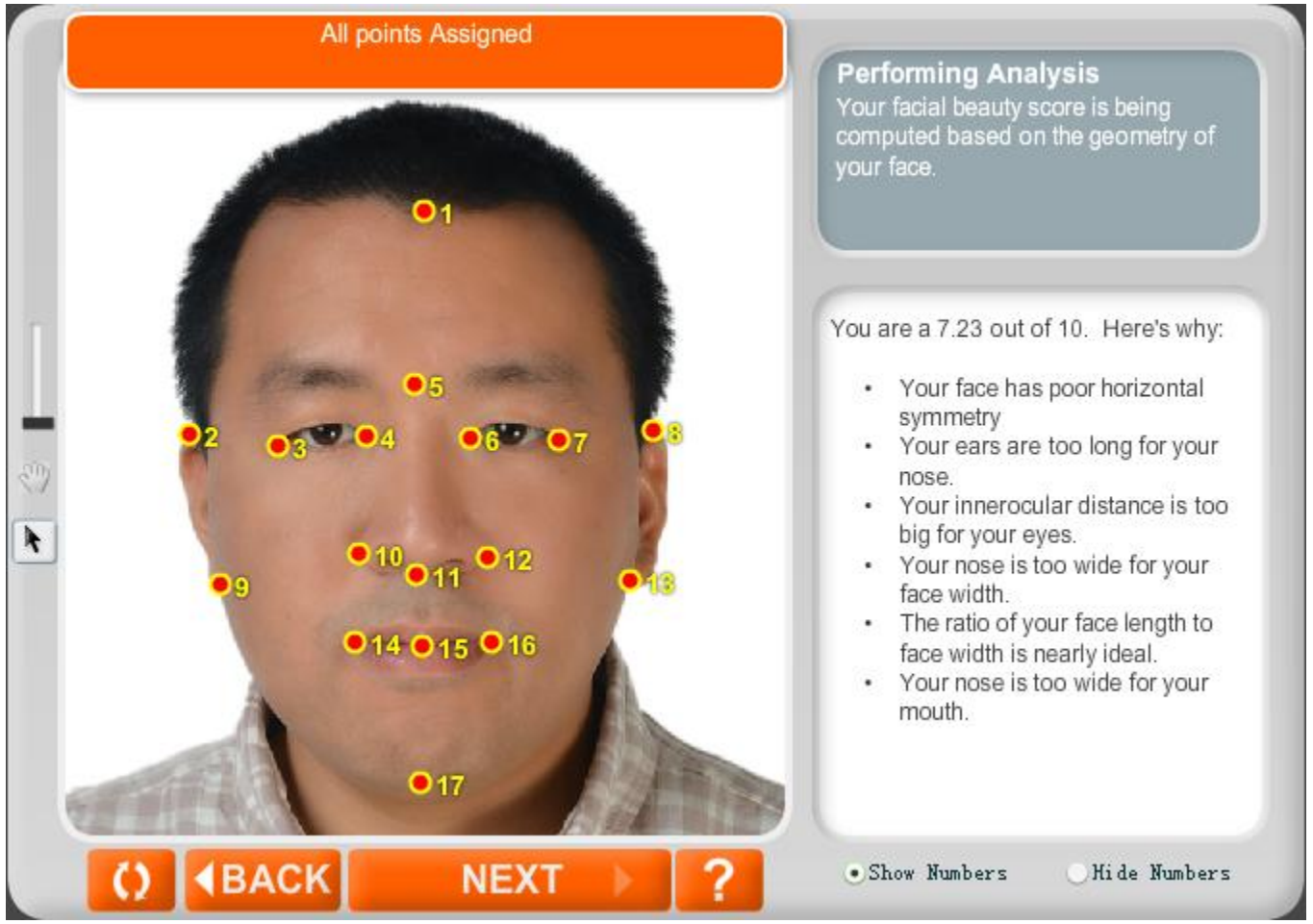


- Input: set of calibrated images and mesh of object
- Output: atlas and texture

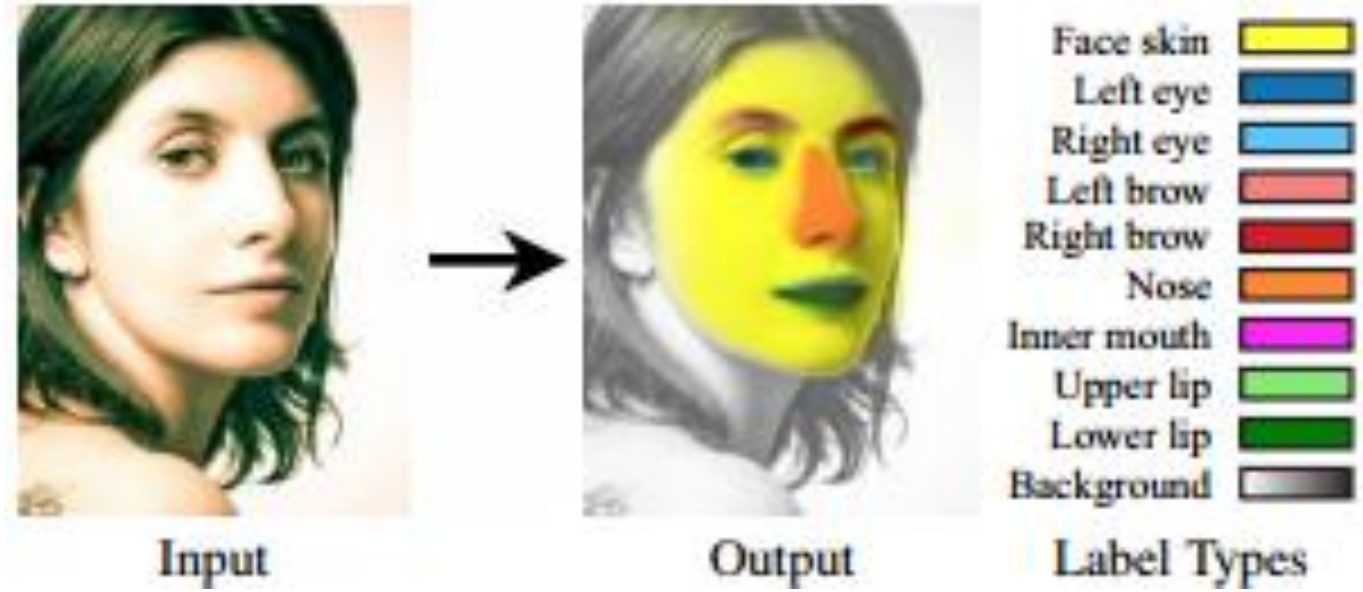
Evolutionary Biology



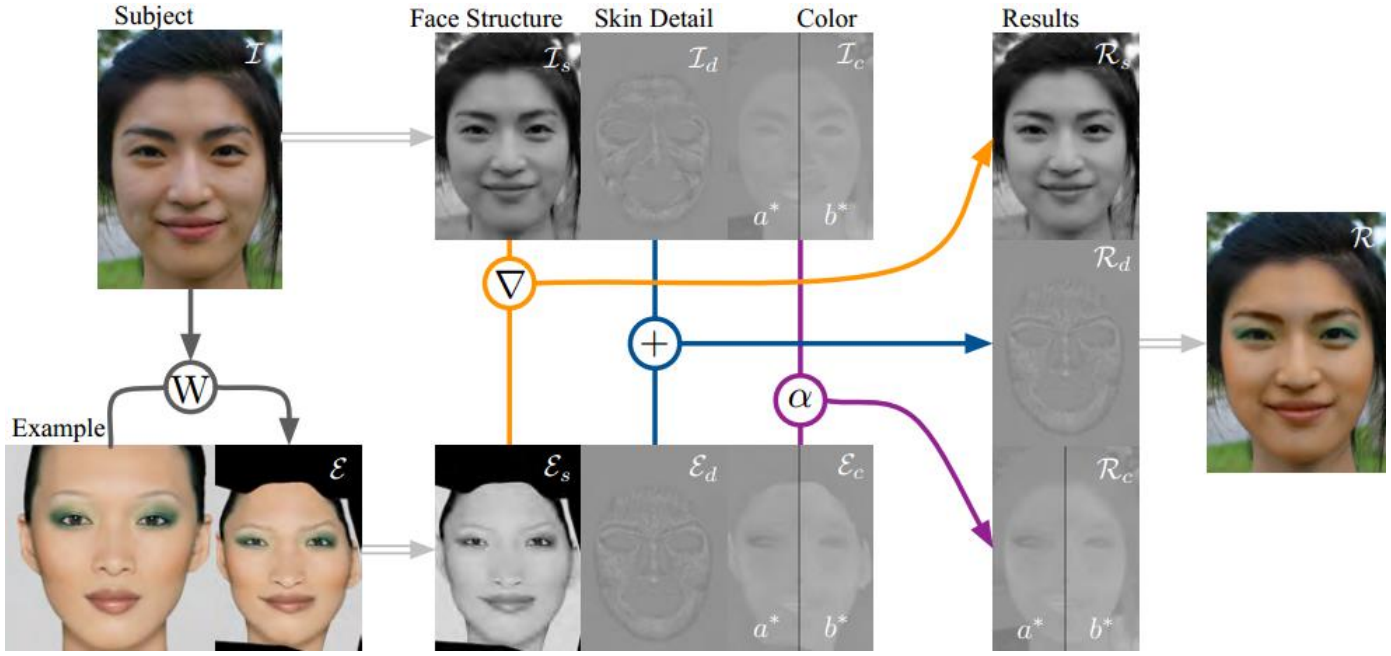
Computational aesthetics



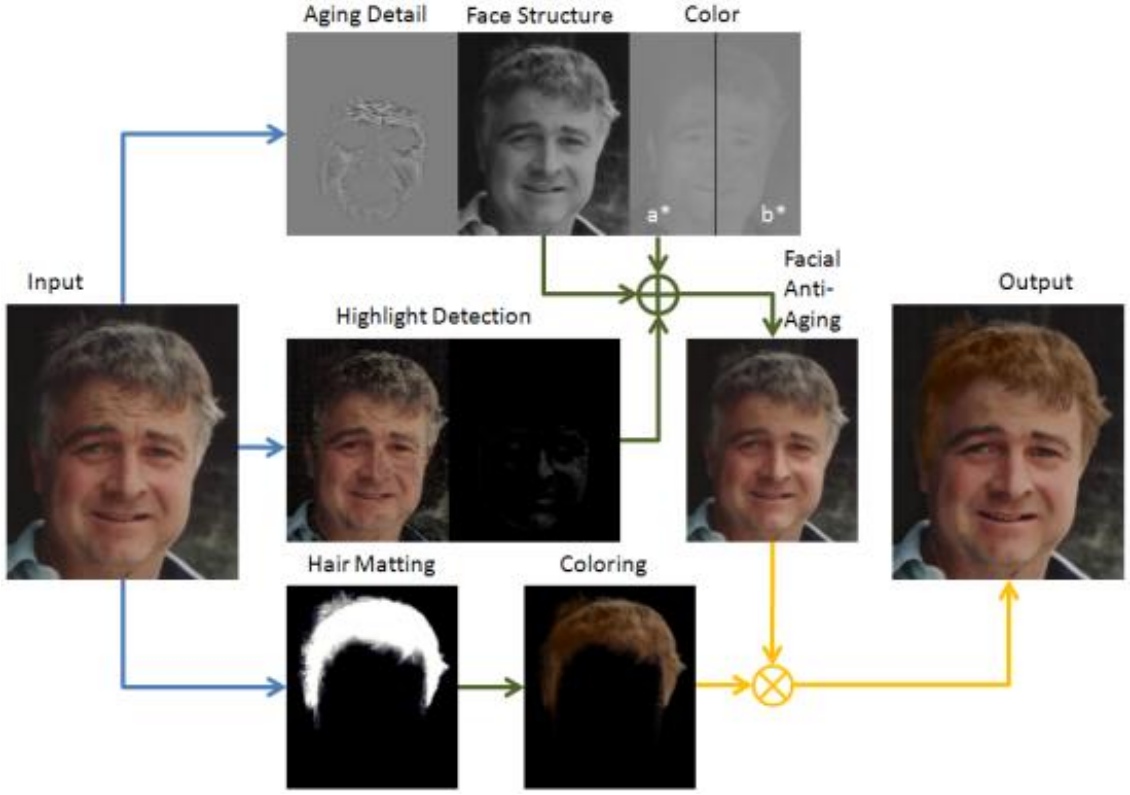
- [Facial Beauty Analysis - Score Your Face]



Cvpr13_Exemplar-Based Face Parsing

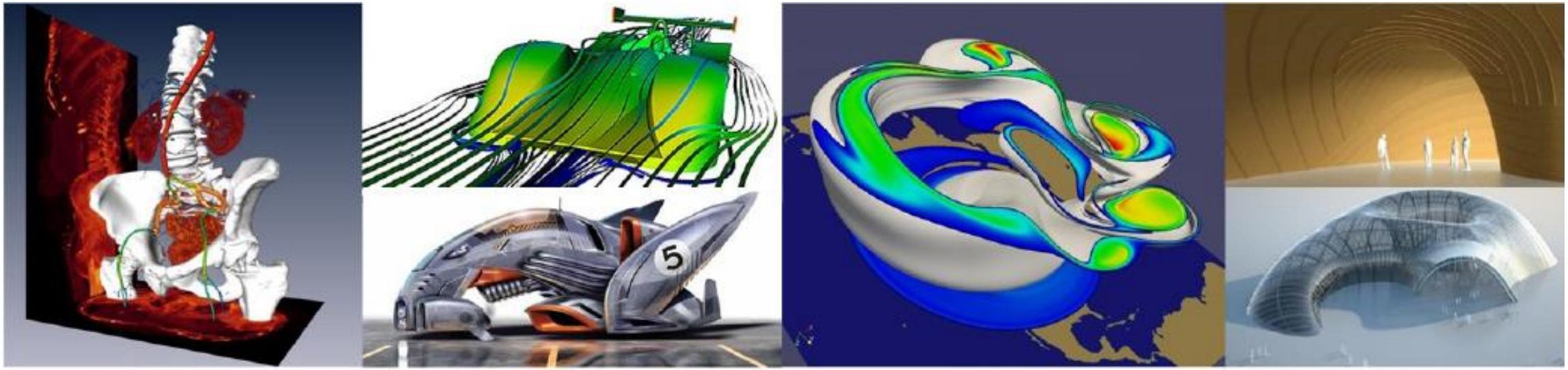


cvpr09_Digital Face Makeup by Example



Iccv11_Digital anti-aging in face images

Applications

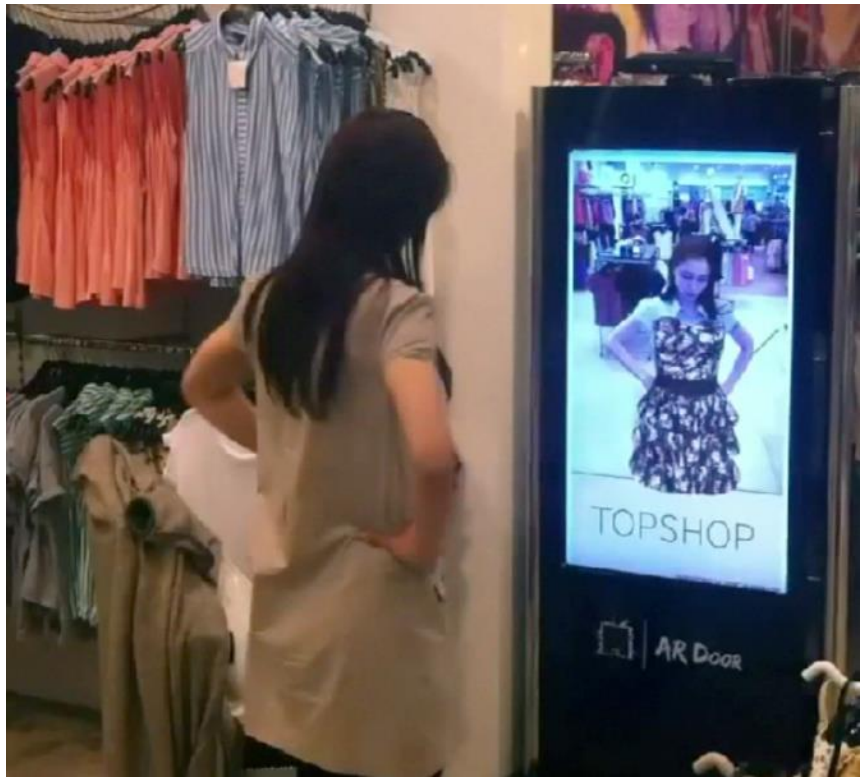


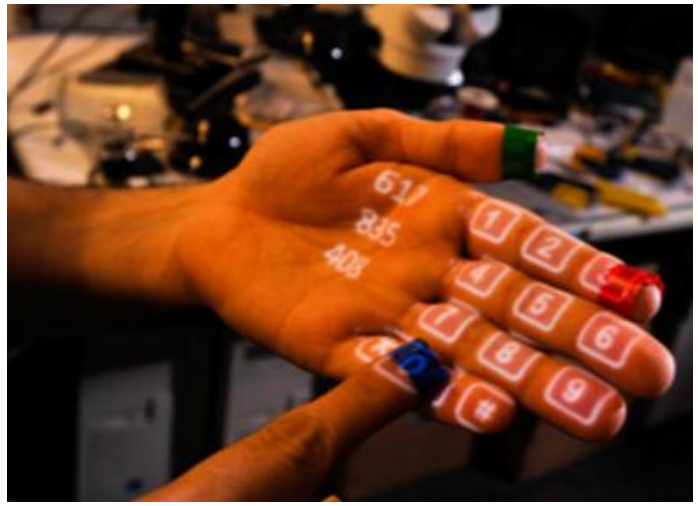
(a)数字医疗　(b)汽车设计　(c) 大气模拟　(d)建筑设计

(e)地形分析　(f)虚拟现实　(g)影视娱乐　(h)虚拟科学实验

Digitized Future

Webcam Social Shopper: the virtual dressing room

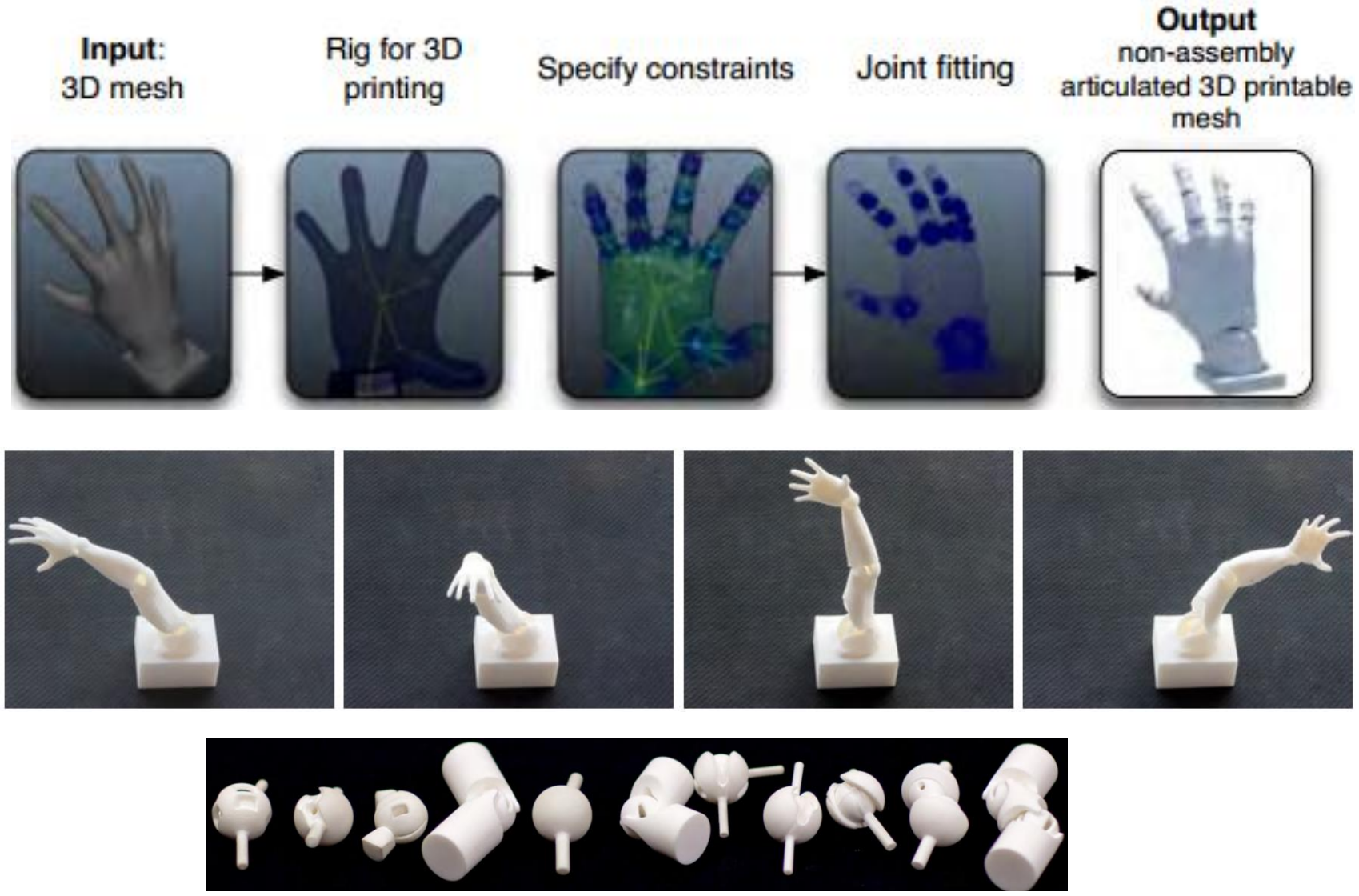




In laptops, tablets, smartphones

From Capture to Fabrication

Siga12_3D-Printing of Non-Assembly, Articulated Models



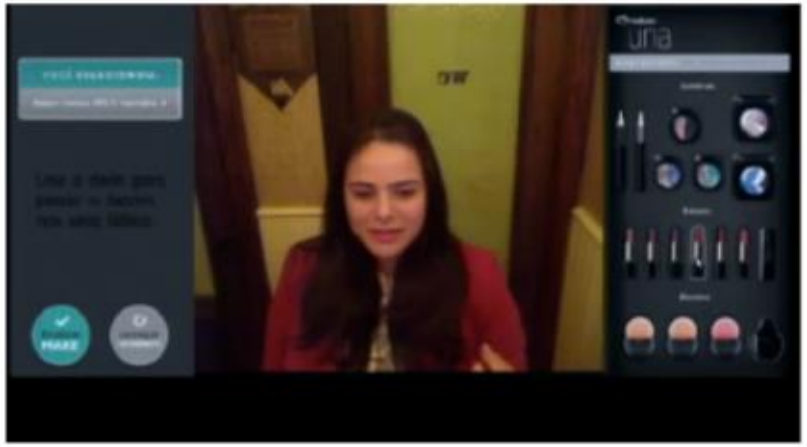
Realtime Future

Why Realtime?

VFX/Game Production

Virtual Avatars

Robotics



AR/Virtual Mirror

Realtime Facial Performance capture

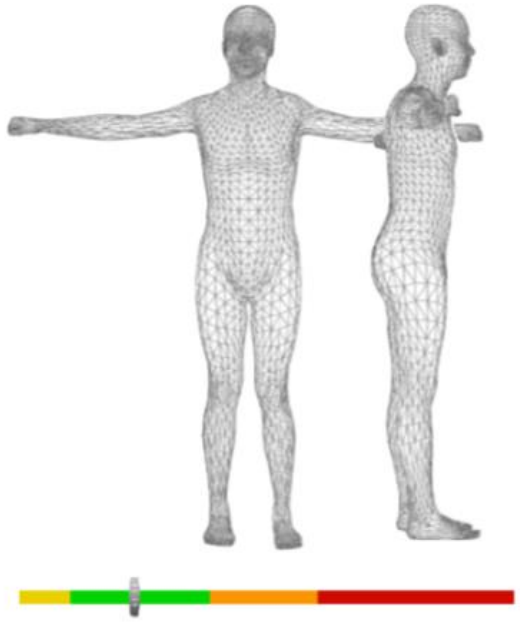
Siga10_A Practical Appearance Model for Dynamic Facial Color

Personalized Future

3D Self-Portraits

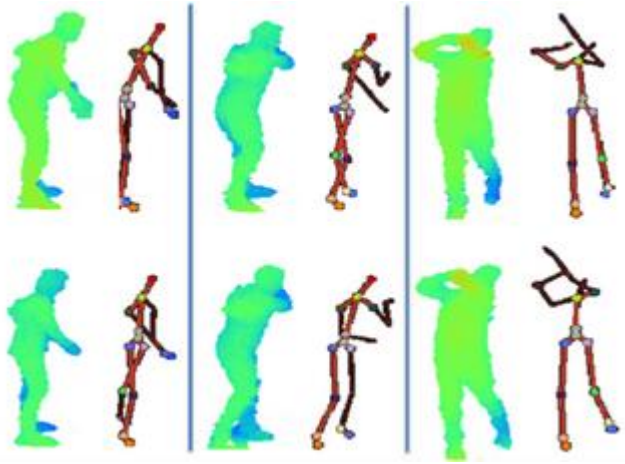
Personalized Applications

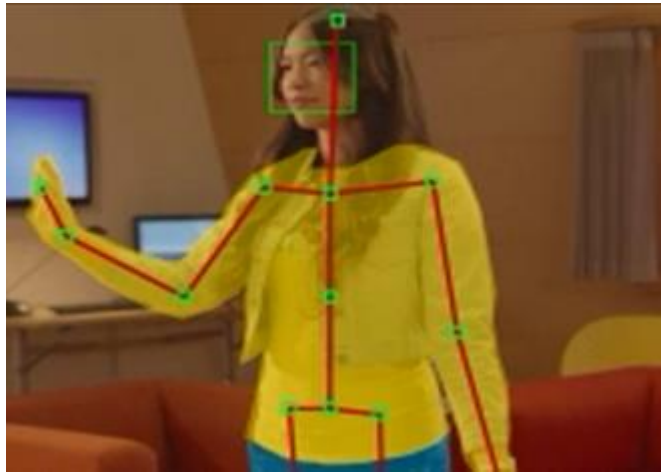
entertainment



fitness

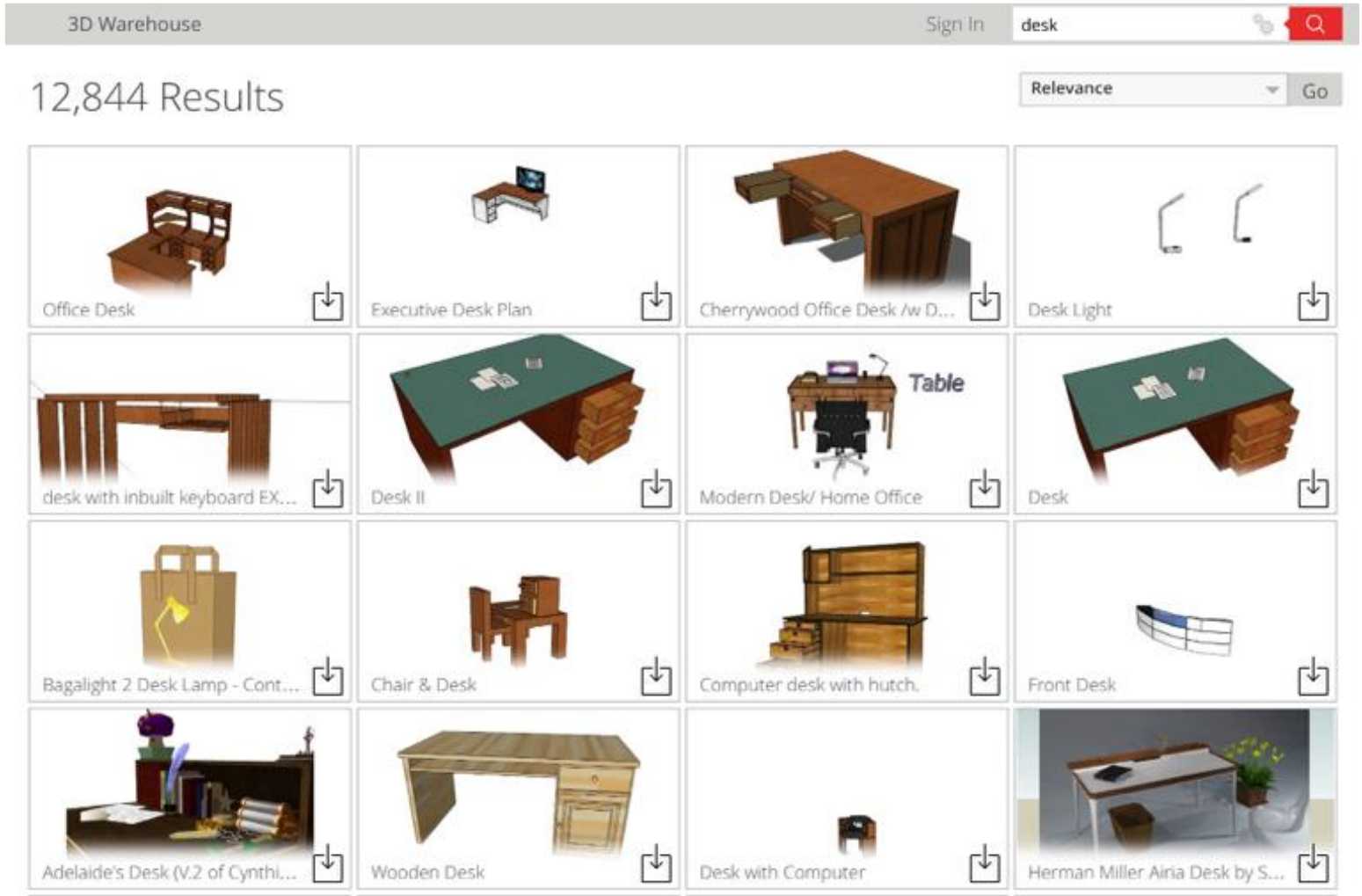
digital garment

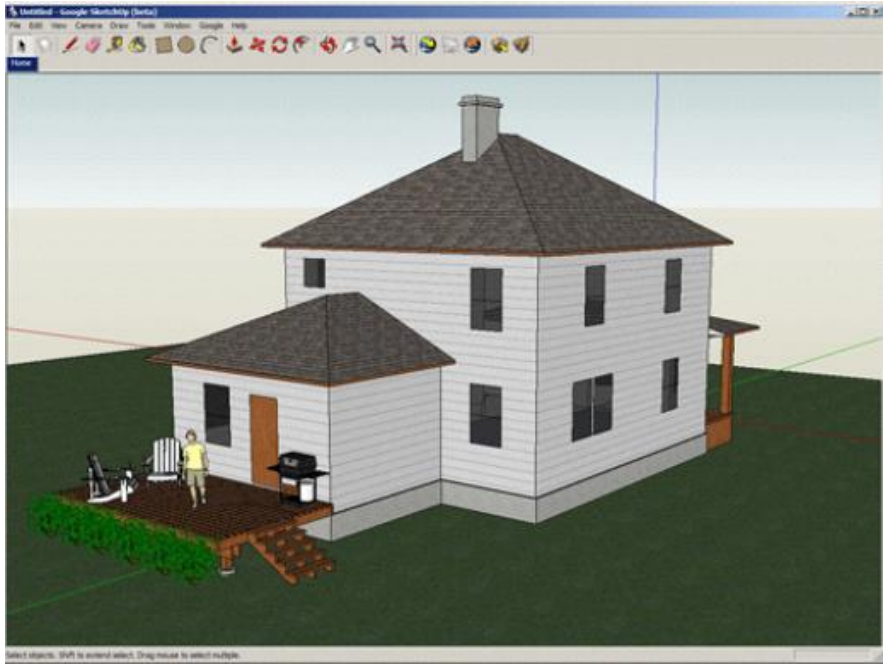




Big data

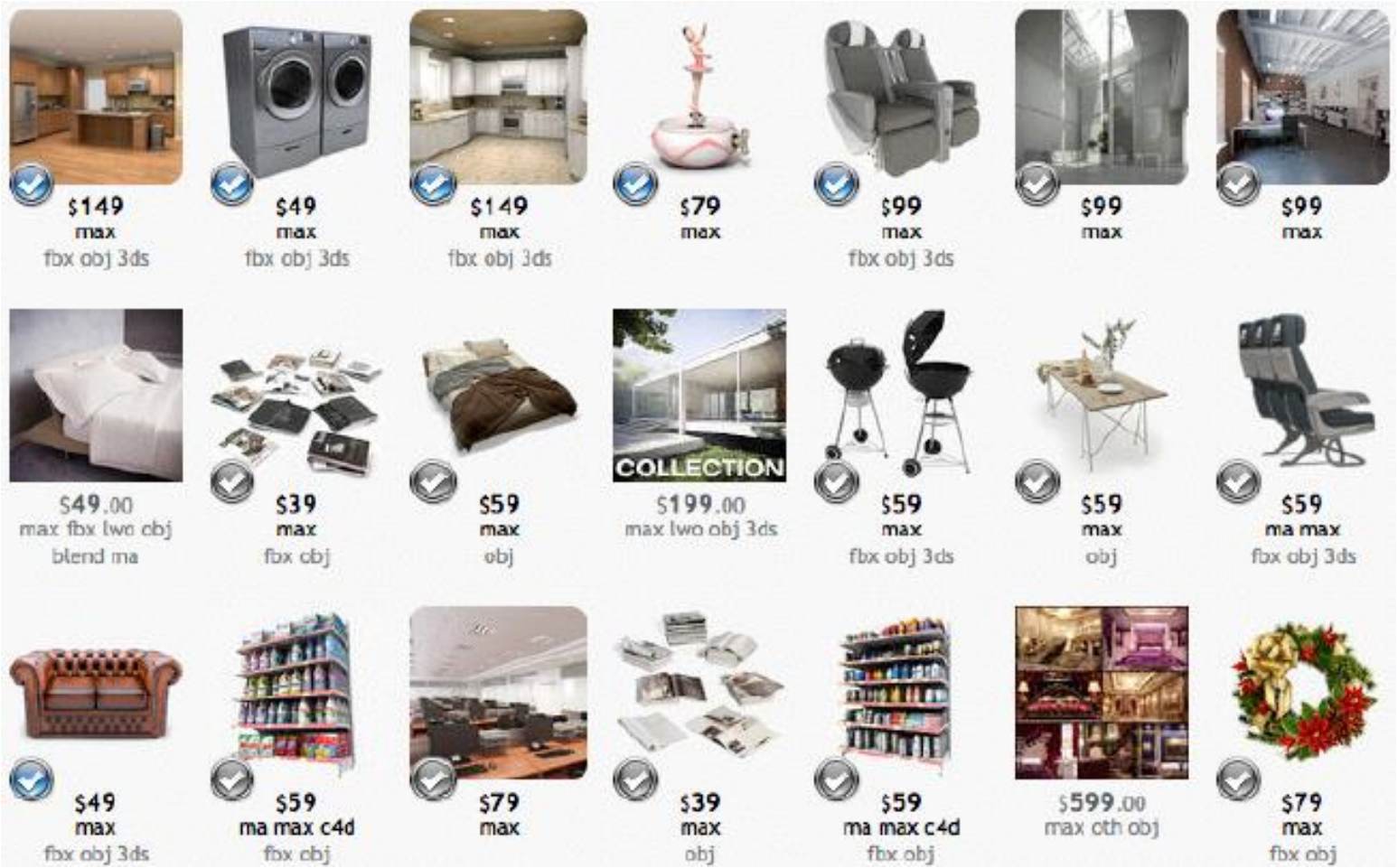
Large and growing repositories of 3D Models

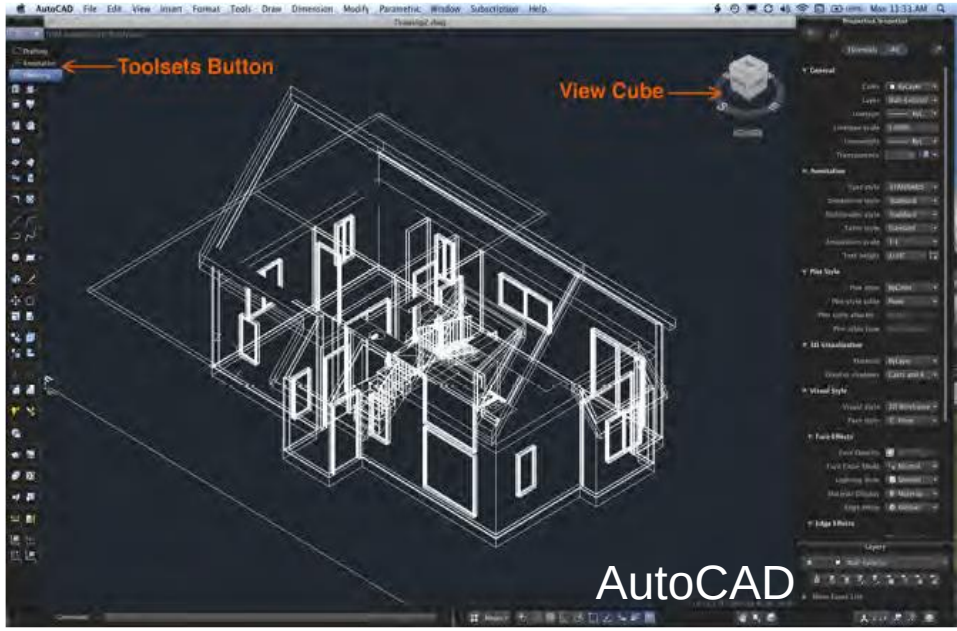




Trimble 3D Warehouse
powered by Google

Large and growing repositories of 3D Models



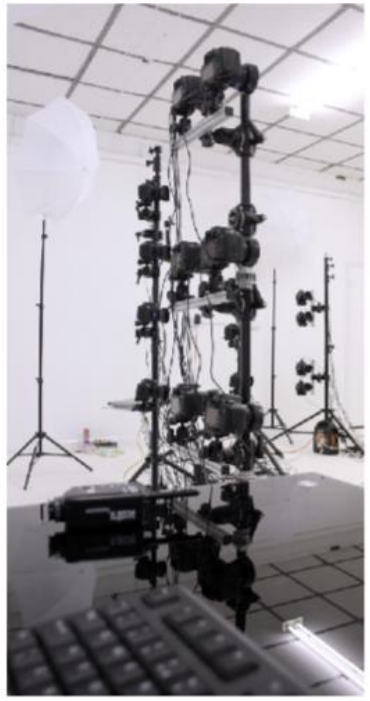


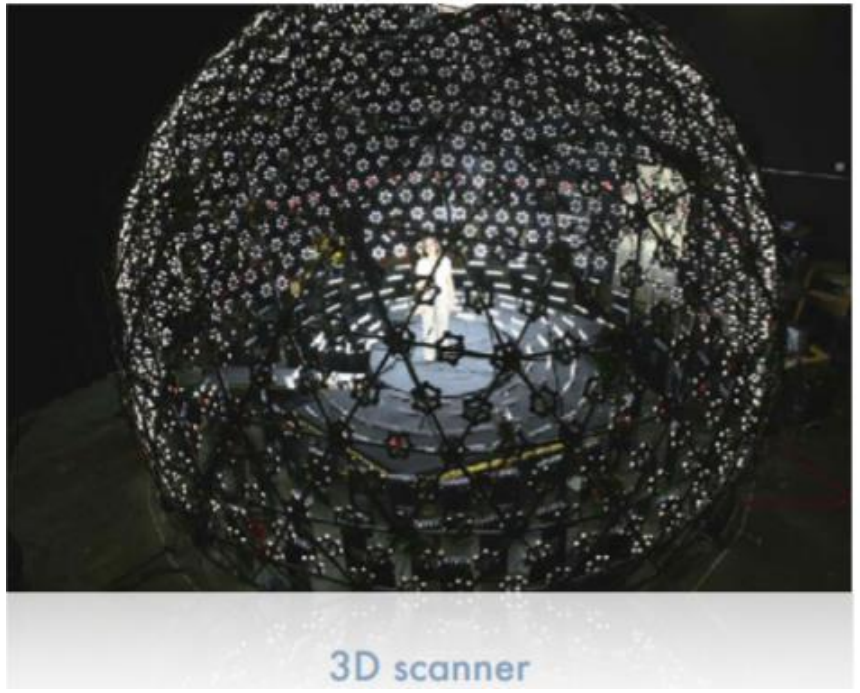
TurboSquid

Digimation

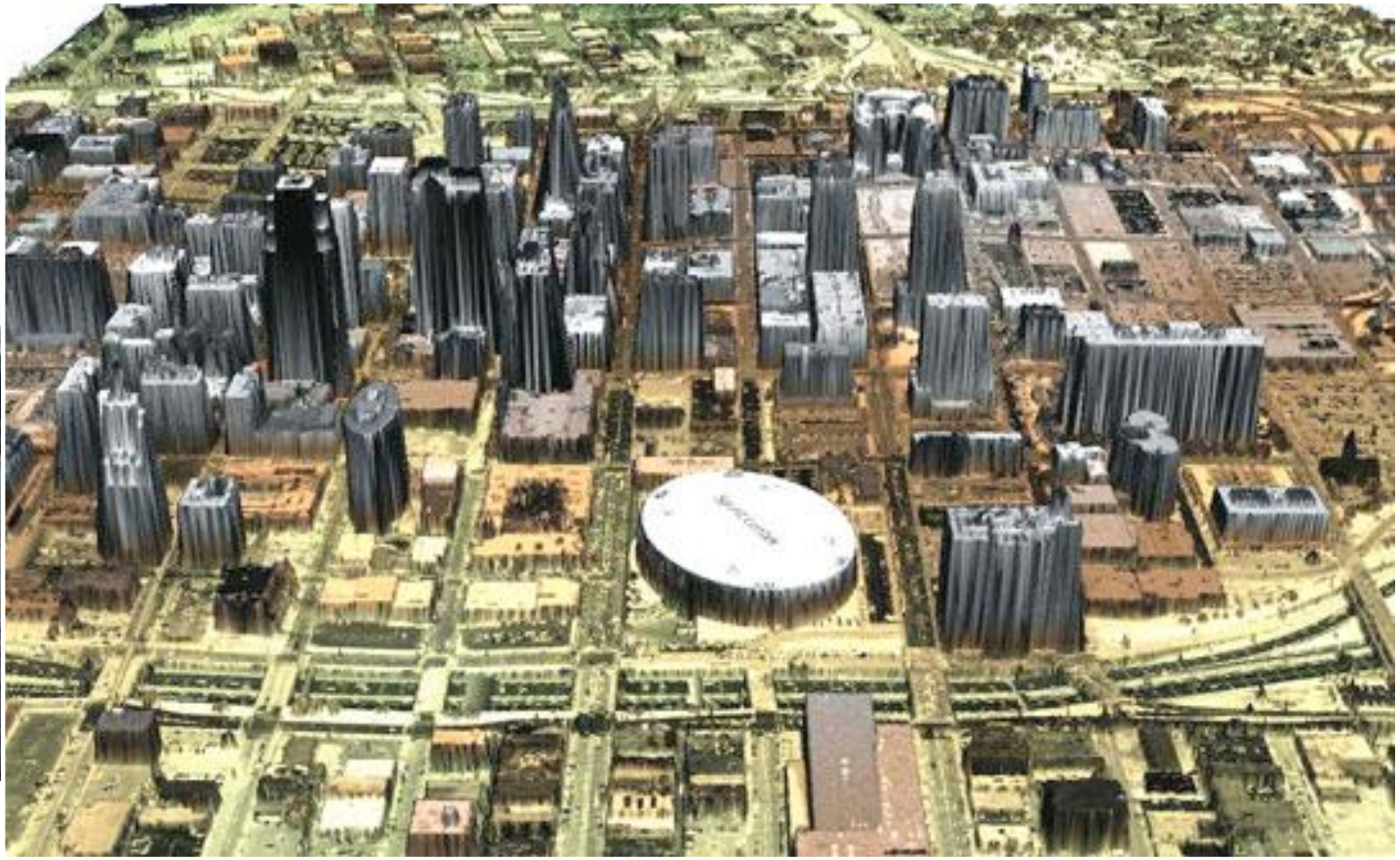
ZBrush

Large and growing repositories of 3D Models



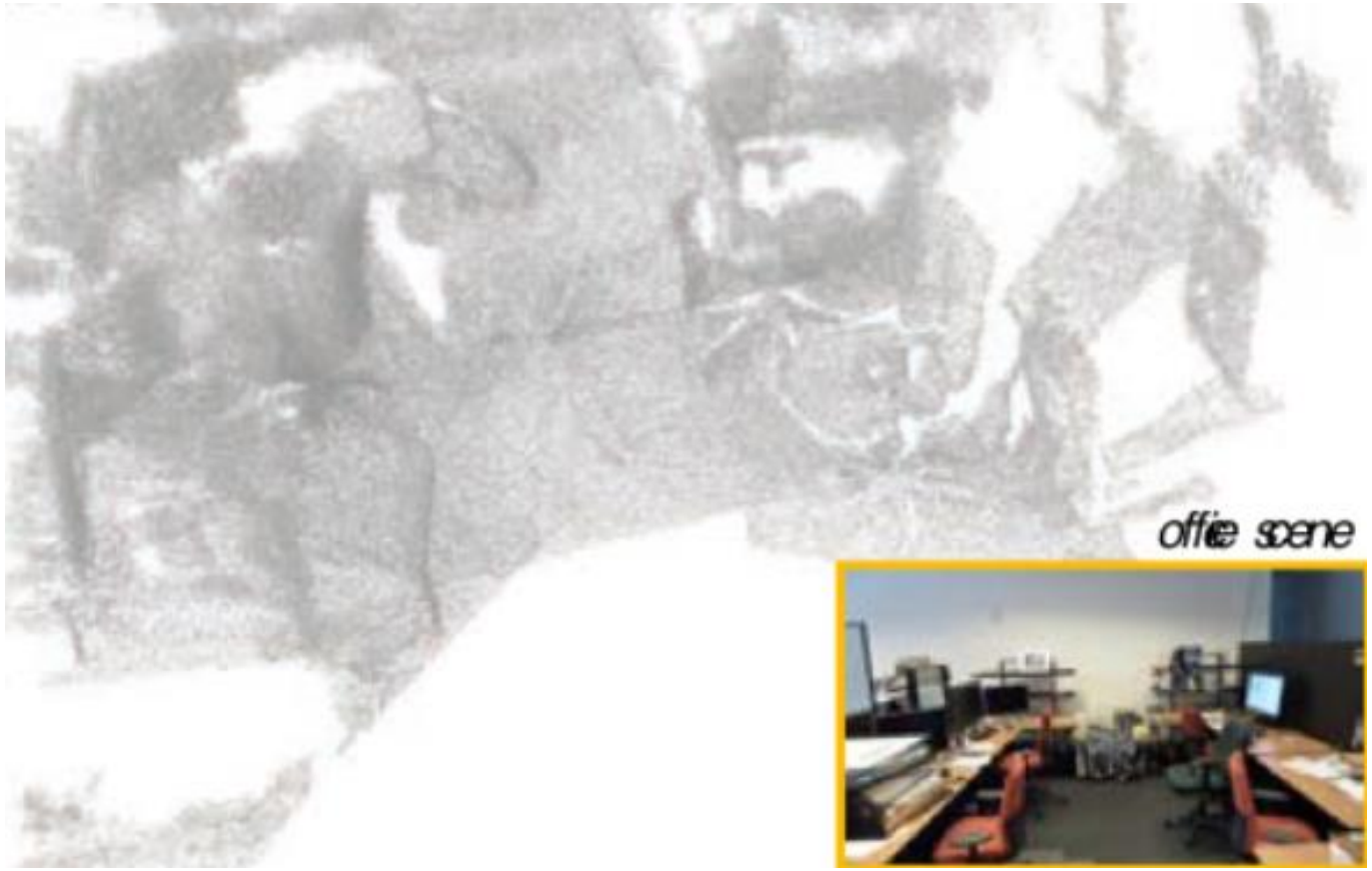


Large and growing repositories of 3D Models



Large and growing repositories of 3D Models

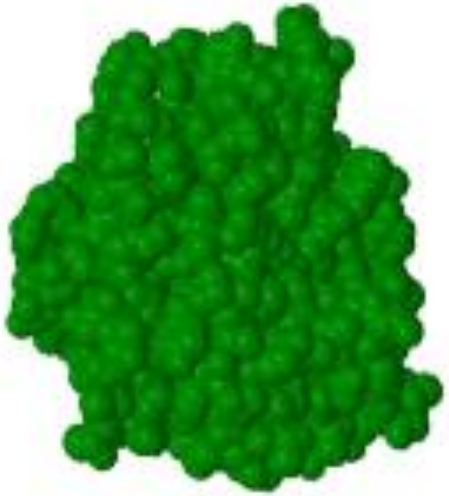
For Everyone



RGB-D data

Motivation

- **Lots** of geometric data in different domains!



Molecular Biology

Medicine

Engineering

Cultural Heritage

Paleontology

Computer Graphics

microscope

ultrasound

MRI scanner

x-ray diffractometer

Geometry

γεωμετρία

stereo camera

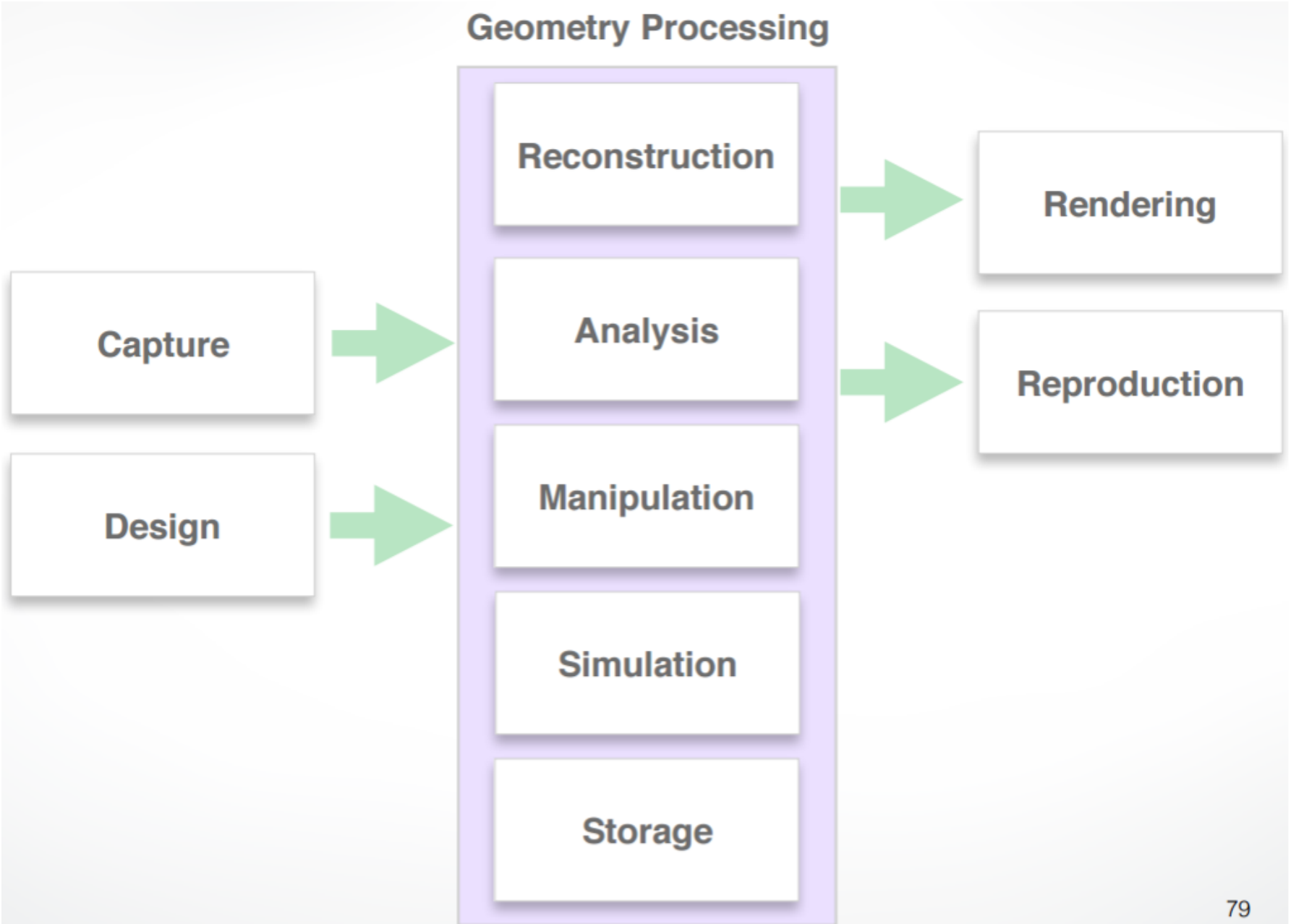
radio telescope

laser scanner

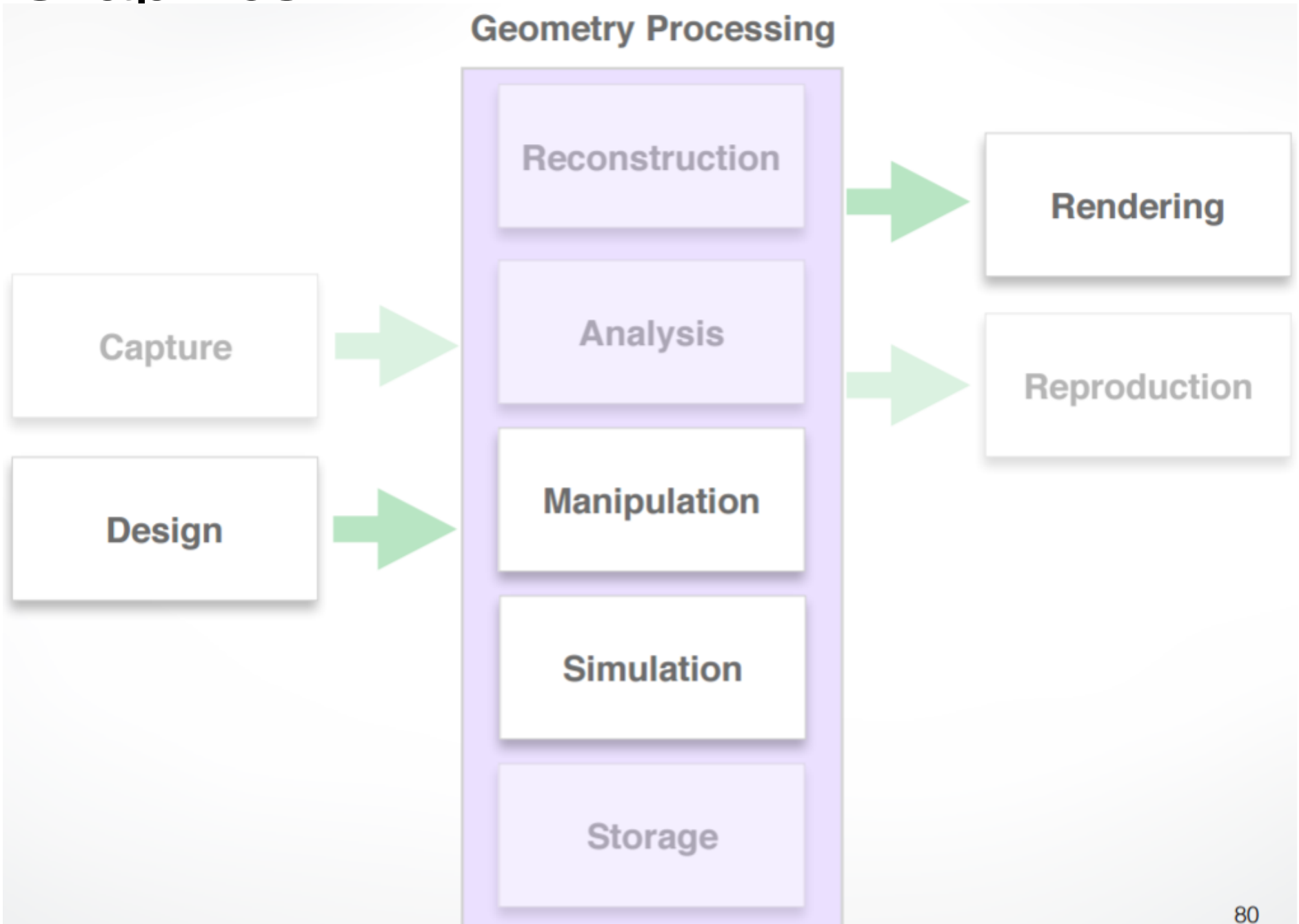
time-of-flight scanner

Summary

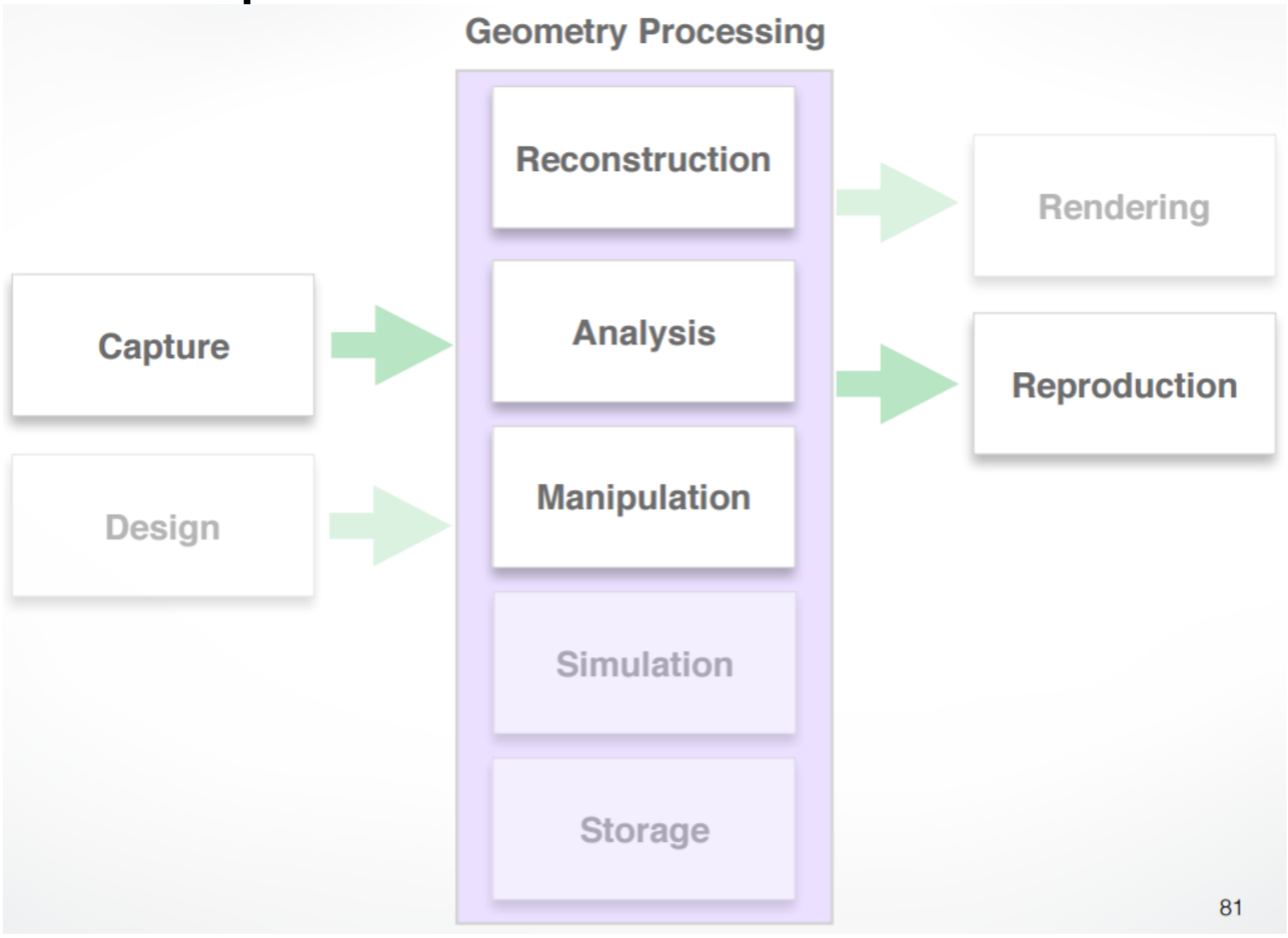
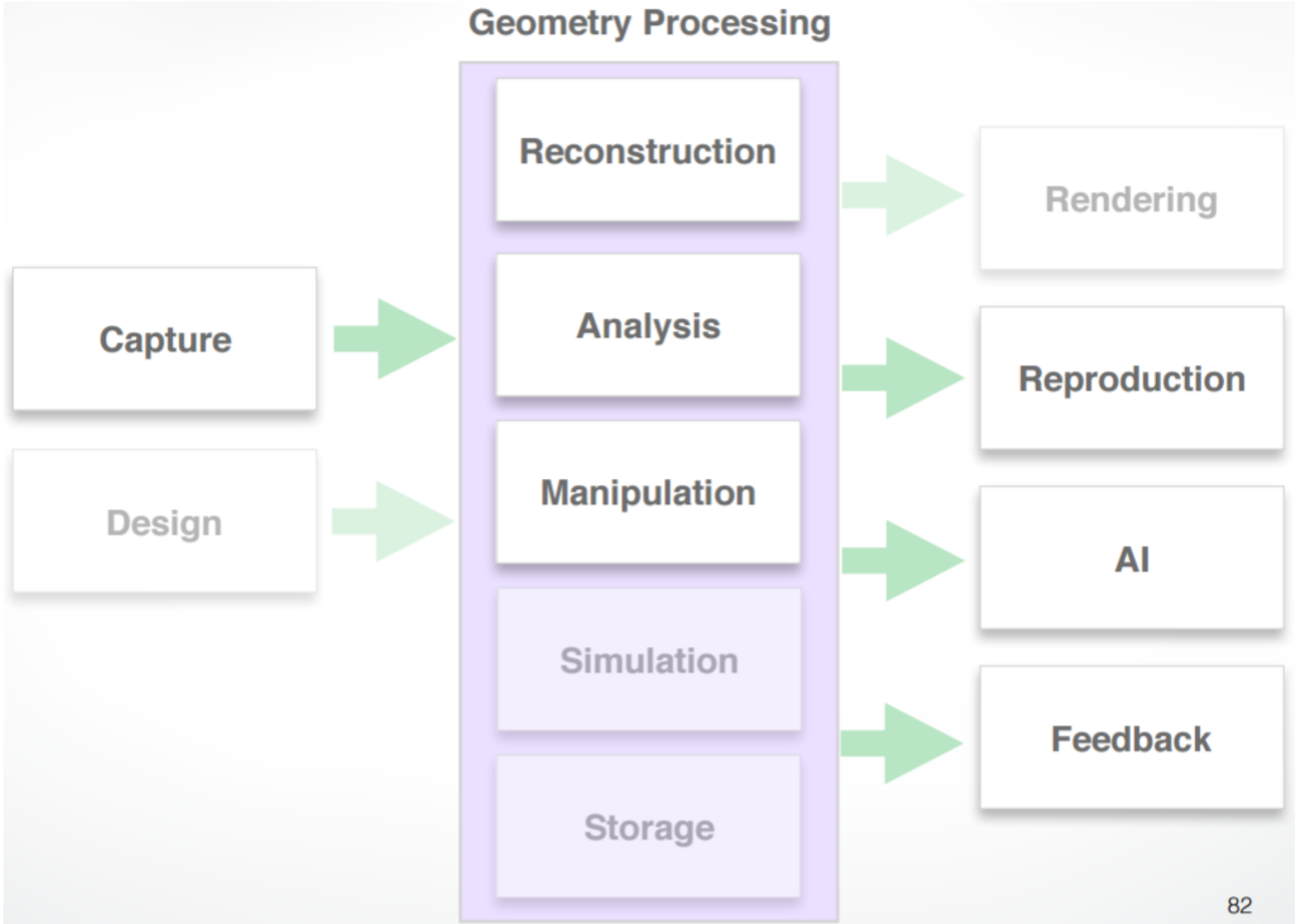
Summary


Geometry Processing
Reconstruction
Analysis
Manipulation
Simulation
Storage
Capture
Design
Rendering
Reproduction

Classic Graphics



Modern Graphics/Vision



The Future: Big Data / Robotics