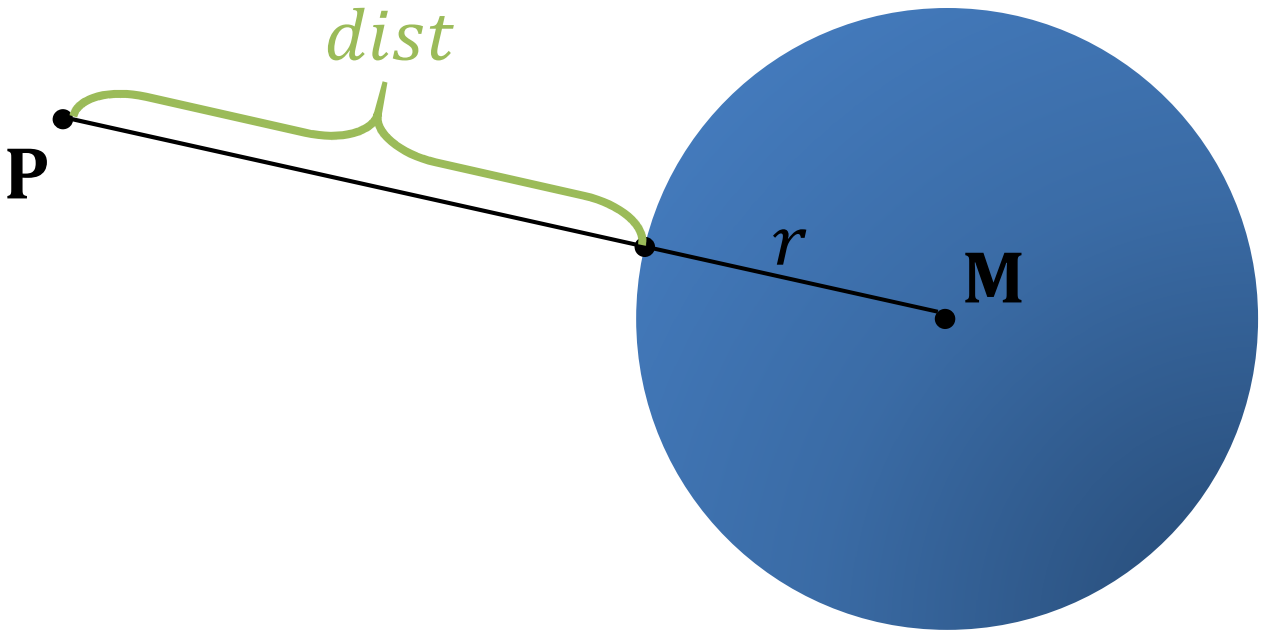
Raymarching Distance Fields

Distance Functions

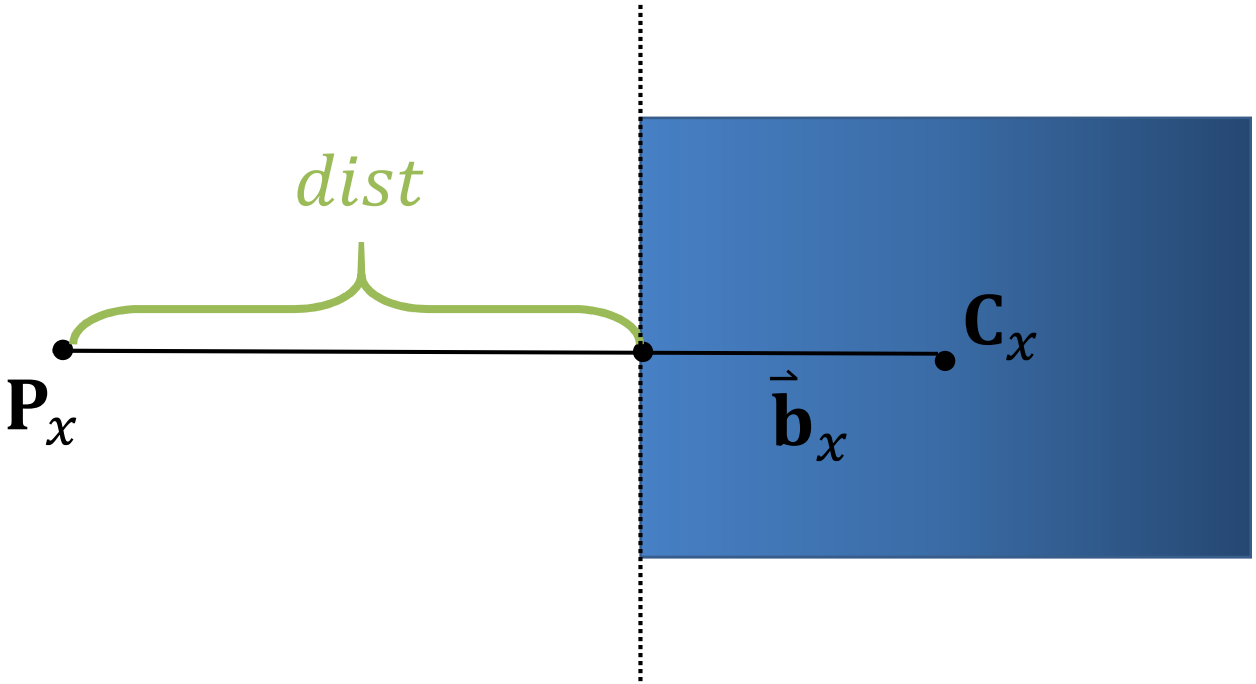
- Distance function sphere
  $dist(\mathbf{P}) = \|\mathbf{P} - \mathbf{M}\| - r$



Distance Functions

- Distance function box – x-direction

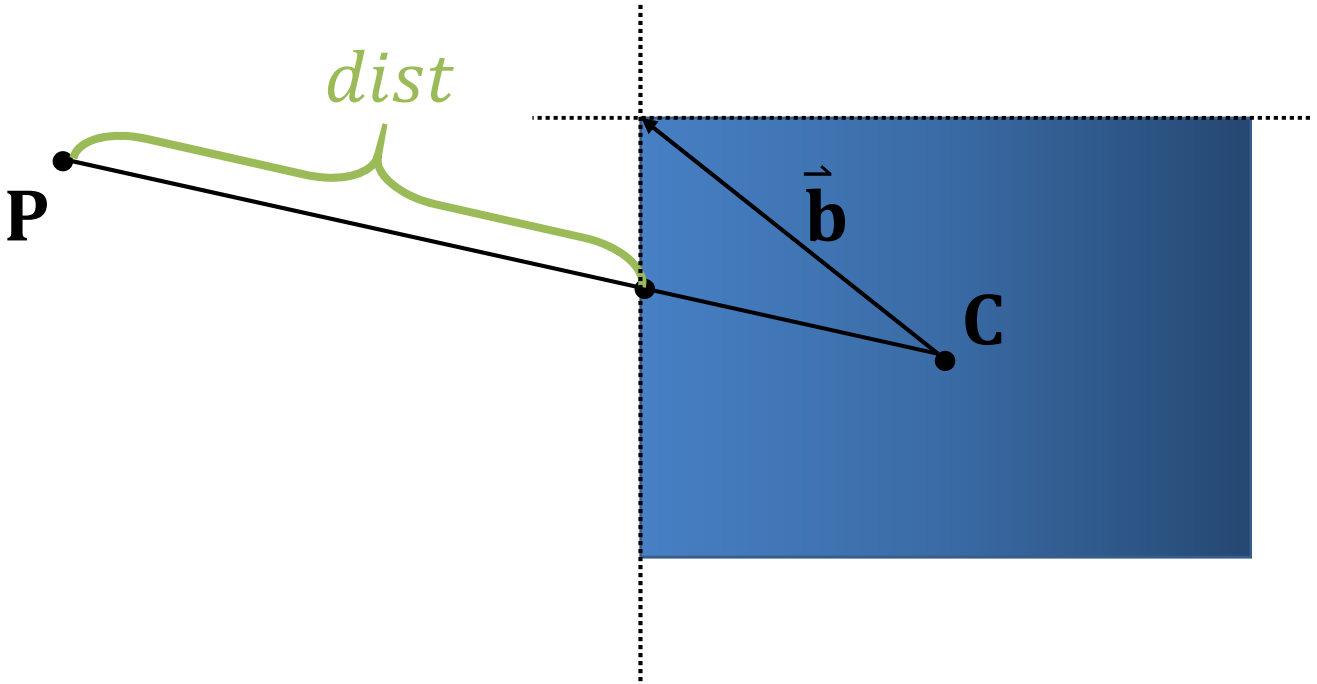
  $dist(\mathbf{P}_x) = \max\left(|\mathbf{P}_x - \mathbf{C}_x| - \vec{\mathbf{b}}_x, 0\right)$



Distance Functions

- Distance function box

$$dist(\mathbf{P}) = \left\| \max\left(|\mathbf{P} - \mathbf{C}| - \vec{\mathbf{b}}, \vec{\mathbf{0}} \right) \right\|$$

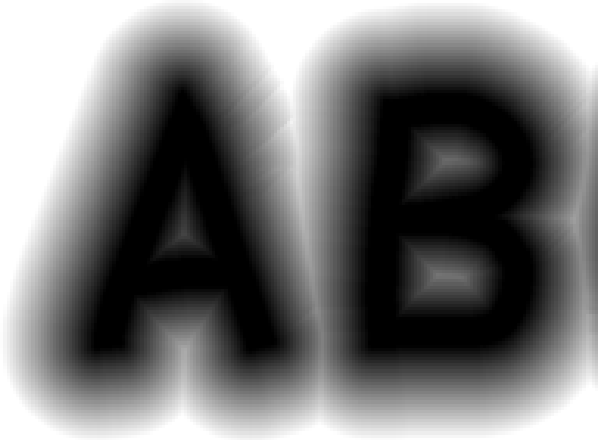


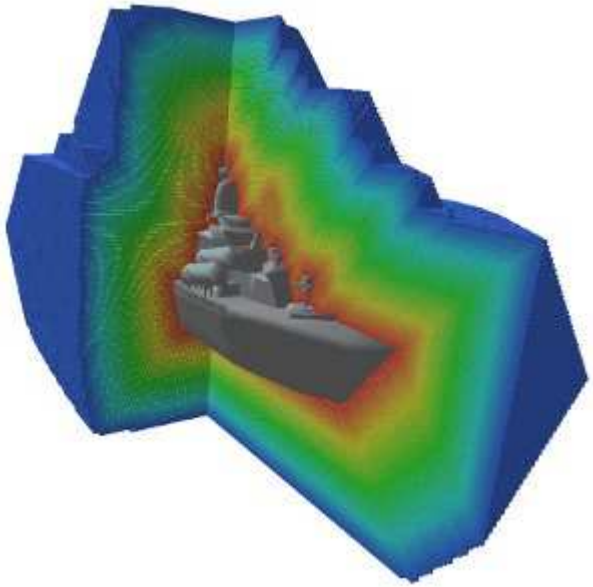
Distance Fields

Beliebigen Punkt in Distance Field einsetzen
-> erhält Abstand zum Objekt

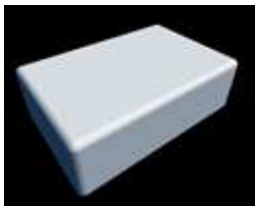
$$\mathbb{R}^2 \rightarrow dist(\mathbb{R}^2)$$

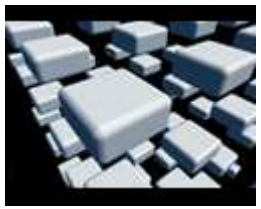
$$\mathbb{R}^3 \rightarrow dist(\mathbb{R}^3)$$





Operations on Distance Fields

- Given $dist(\mathbb{R}^3) =$ 

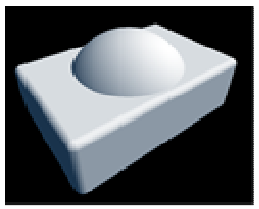
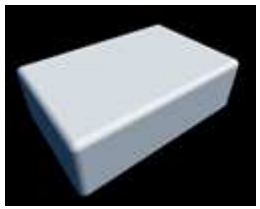
 $= dist(repeat(\mathbb{R}^3)$

- Repeat is $\mathrm{mod}\left(\mathbf{P}, \vec{\mathbf{b}}\right) - \frac{1}{2}\vec{\mathbf{b}}$

Wdh. von Objekten,
b = (1,0,0) immer nach 1 Einheit wiederholt
-1/2*b : Start von -0.5 bis 0.5

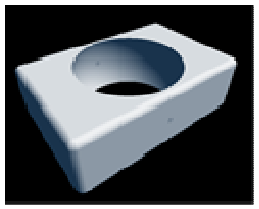
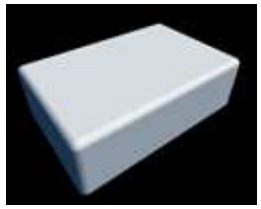
Operations on Distance Fields

- Given $dist_1(\mathbb{R}^3)$ and $dist_2(\mathbb{R}^3)$


$= union \left(\right.$

,

$\left. \right)$

- The union is $\min(dist_1(\mathbb{R}^3), dist_2(\mathbb{R}^3))$


$= substraction \left(\right.$

,

$\left. \right)$

- The substraction is $\max(-dist_1(\mathbb{R}^3), dist_2(\mathbb{R}^3))$

Raymarching Distance Fields

- $dist(\mathbf{P}_i)$