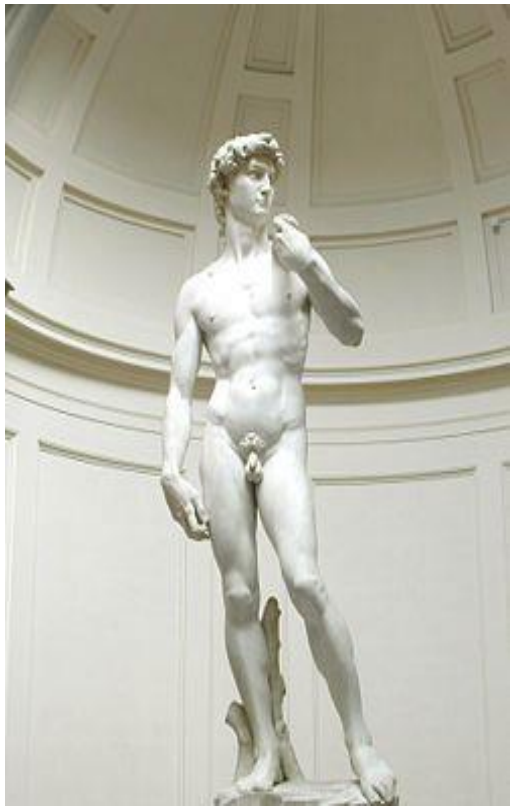
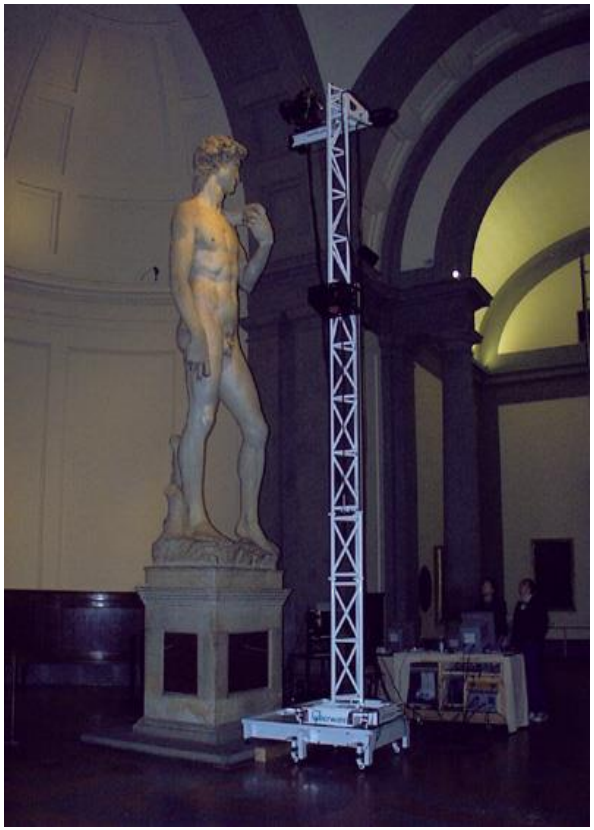
Acquisition pipeline

Umberto Castellani
Robotics, vision and control

Overall aim



Real Object



3D Scanning

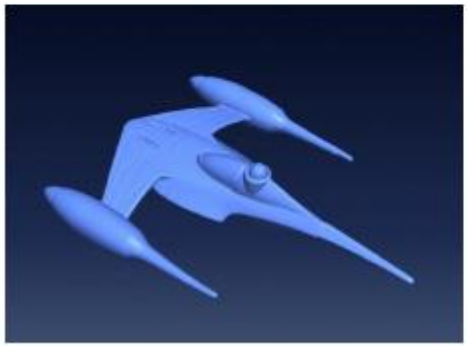
Virtual Model

https://youtu.be/r1e088hGee4

3D modelling from reality pipeline

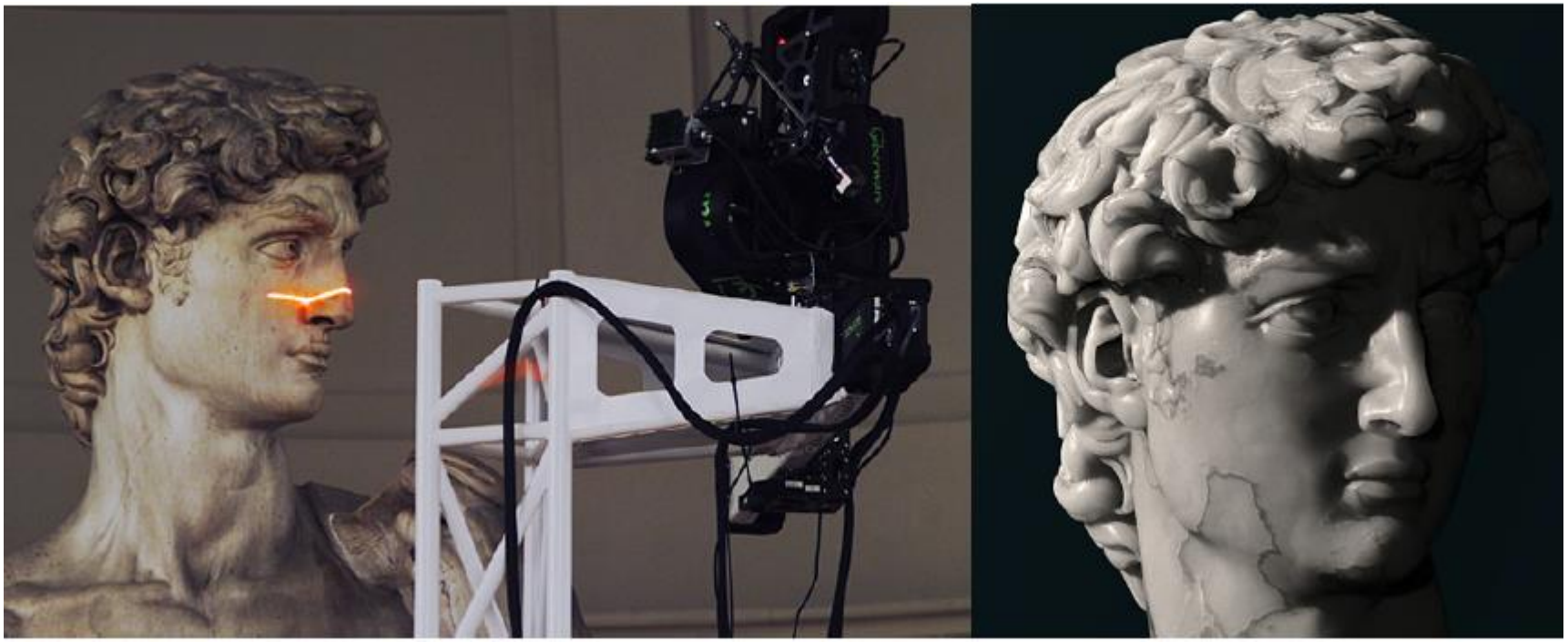
Acquisition

Range Scanners



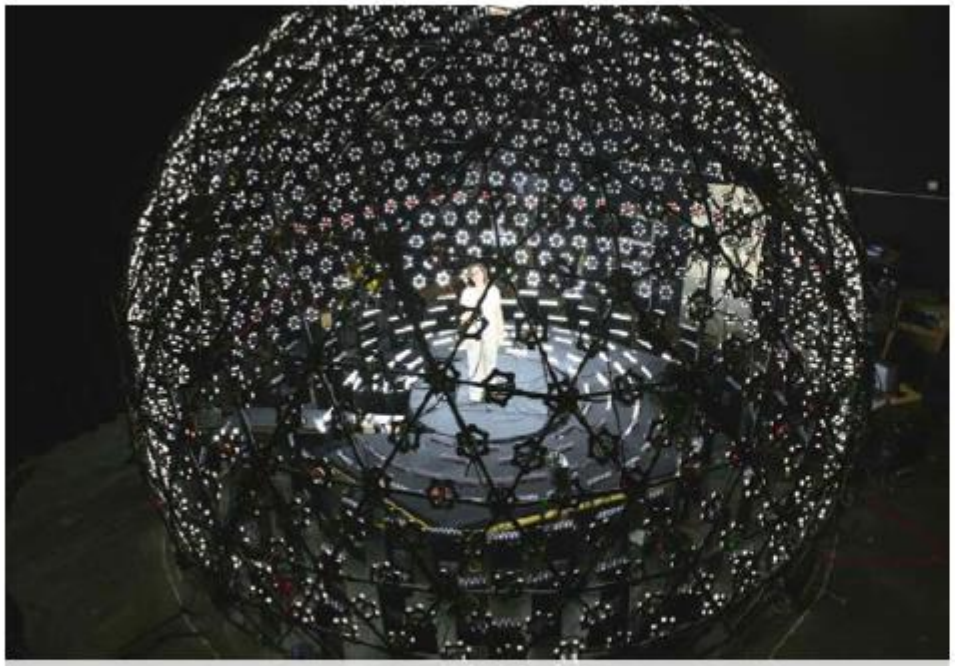
Acquisition

- Static object



Acquisition

- Full body

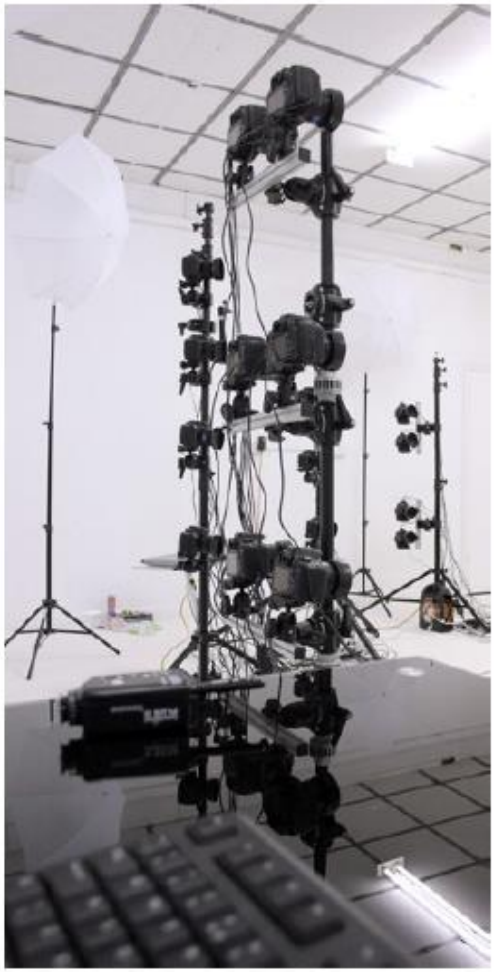


3D scanner

3D acquisition

Acquisition

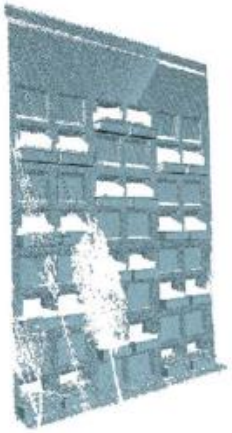
- Full body



Lee Perry-Smith, **Infinite Realities + Agisoft**

Acquisition

- Entire city

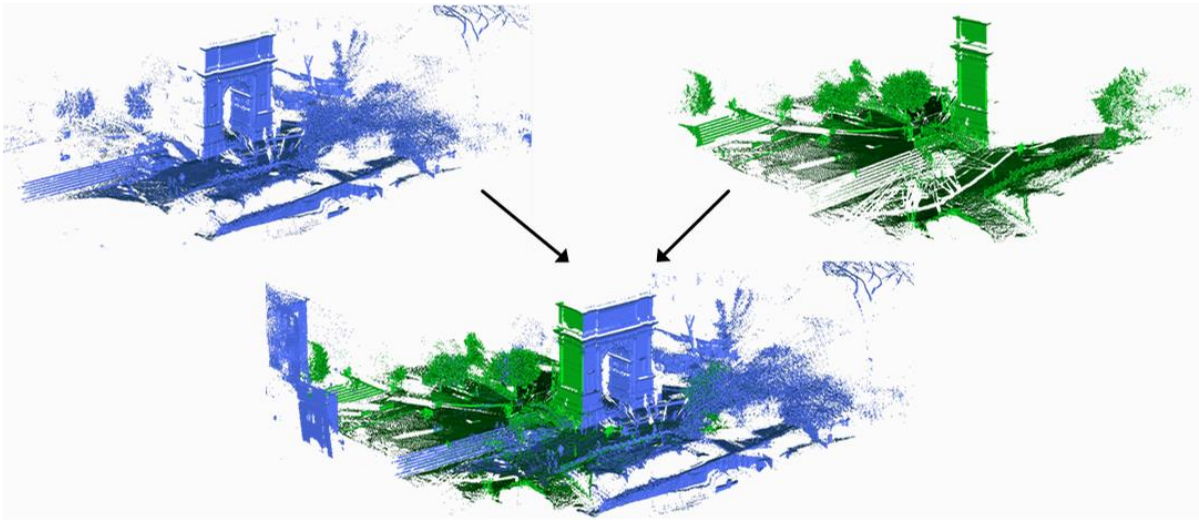


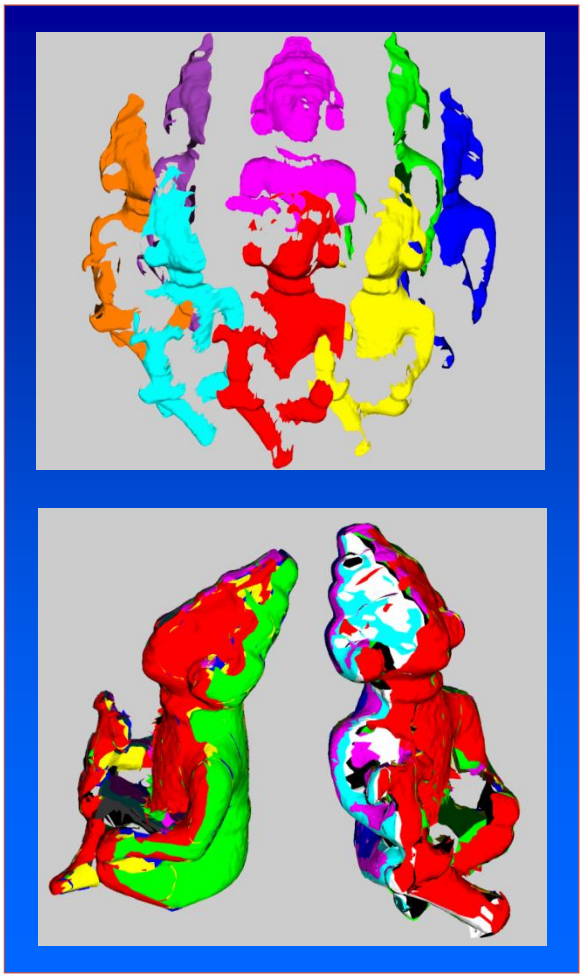
Acquisition

- Dynamic scenes

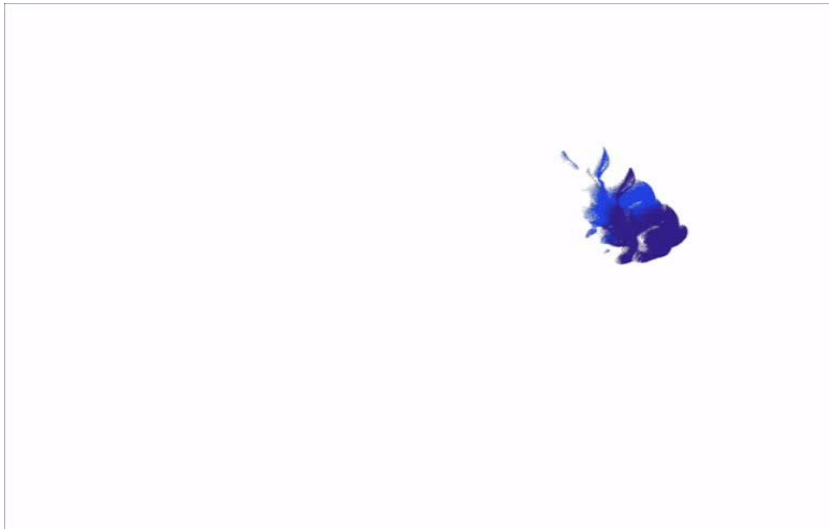
Registration

- Scanning technologies acquire partial views
- Registration aim at aligning views to bring them to the same (i.e., global) reference systems





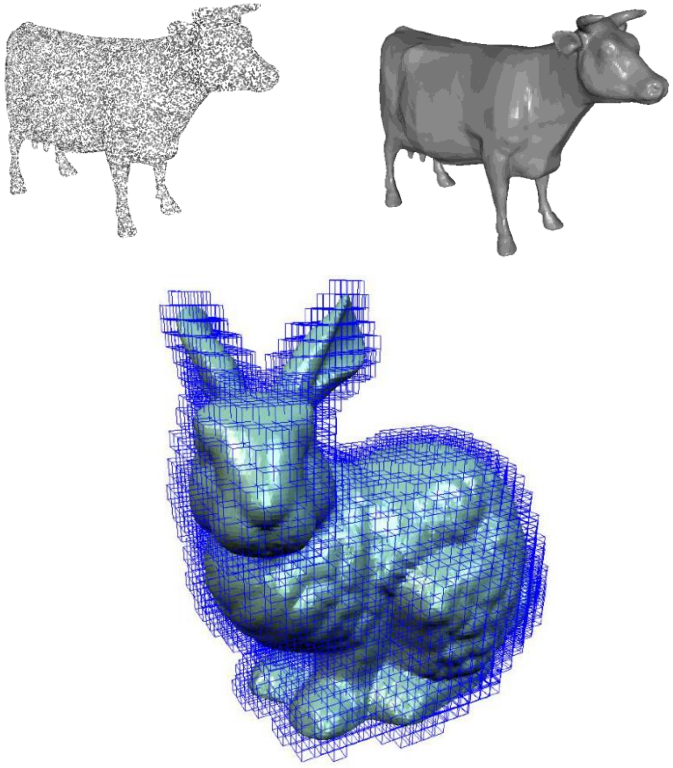
Registration



Multiple views

Meshing

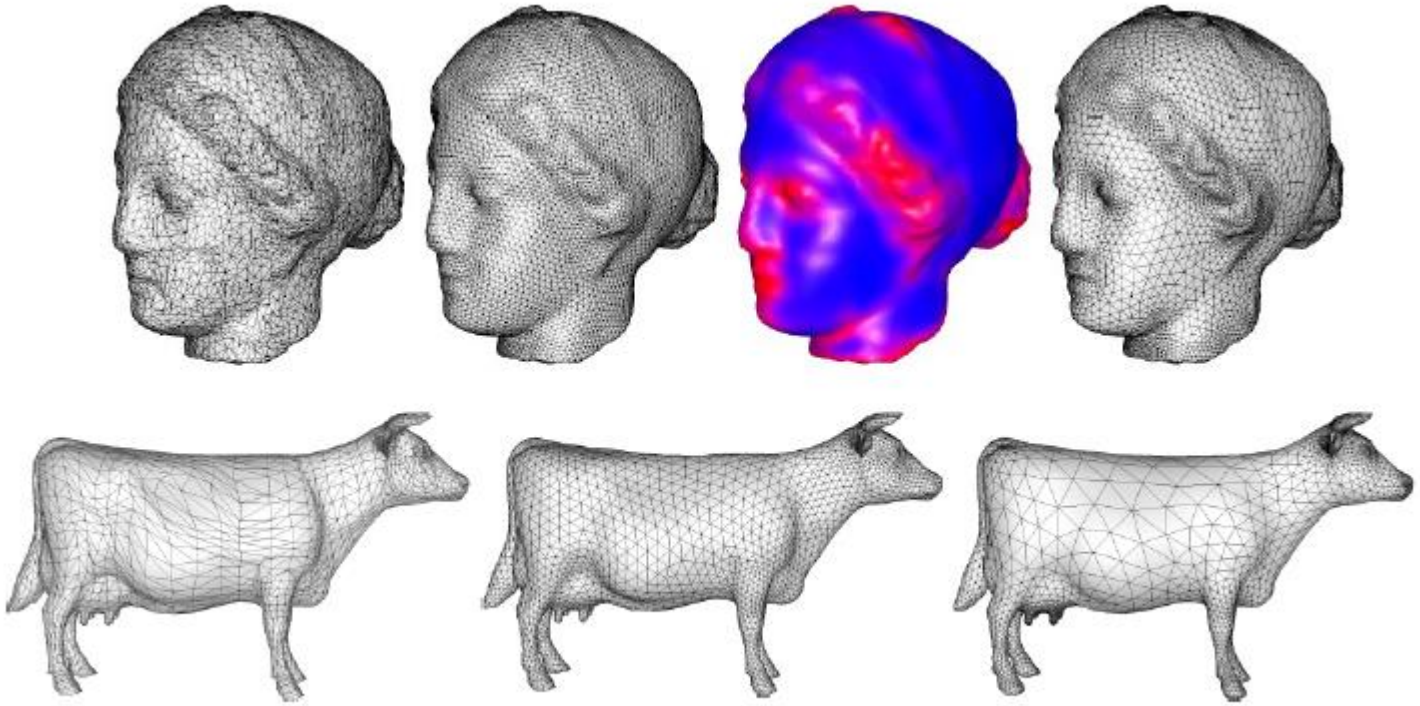
- Once views are aligned a merging procedure is required to obtain a single mesh of the entire object



Marching cube

Meshing

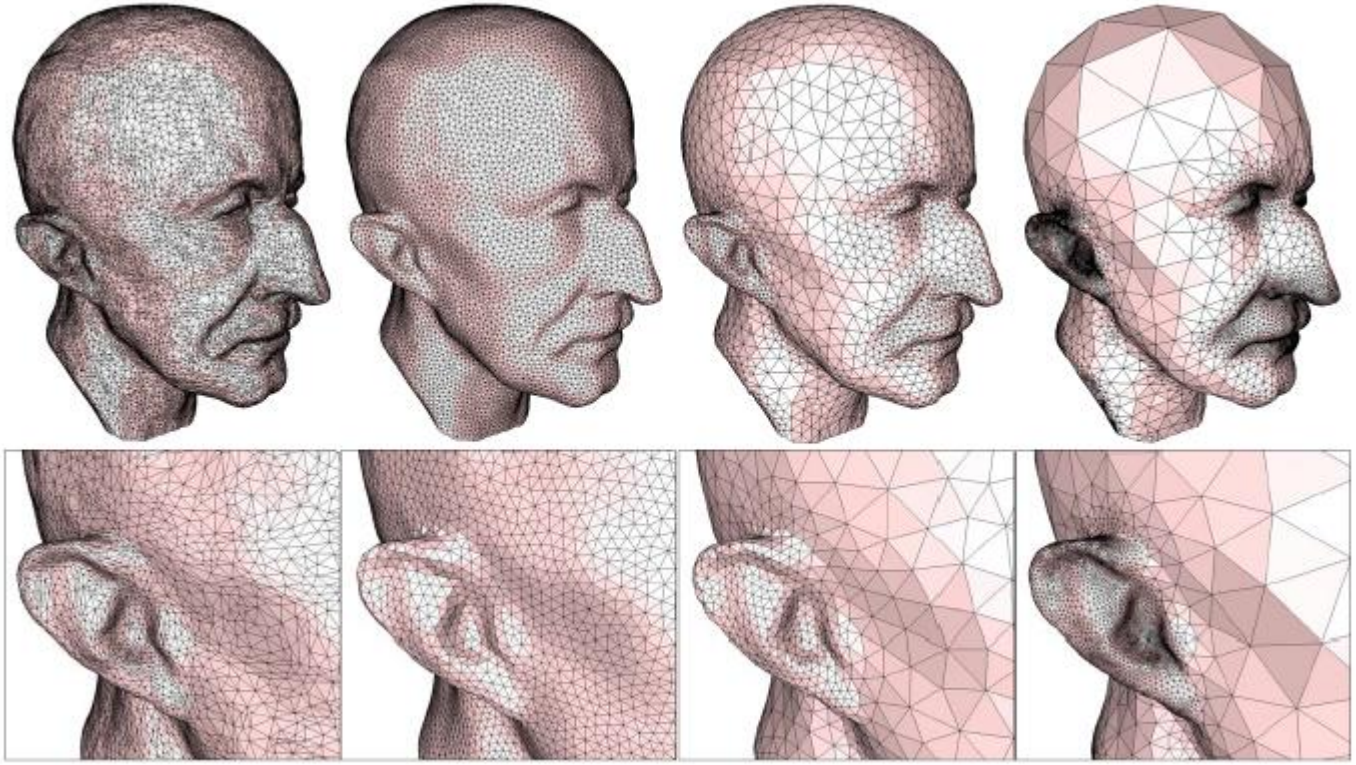
- Remeshing, level of details



High vs. Low poly

Meshing

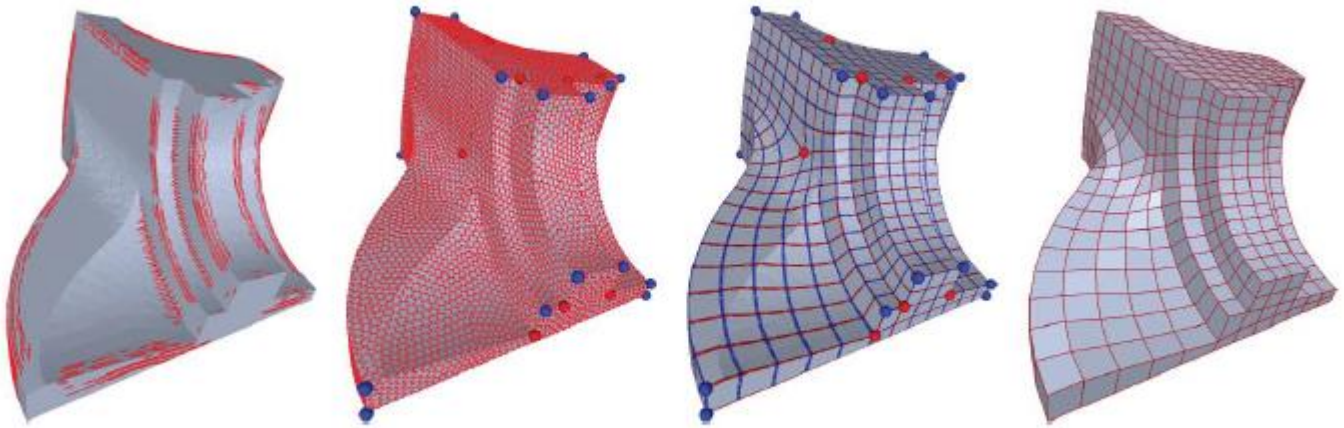
- Remeshing, tessellation contraints



Uniform vs. adaptive tessellations

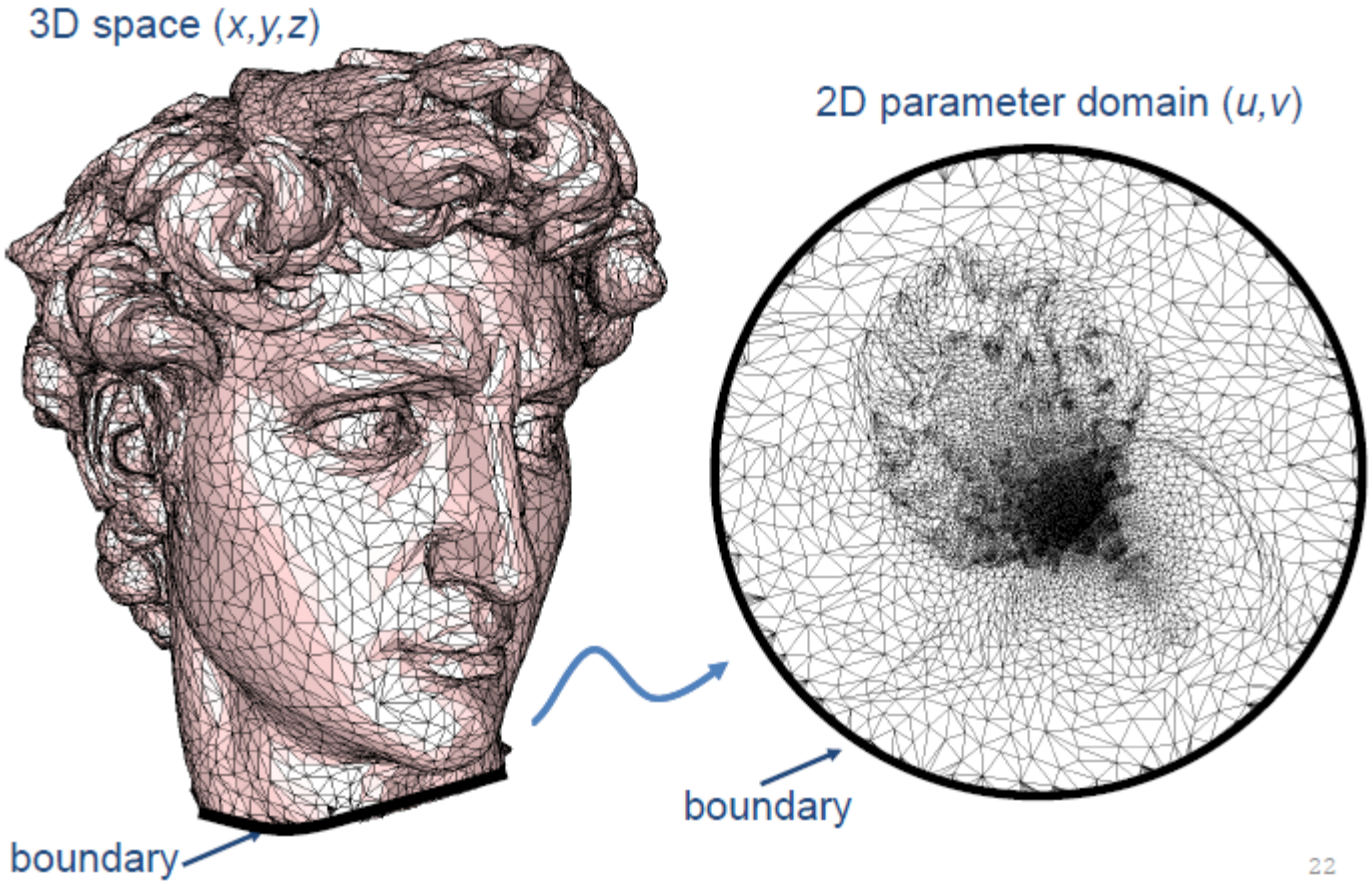
Meshing

- Quad remashing



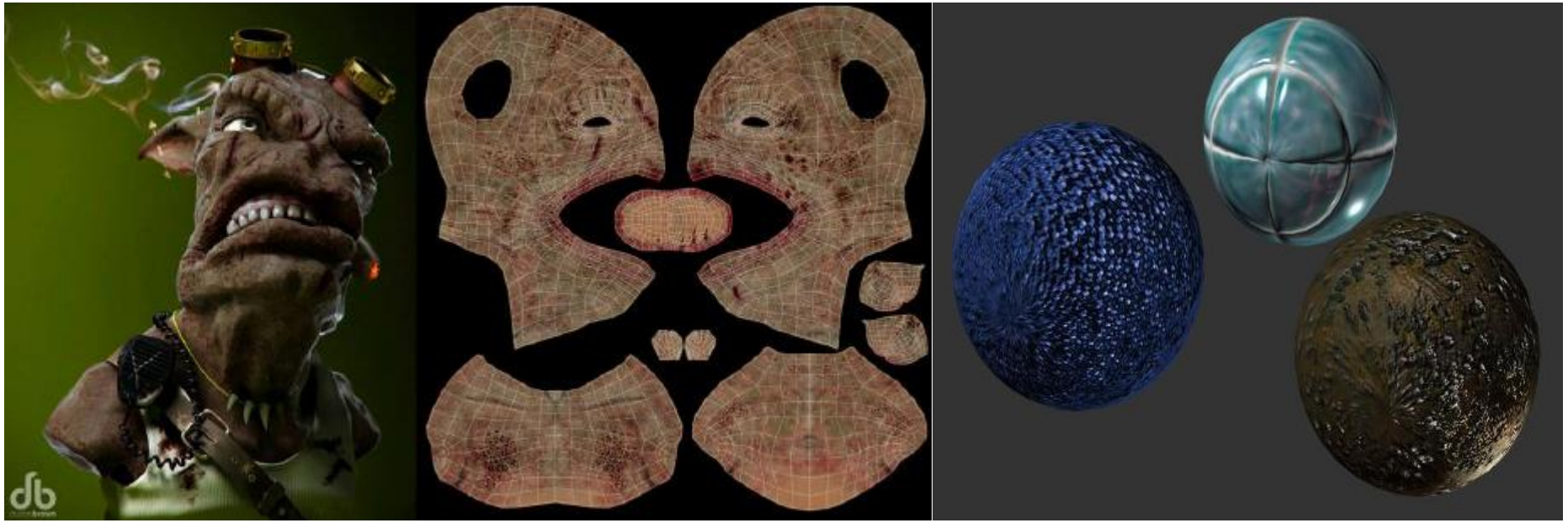
Advances

- Surface parametrization



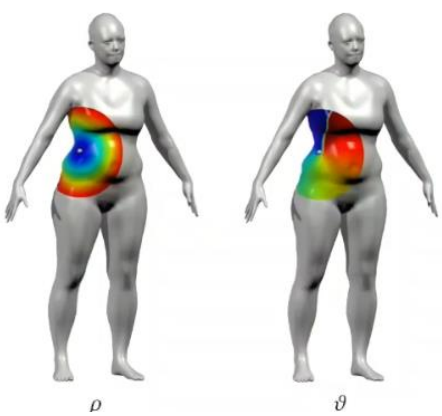
Advances

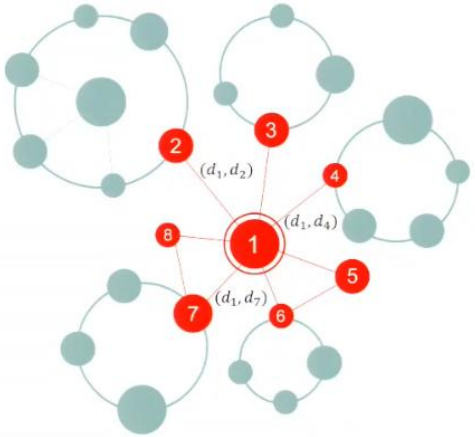
- Surface parametrization

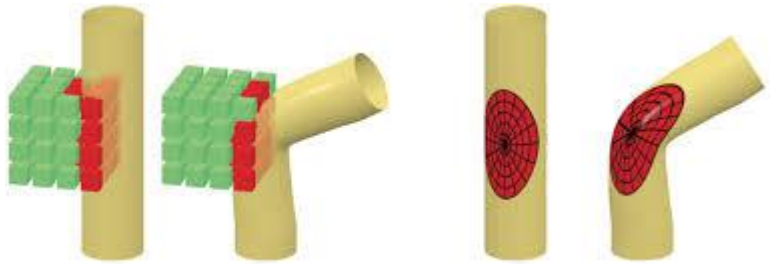


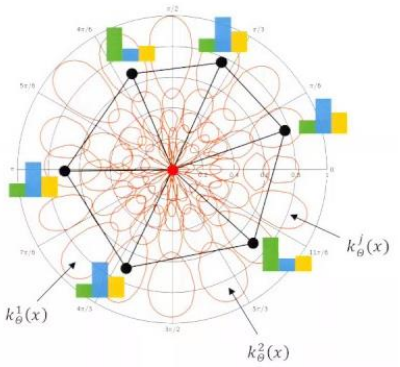
Texture mapping and image materials

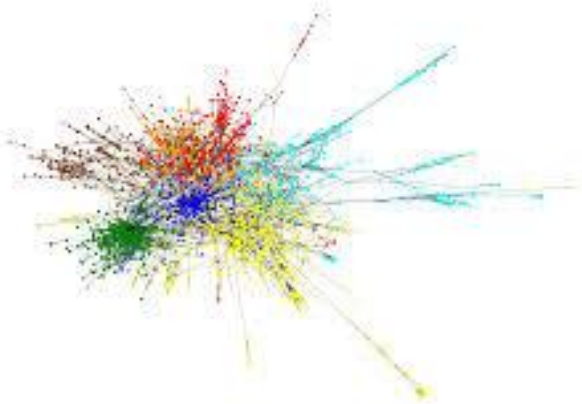
What next?





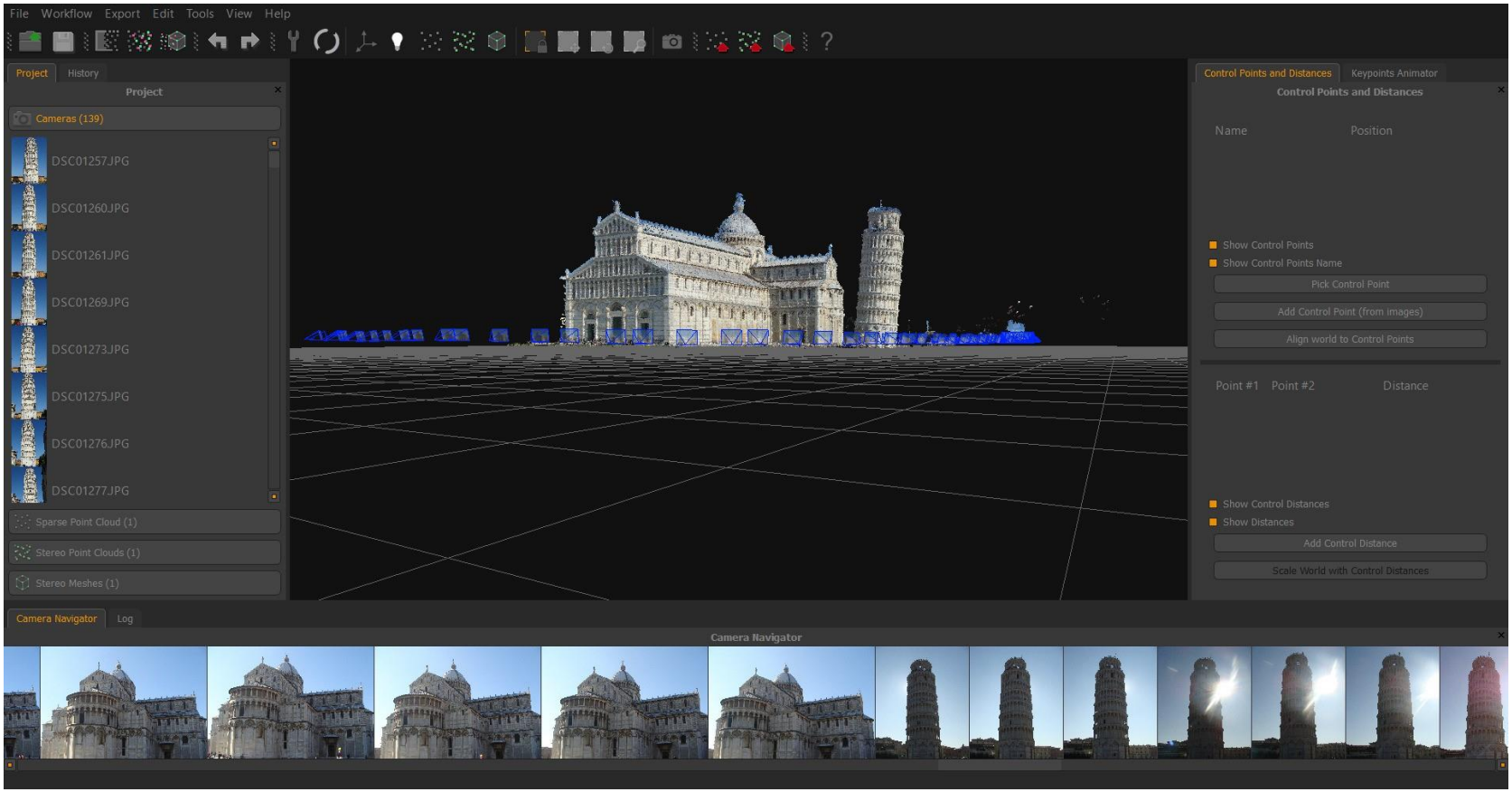






- **Geometric deep learning**: http://geometricdeeplearning.com/

Structure and motion



https://www.3dflow.net/3df-zephyr-photogrammetry-software//

3DF Zephyr Pro

Structure and motion

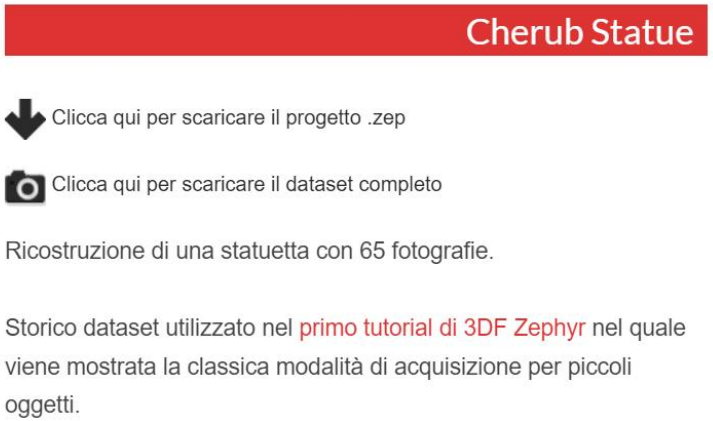
https://www.3dflow.net/3df-zephyr-photogrammetry-software//

3DF Zephyr Pro

Homework1

Play with Zephyr:

- **TUTORIAL 1**: https://www.3dflow.net/technology/documents/3df-zephyr-tutorials/convert-photos-3d-models-3df-zephyr/
- **VIDEO-TUTORAL**: https://www.3dflow.net/it/tutorial-per-3df-zephyr/
- **VIDEO-TUTORIAL WITH DATA**: https://www.3dflow.net/it/community-fotogrammetria/3df-zephyr-vetrina-di-ricostruzioni/



Homework2

Create your 3D model of your physical object:

- This model will be used in our robotics, vision and control pipeline

The object should be grabbed by the robot