

Solid geometry

- Inherently 3D, geometric elements describe sets of spaces enclosed by 2D boundaries
- For example, a solid sphere is the simplest solid element. Other simple primitives include the cube, cylinder, cone, and torus

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Solid geometry

- Other objects are defined by combinations of primitives.
- An entire math has been explored related to the combination of solid primitives called **constructive solid geometry (CSG)**
- With CSG, complex shapes may be generated from operations formed on primitives

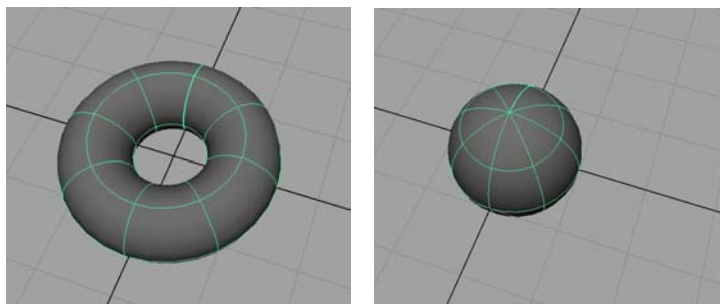
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Solid geometry

- Boolean operators are defined tools for combining solid geometry for CSG
- These perform group operations on the points included in the solid primitives
- They are:
 - Union
 - Subtraction
 - Intersection
- These bool-op's are implemented in Maya₃

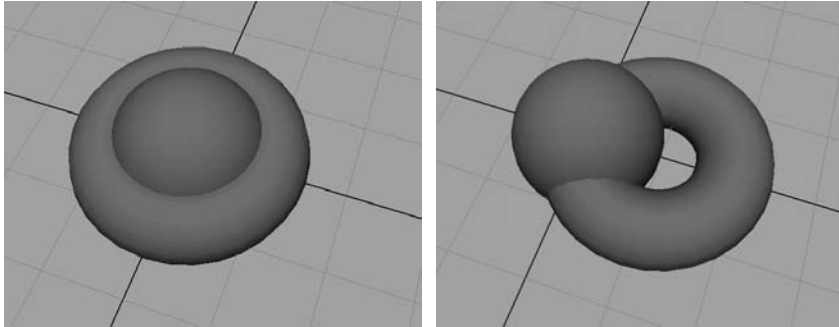
Solid geometry

- Boolean operator: **Union** combines two elements into a single one



Solid geometry

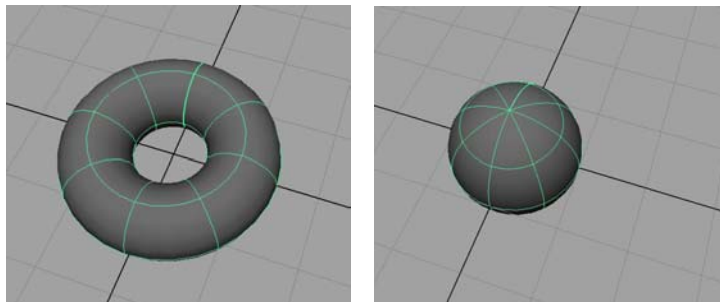
- Boolean operator: **Union** combines two elements into a single one



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Solid geometry

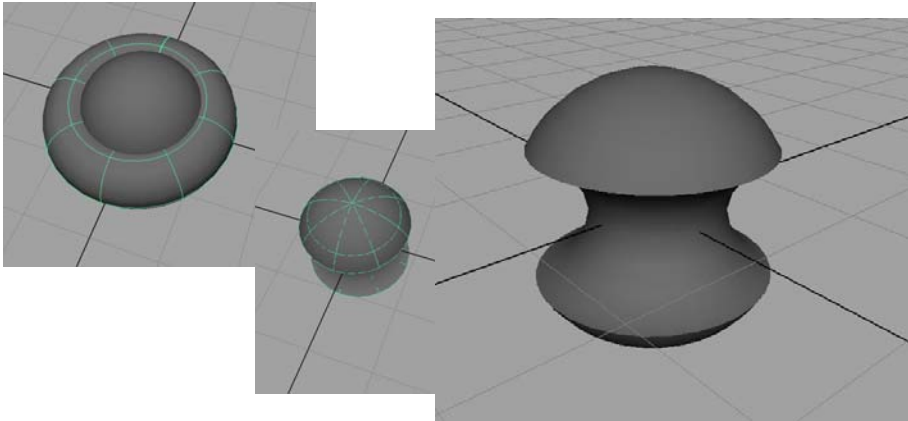
- Boolean operator: **Subtract** take the difference between two elements



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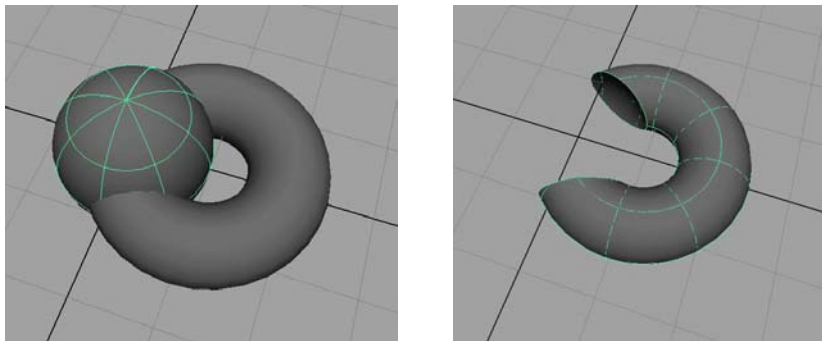
Solid geometry

- Boolean operator: **Subtract** take the difference between two elements



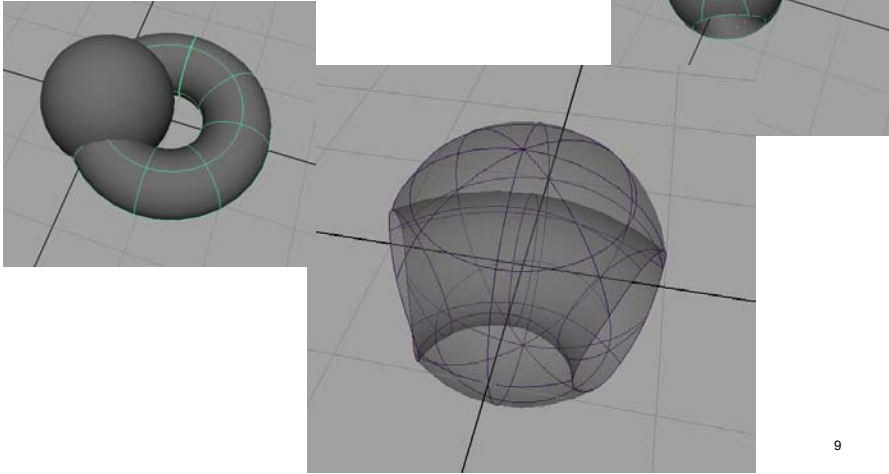
Solid geometry

- Boolean operator: **Subtract** take the difference between two elements



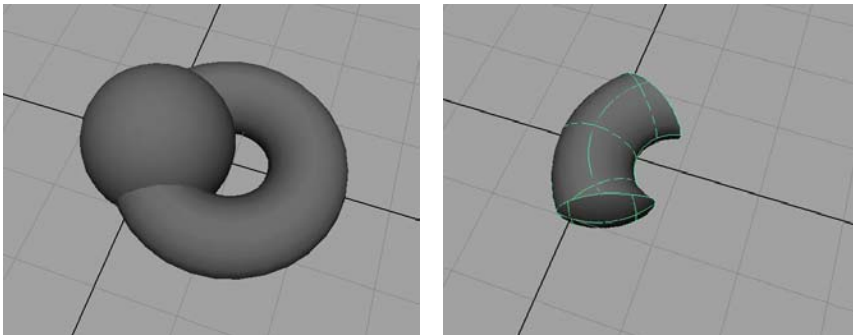
Solid geometry

- Boolean operator: **Subtract**



Solid geometry

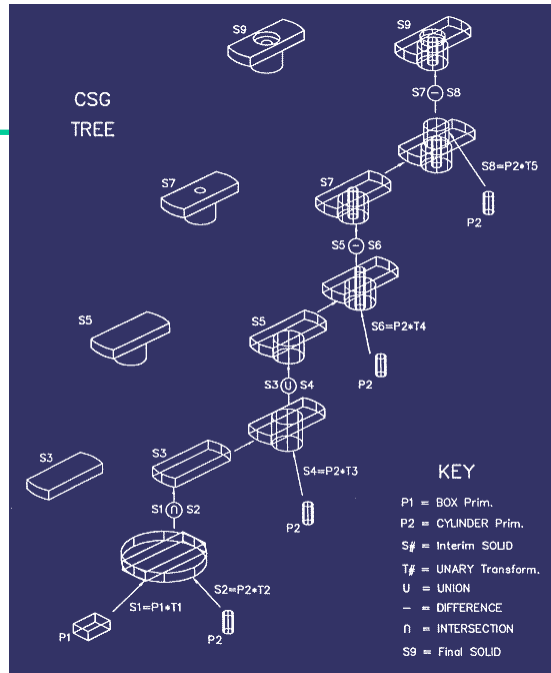
- Boolean operator: **Intersection** finds the common points in the given primitives



CSG Tree

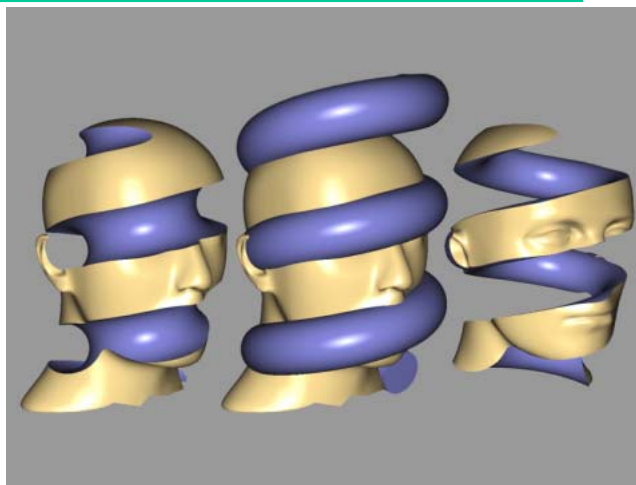
Graph for hierarchy of Boolean operations

Often used for CAD and Mech Eng



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Solid geometry



Adams & Dutre 2003

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