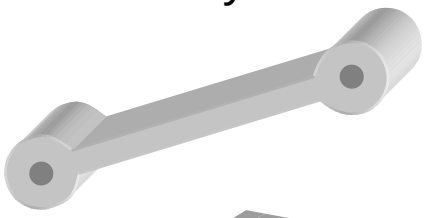
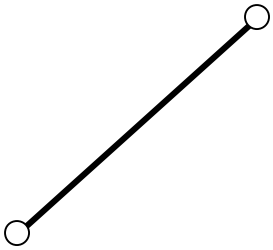
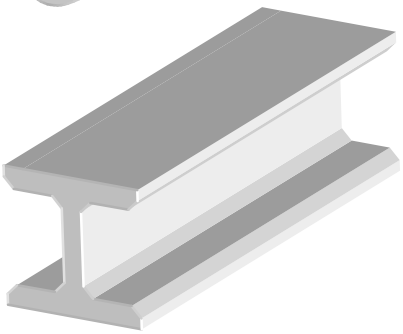
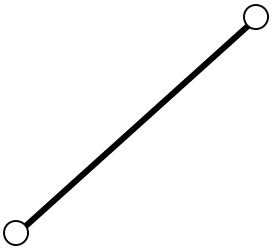
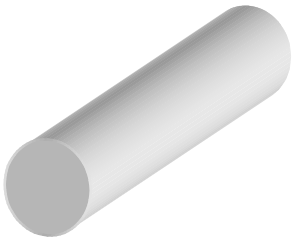
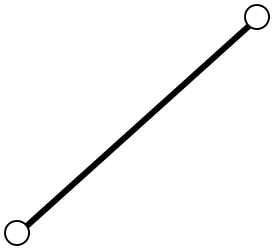
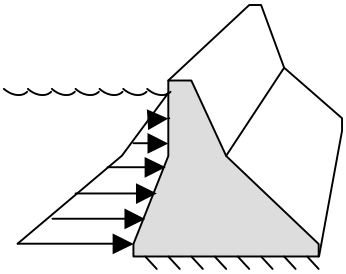
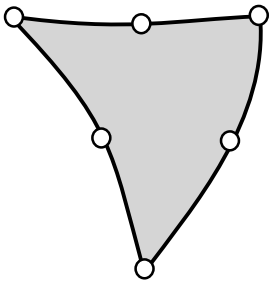
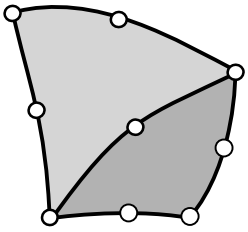
Chapter 7. Finite Element Modeling

Isoparametric Formulation — Element type and geometry

	Physical	Element	DOF
Trusses			u_{uaxial}
Beams			$u_{transverse}$, rotation
Shafts			twist
Planar structures			u_x and u_y
3-D Solids			u_x u_y and u_z

Things to watch for when building you model

- unconnected (floating) nodes or elements
- nearly coincidental nodes that are not connected
- elements with large aspect ratios or highly differing corner angles
- elements that share nodes that do not have the same dof
- a midside that is too curved or a midside node too far from the correct location
- a shell element with too great a curvature

Things to watch for when viewing results

- deformed shape that is unrealistic (or may be overly exaggerated by the GUI)
- gaps do not overclose, there is no interpenetration between parts
- stresses that vary by large amounts over too few elements (ex. high stresses at reentrant corners)
- verify whether reaction forces satisfy static equilibrium
- deformation is small (note linear analysis is based on expressing the equilibrium equations with respect to the undeformed configuration)
- stress plots should be based on unaveraged nodal stresses (look at the “element solution” for stresses and the “nodal solution” for displacements) so that interelement discontinuities can be observed