BLSURF
CAD Surface Mesher

University of Technology of Troyes – ICD-GAMMA3 : Houman BOROUCHAKI et Patrick LAUG (INRIA)

Objective Automatic generation of surface meshes composed of parameteric patches (CAD surfaces)
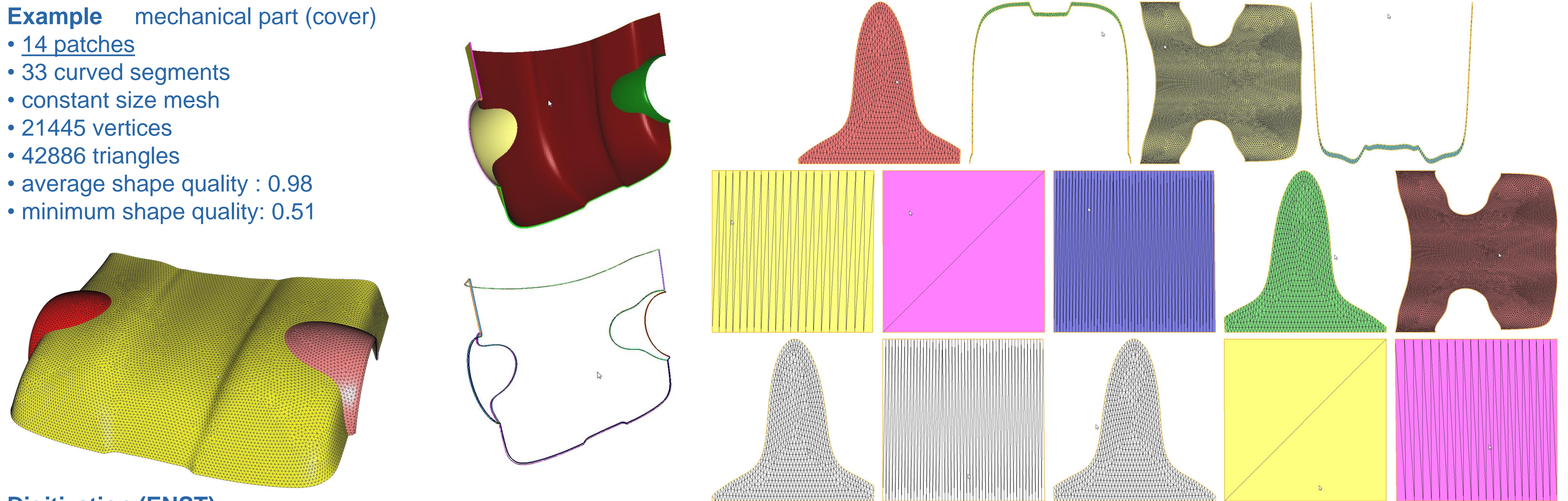
Concepts *Metric*: measure of the unity in all directions
Induced metric: first fundamental form
Generalized Delaunay kernel: point insertion
Frontal method: point definition
Unit mesh: mesh of unit length edges
Quality in form: shape regularity

Methodology
- Construction of the topological skeleton
- Specification of 3D metrics
- Discretization of the contours
  - Unit discretization of curved segments in space
  - Mapping into parametric planes
- Meshes of parametric domains
  - Construction of 2D induced metrics in parametric domains
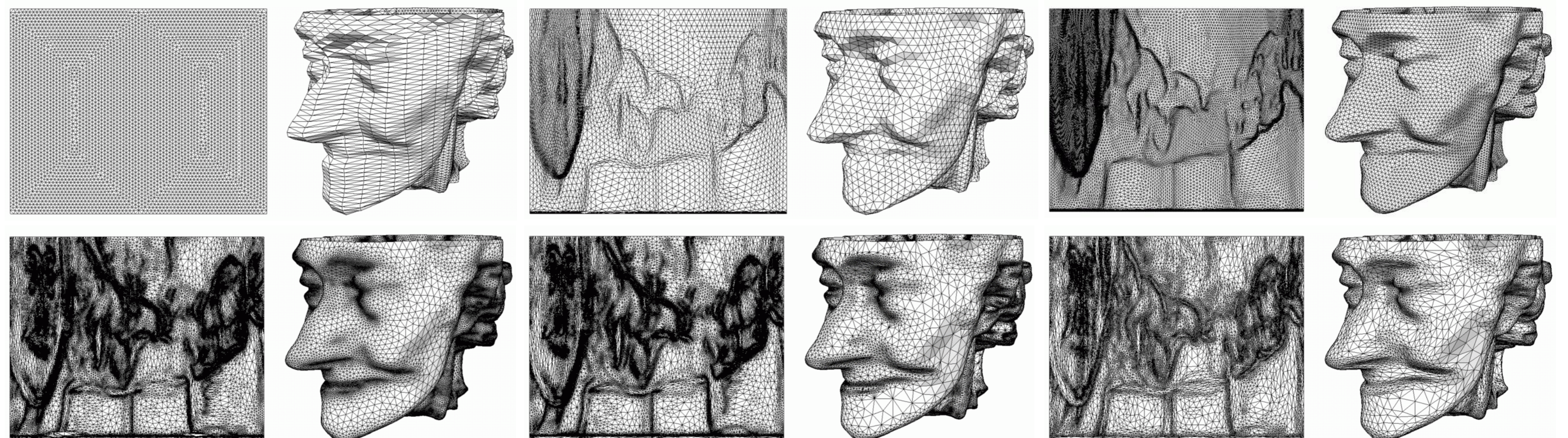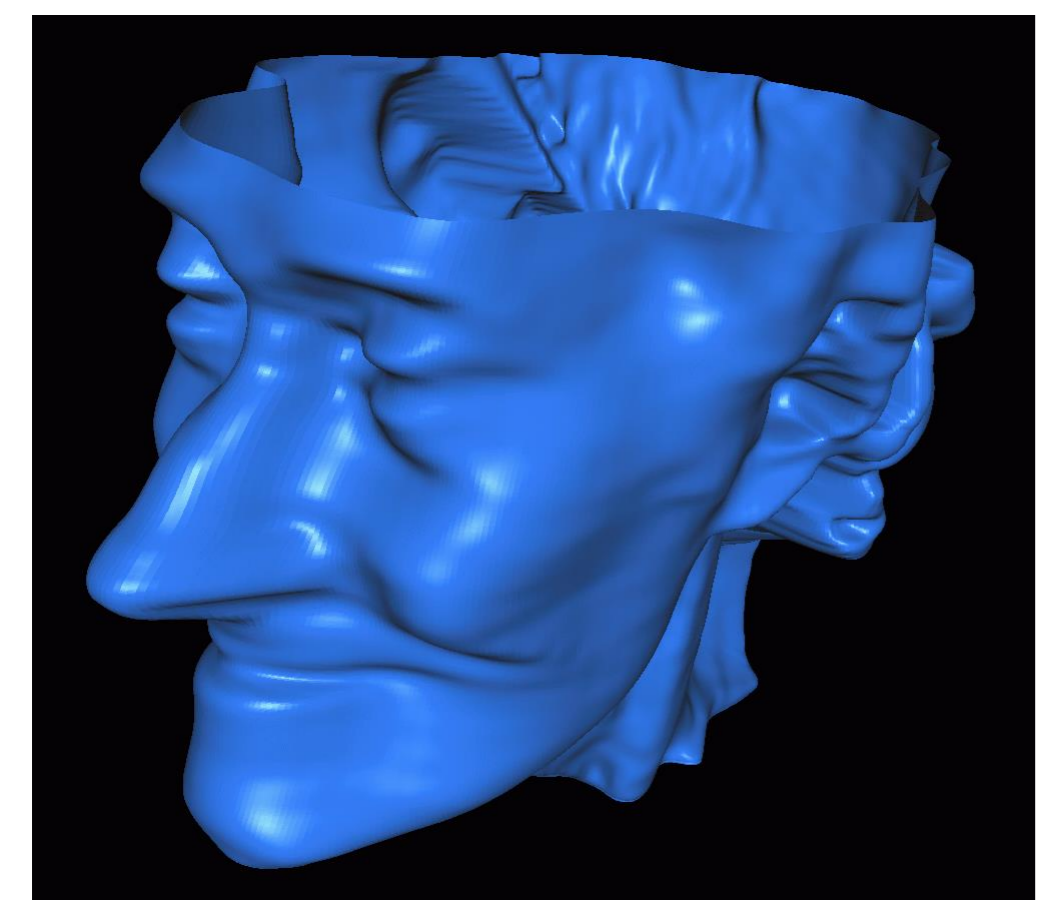 - Unit mesh generation of the parametric domains

Example mechanical part (cover)
- 14 patches
- 33 curved segments
- constant size mesh
- 21445 vertices
- 42886 triangles
- average shape quality : 0.98
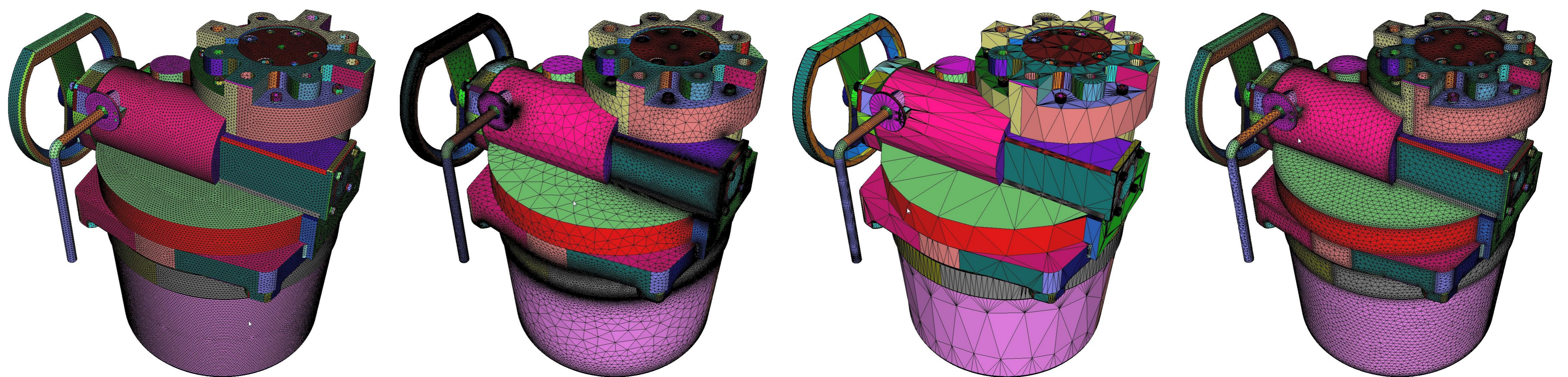- minimum shape quality: 0.51

Digitization (ENST)
- Bust of Voltaire
- Constant 2D metric
- Constant metric
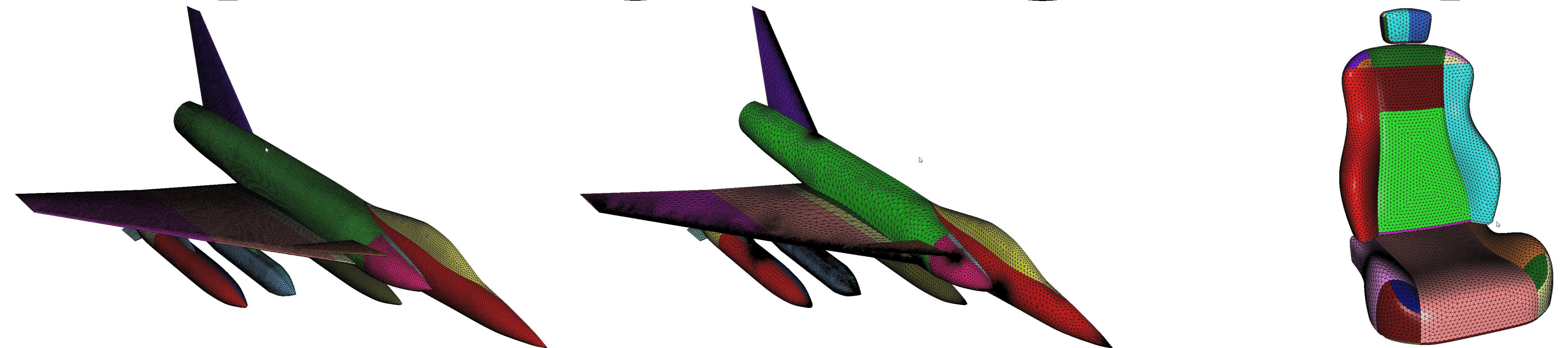- Geometric metric
  - isotropic
  - anisotropic

Solid mechanics (OpenCascade)
- Mechanical device
- 1181 patches
- Constant metric
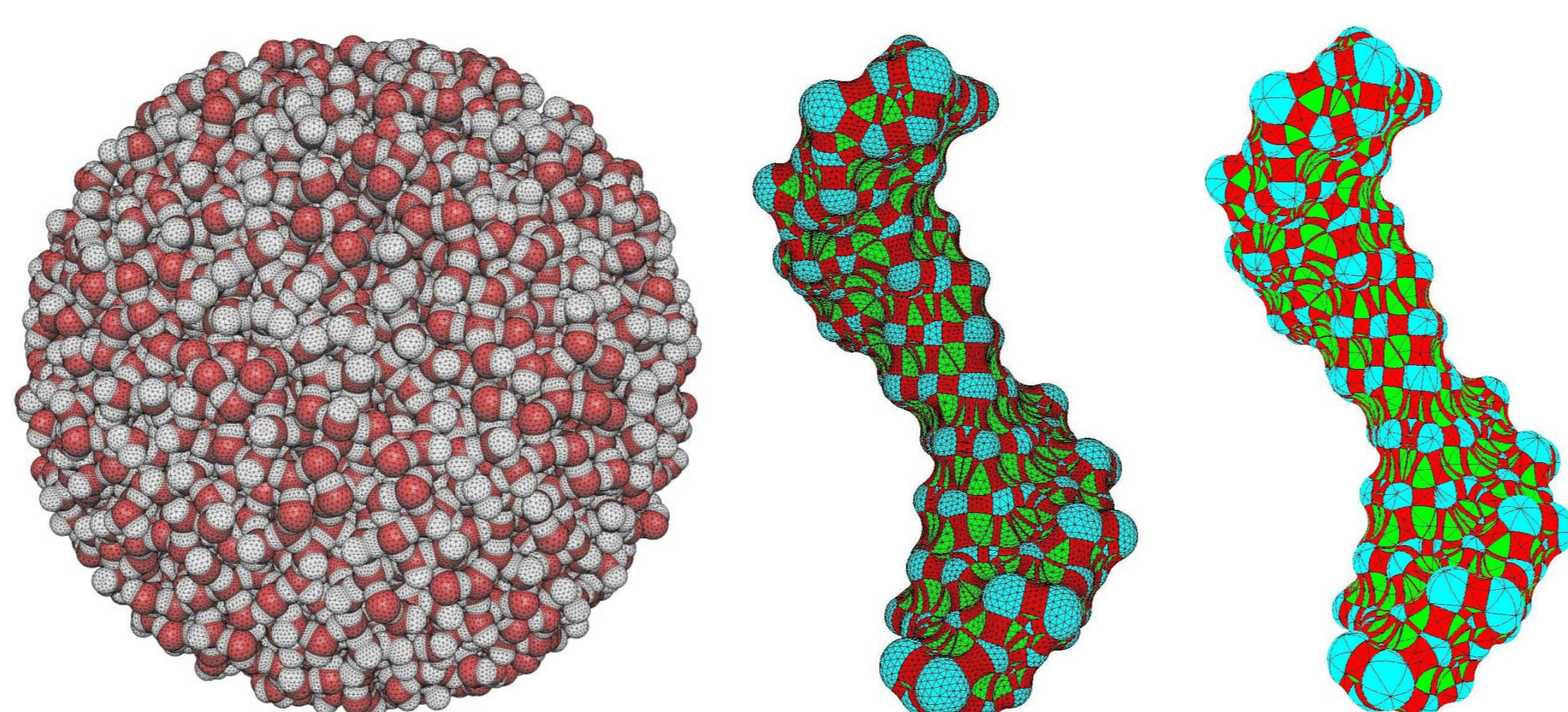- Geometric metric
  - isotropic
  - anisotropic
- Specified metric

Fluid mechanics (Dassault Aviation)
- Fighter plane (study)
- 72 patches
- Constant metric
- Geometric metric

Molecular chemistry
- Water sphere (echistatin)
  - 12596 atoms
  - Specified metric
- DNA fragment
  - 637 atoms
  - Specified metric
  - Quadratic elements

Textile (LECTRA)
- Car seat
- 75 patches
- Constant metric
- Geometric metric