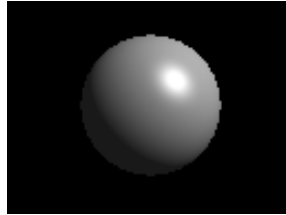


CSG trees

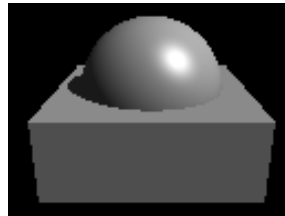


Composition operators

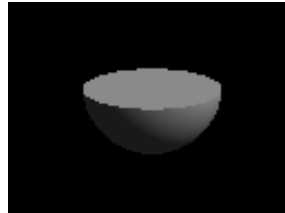
- Boolean composition operators:



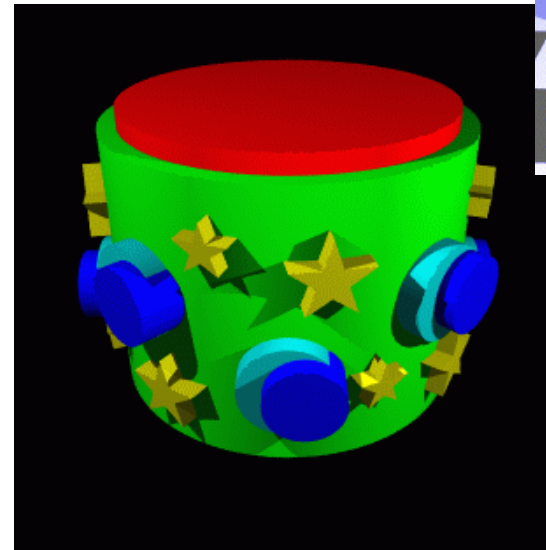
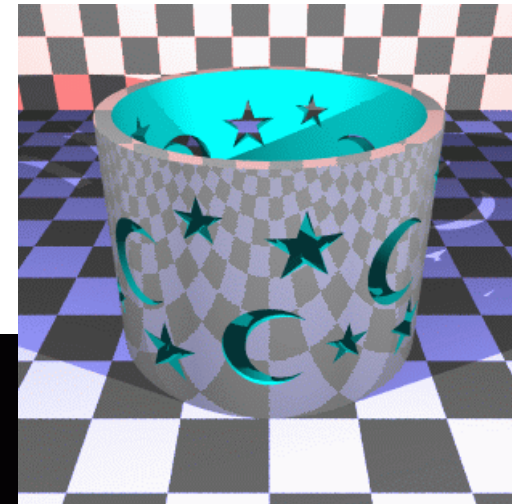
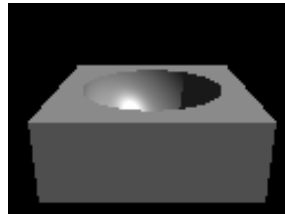
– Union



– Intersection



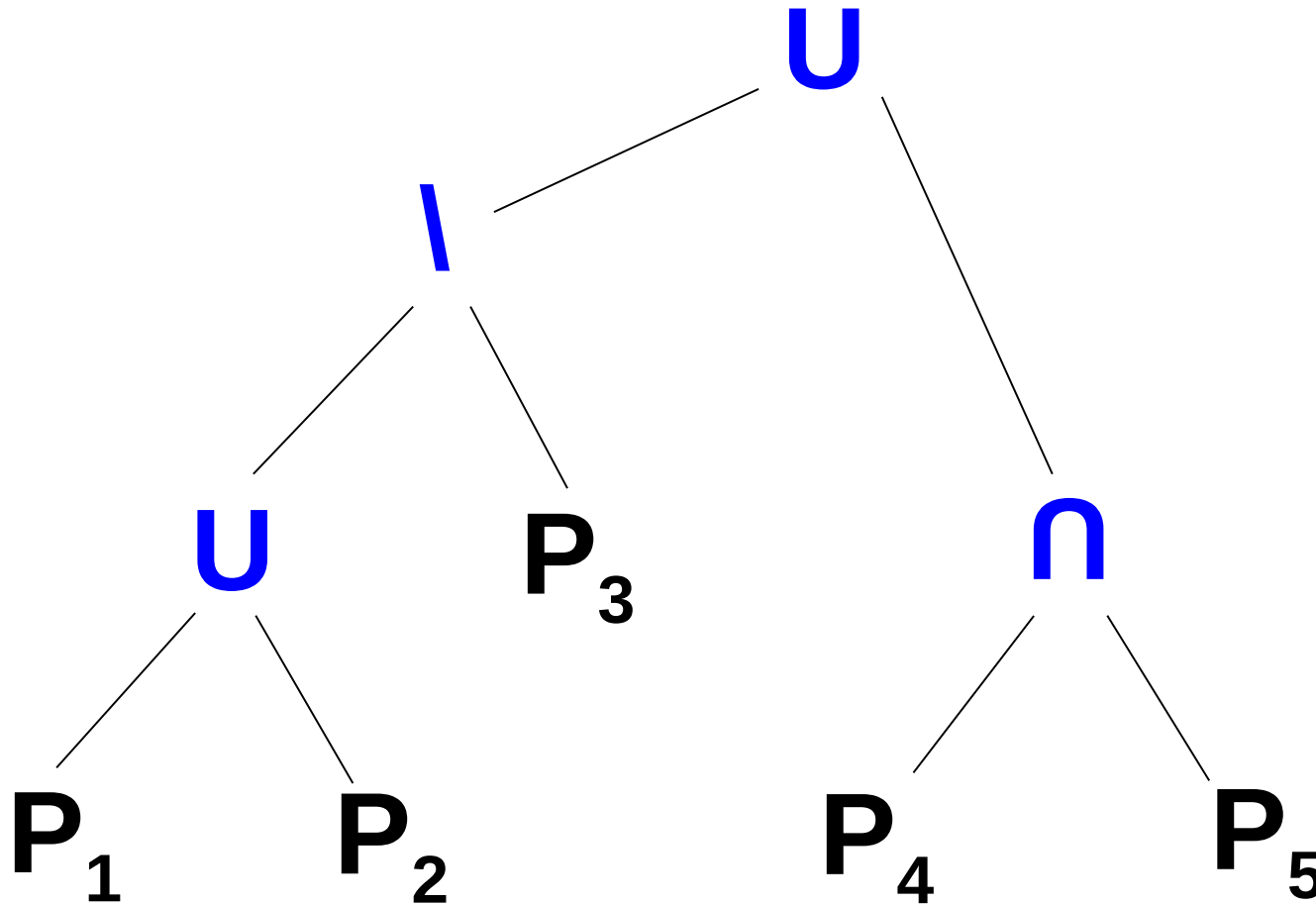
– Difference



CSG trees

Constructive Solid Geometry : composition tree

- The nodes of the tree are composition operators
- The leaves of the tree are geometric primitives



CSG on implicit surfaces

- $O_1 \cap O_2$:

$$f(x, y, z) = \min(f_1, f_2)$$

- $O_1 \cup O_2 = \neg(\neg O_1 \cap \neg O_2)$:

$$f(x, y, z) = \max(f_1, f_2)$$

- $O_1 \setminus O_2 = O_1 \cap \neg O_2$

$$f(x, y, z) = \max(f_1, -f_2)$$



Tutorial

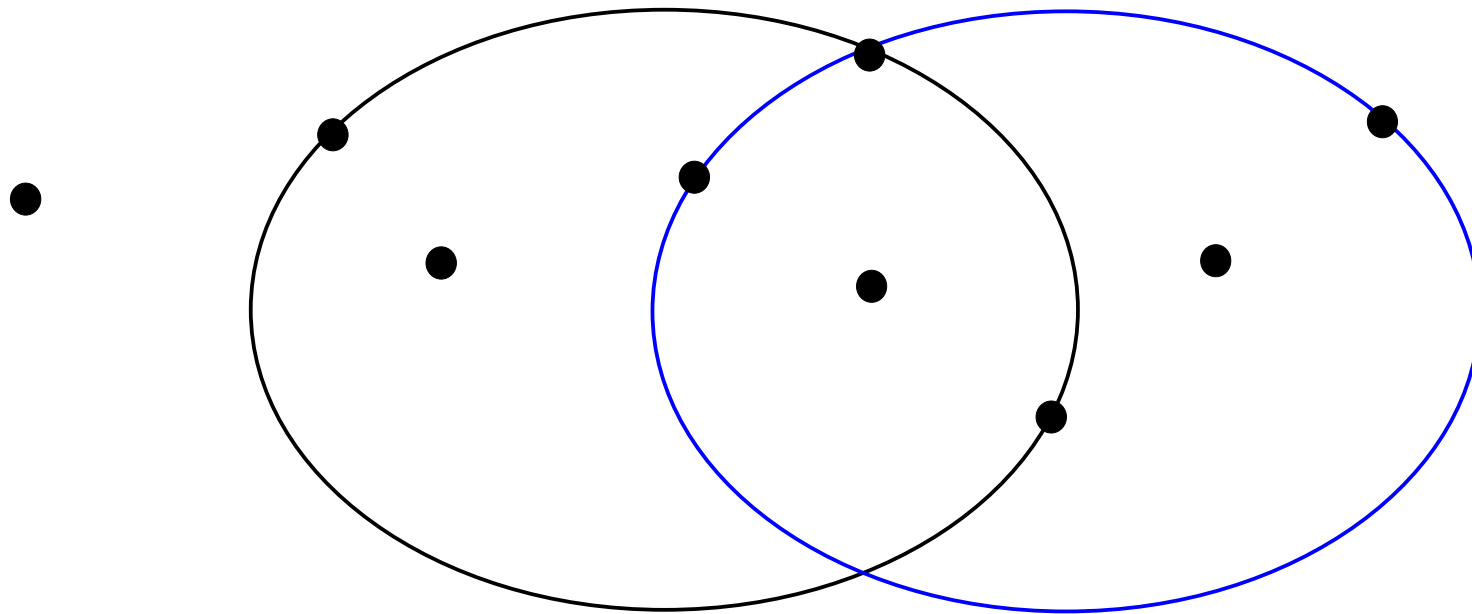
At each point, compute the sign of f_1 and f_2 then f_3 . Deduce the shape of O_3

$$f_1 : \mathbb{R}^3 \rightarrow \mathbb{R}$$

$$O_1 = \{ P \in \mathbb{R}^3 / f_1(P) \leq 0 \}$$

$$f_2 : \mathbb{R}^3 \rightarrow \mathbb{R}$$

$$O_2 = \{ P \in \mathbb{R}^3 / f_2(P) \leq 0 \}$$



$$f_3 = \min (f_1, f_2)$$

$$O_3 = O_1 \cup O_2 = \{ P \in \mathbb{R}^3 / f_3(P) \leq 0 \}$$

