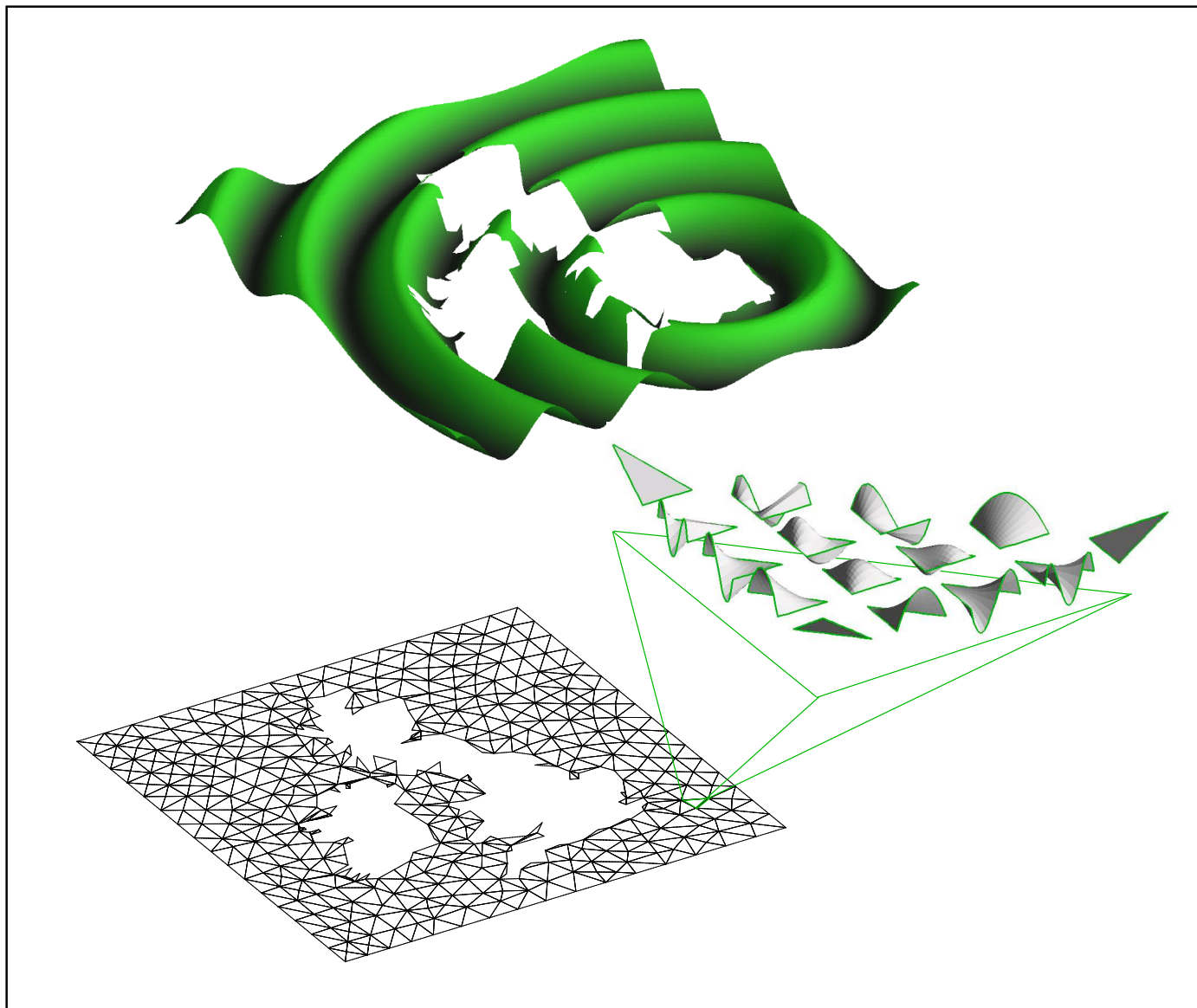


Pre-Processing and Post-Processing

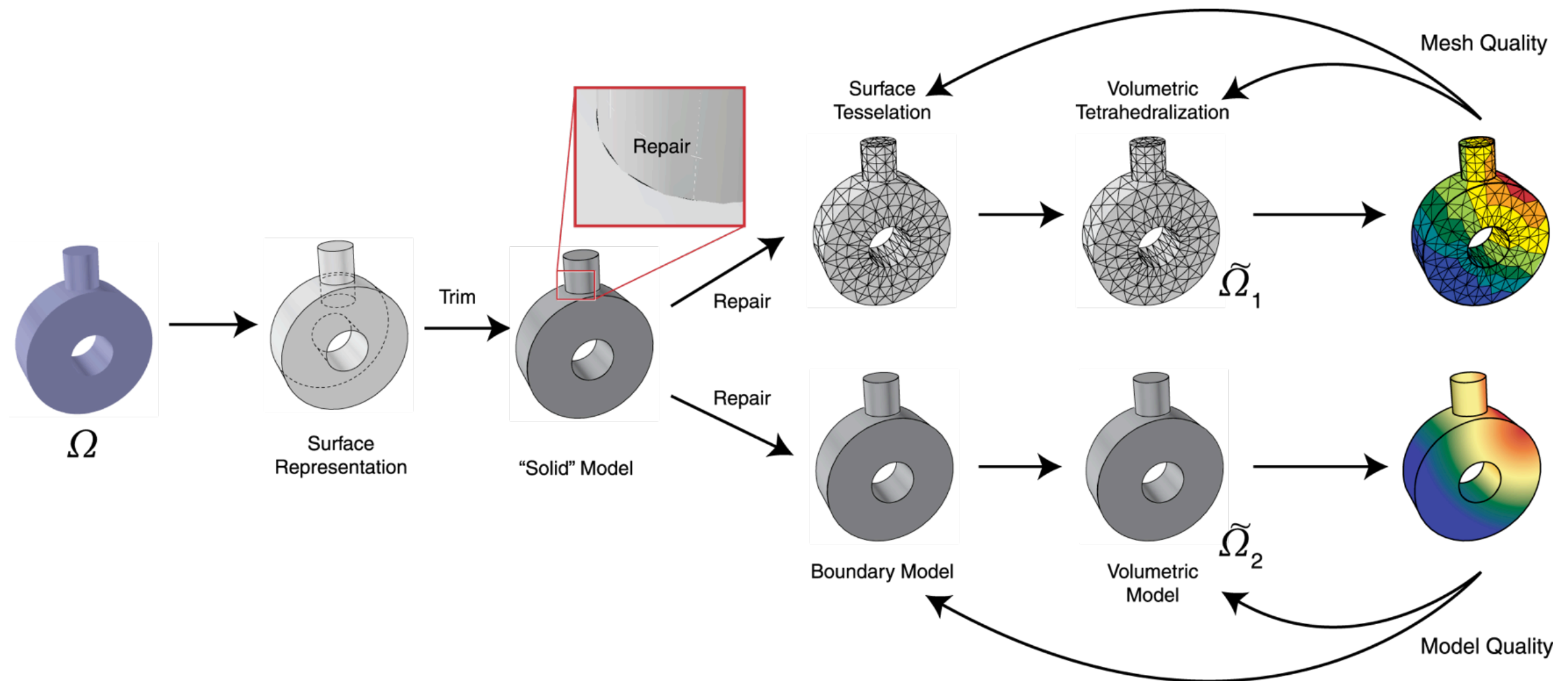


Outstanding Issues

Preprocessing: Mesh Generation

Postprocessing: Data Analysis and Visualization

Modeling and Meshing Pipeline



Mesh Generation

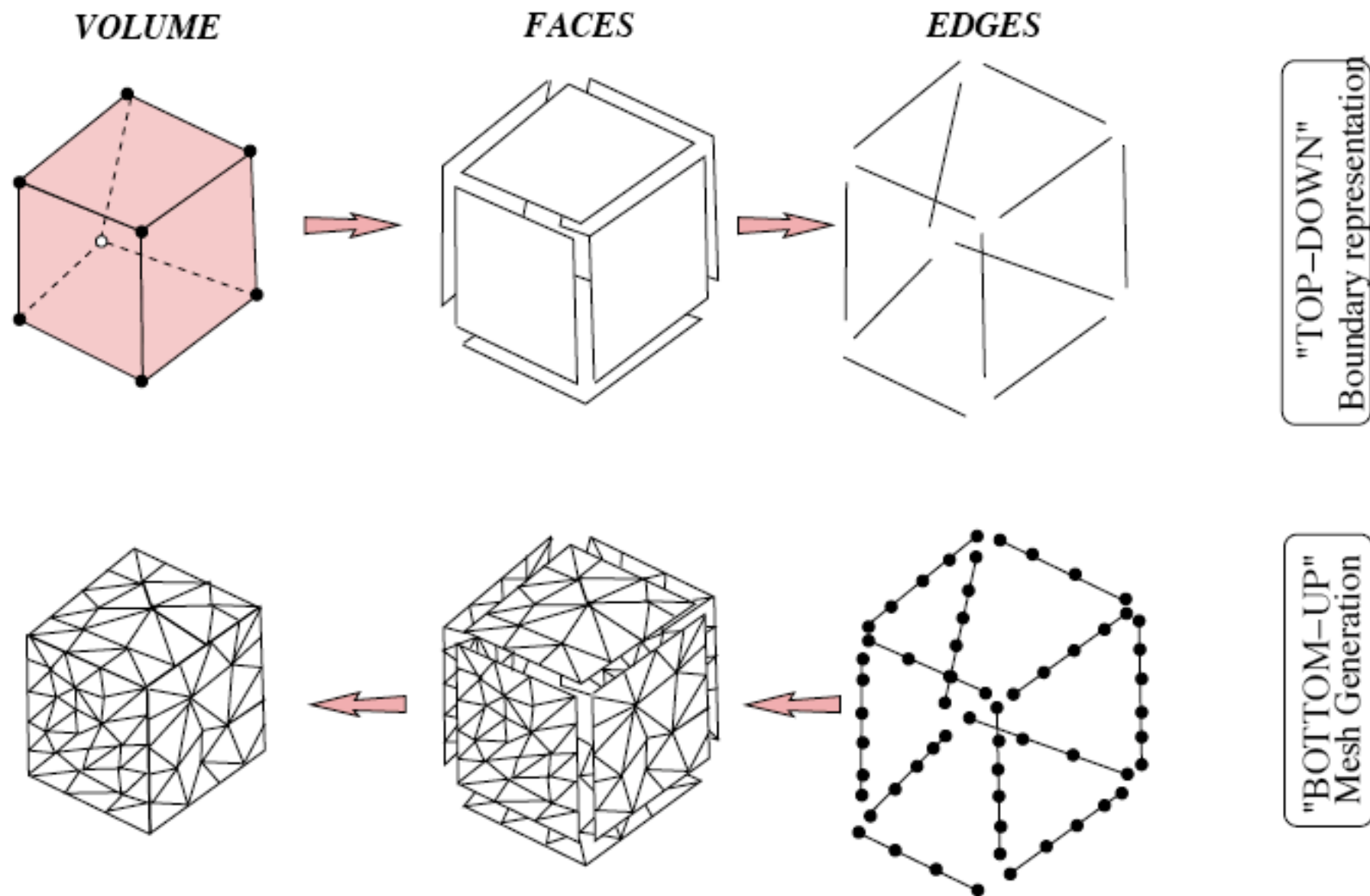


Figure 3.25 Illustration of the “top-down” boundary representation (B-Rep) of a domain for use in a “bottom-up” mesh generation strategy (Courtesy of J. Peiró)

Mesh Generation

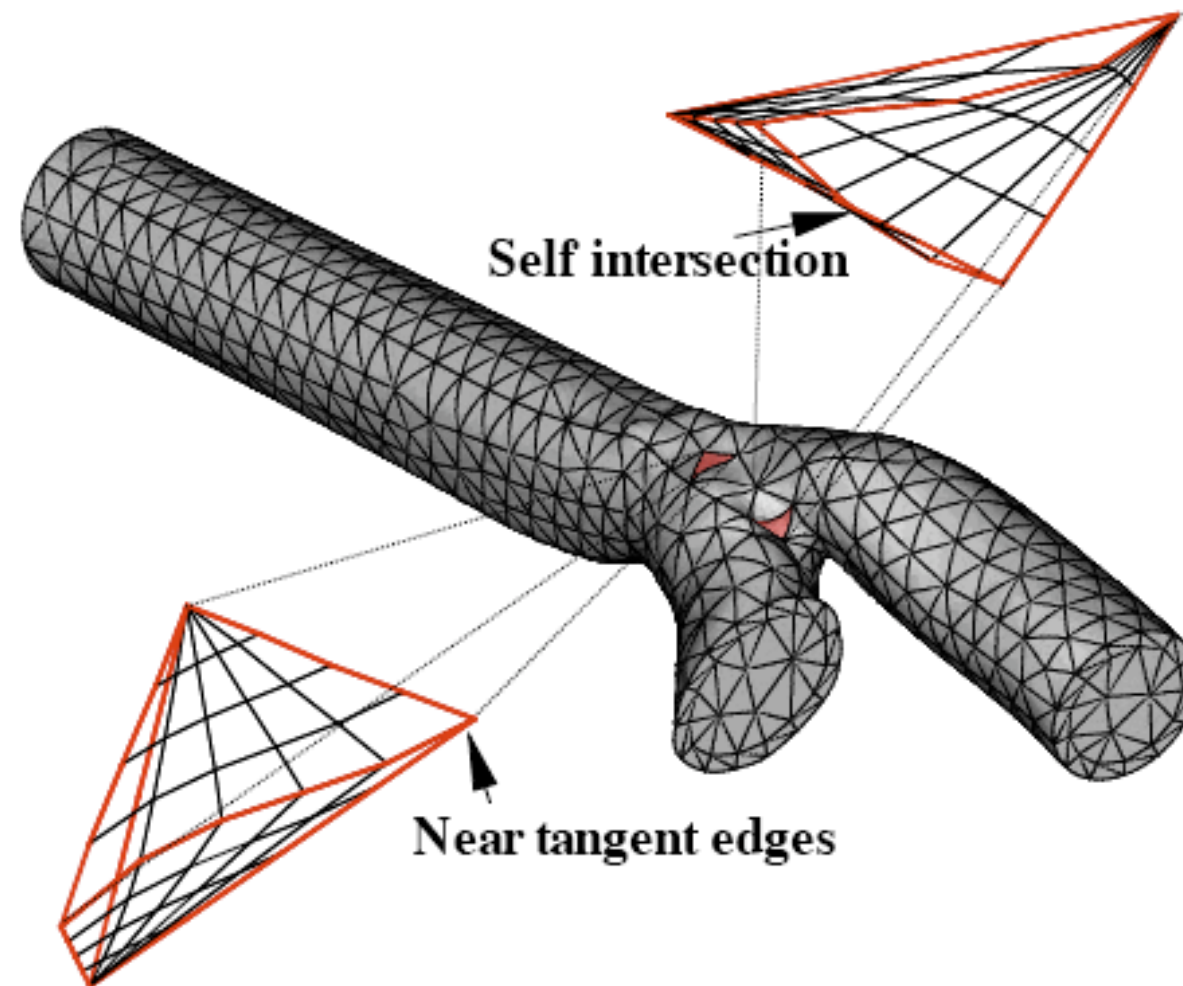


Figure 3.24 Generation of high-order curvilinear elements from coarse mesh. The deformation of straight sided element can lead to invalid elements being generated with singular mappings.

Minimal Requirement: $J^e(\xi) = \left| \frac{\partial \chi_i^e}{\partial \xi_j} \right| > 0 \quad \forall \quad \chi_i^e(\xi) \in \Omega^e, \xi \in \Omega_{st}$

Course Notes: Sections 3.3.2 & 3.3.3

Curvature Challenge

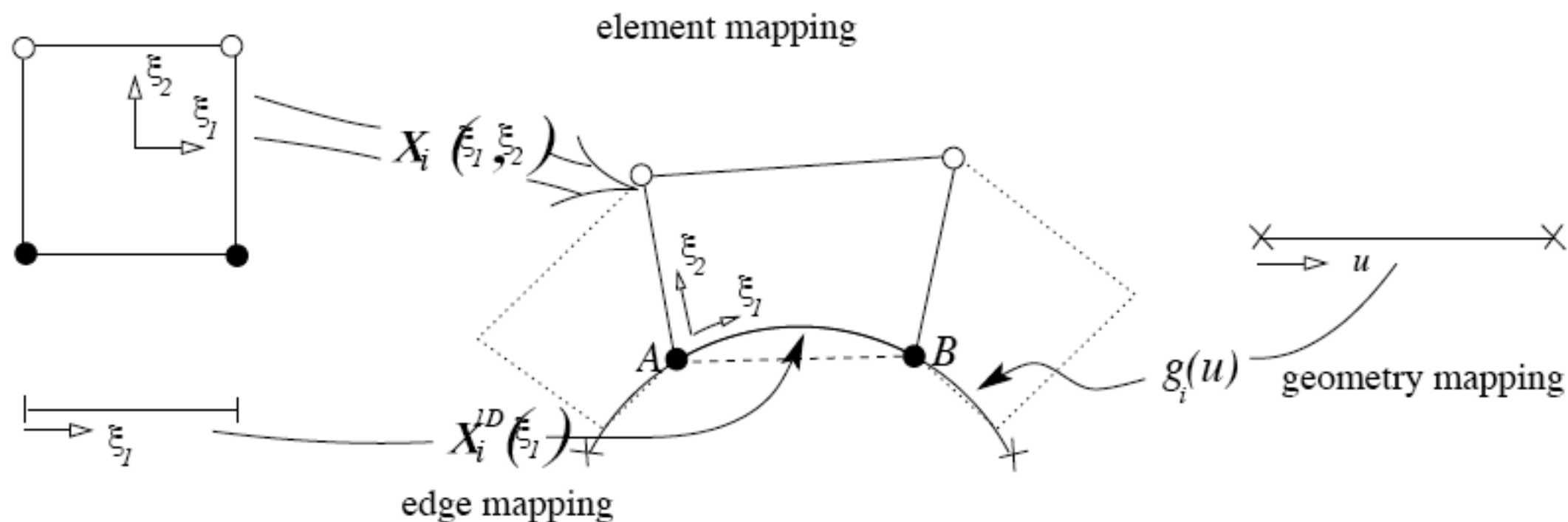


Figure 3.26 Mappings involved in the generation of a curvilinear element. The mapping $\chi_i(\xi_1, \xi_2)$ defines the element to standard region transformation. This transformation requires the definition of the edge mapping $\chi_i^{1D}(\xi_1)$. Normally, a parametric mapping $g_i(u)$ will also exist which defines the geometry boundary.

Curvature Challenge

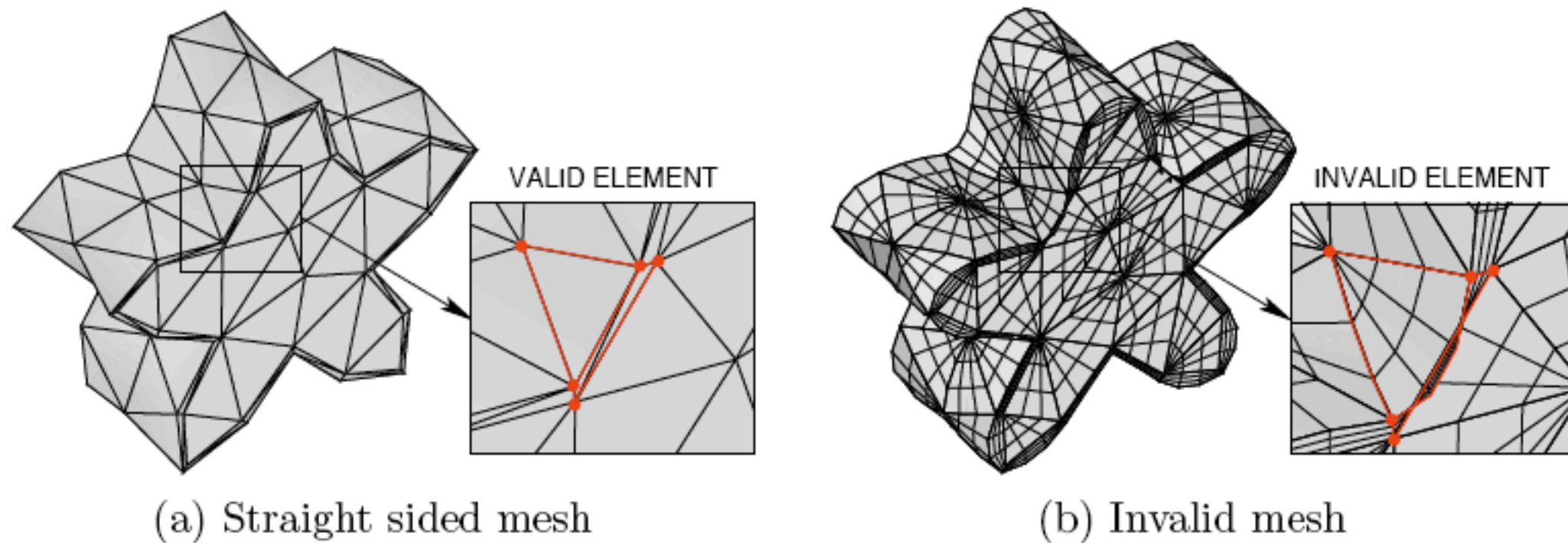


Figure 3.28 Edge deformation of a straight sided coarse mesh leading to invalid curvilinear meshes in regions of concave curvature relative to the element volume.

Visualization Challenge