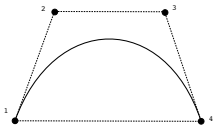
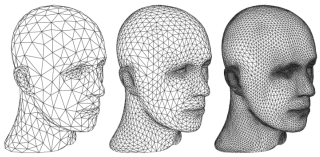
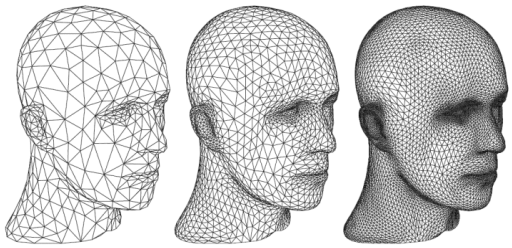
Modeling 2





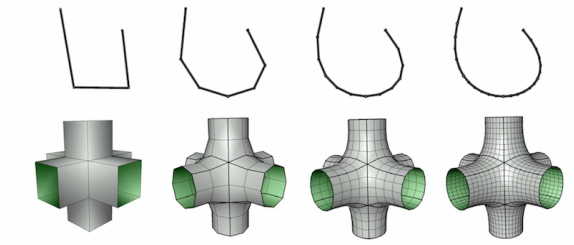
Subdivision Surfaces

- given coarse triangular mesh, generate smoother surface



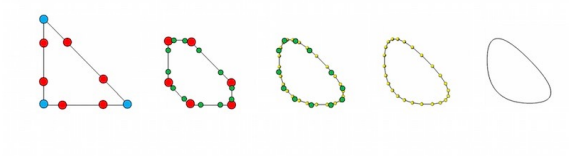
Subdivision

- smooth surface as the limit of a sequence of refinements of rougher mesh



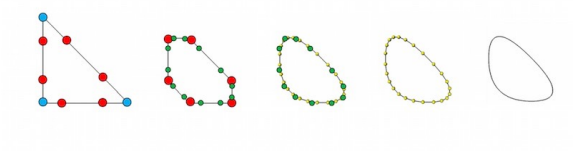
Subdividing Curves

- variety of techniques
- one example: corner cutting



Corner Cutting

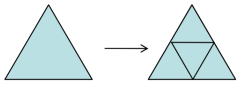
- place 2 vertices, 1/4 and 3/4 between original vertices
- remove original vertices
- repeat

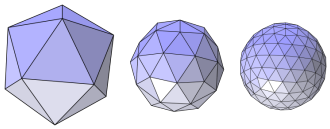


Subdividing Surfaces

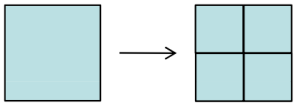
- different techniques
  - triangles: Loop
  - quads: Catmull-Clark

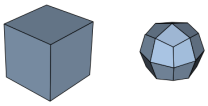
Subdividing Triangles





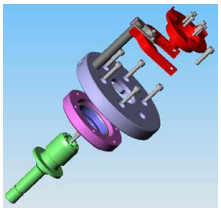
Subdividing Quads





Solids

- useful for CAD/CAM
- want:
  - in/out
  - boundaries
  - properties mass, moment of inertia, etc

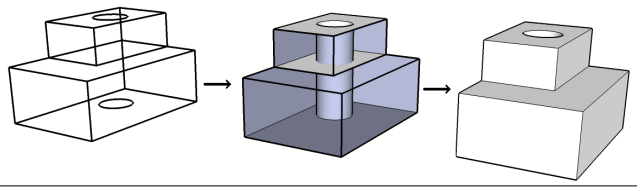


Representing Solids

- boundary representations
- CSG
- BSP Trees
- Voxels

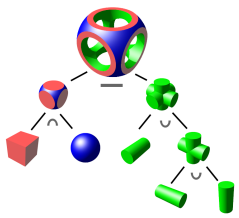
Boundary Representations

- solid represented by collected of connected surface elements (boundary)
- topology (faces, edges, vertices)+ geometry
- Euler-Poincaré formula: V+F-E-R=2(S-H)



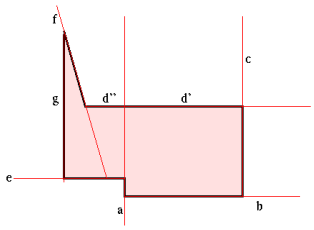
CSG

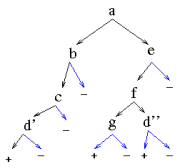
- Boolean set operations on simpler solids
- Union, Intersection, Difference, Negation



BSP Solids

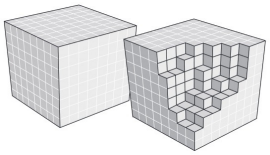
- leaf nodes can store in/out

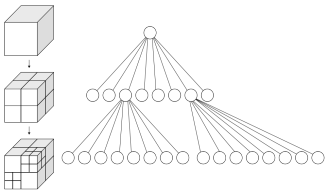




Voxels

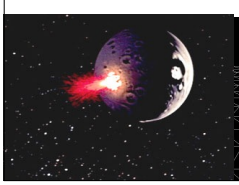
- dice space into voxels
- voxel is either in or out
- uniform vs octree

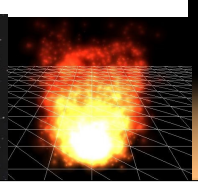


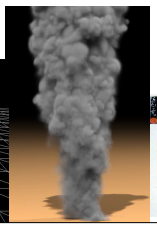


Particle Systems

- emitter: source of particles with particle behaviour parameters
- good for complicated, chaotic phenomena
- fire, smoke, water
- grass, hair







Fractals

- many things in nature self-similar at different scales
- tedious to model by hand -> procedural model
- user specifies general outline, details added procedurally