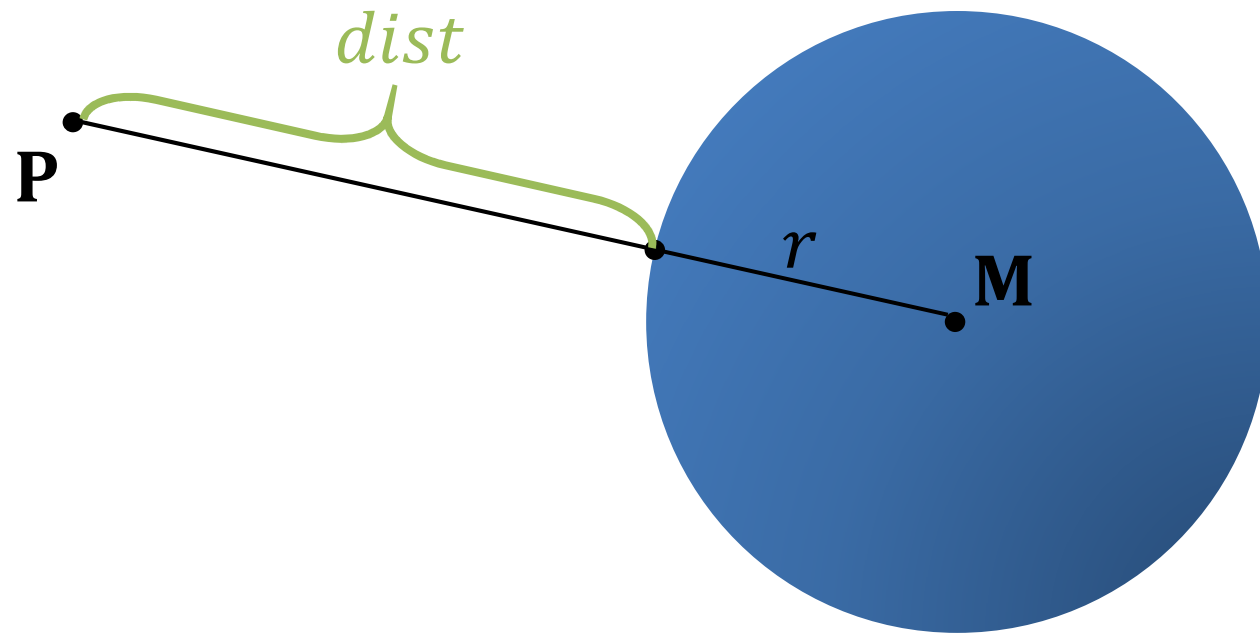


Raymarching Distance Fields

Distance Functions

- Distance function sphere

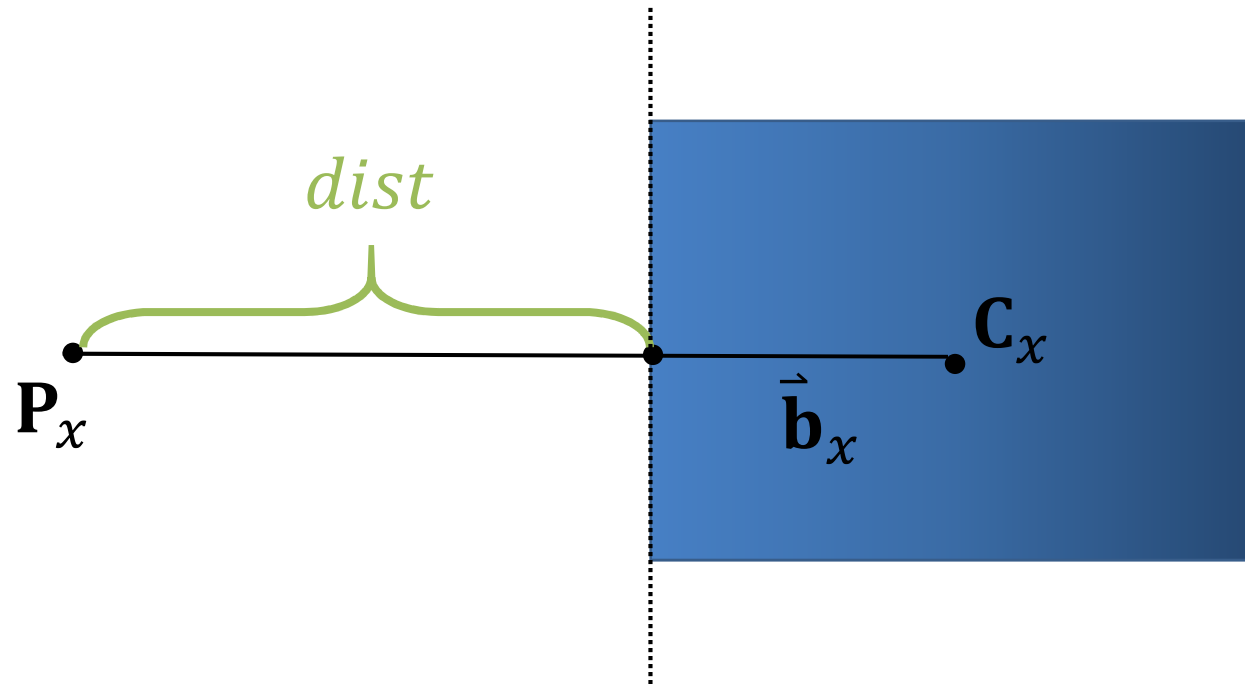
$$\textit{dist}(\mathbf{P}) = \|\mathbf{P} - \mathbf{M}\| - r$$



Distance Functions

- Distance function box – x -direction

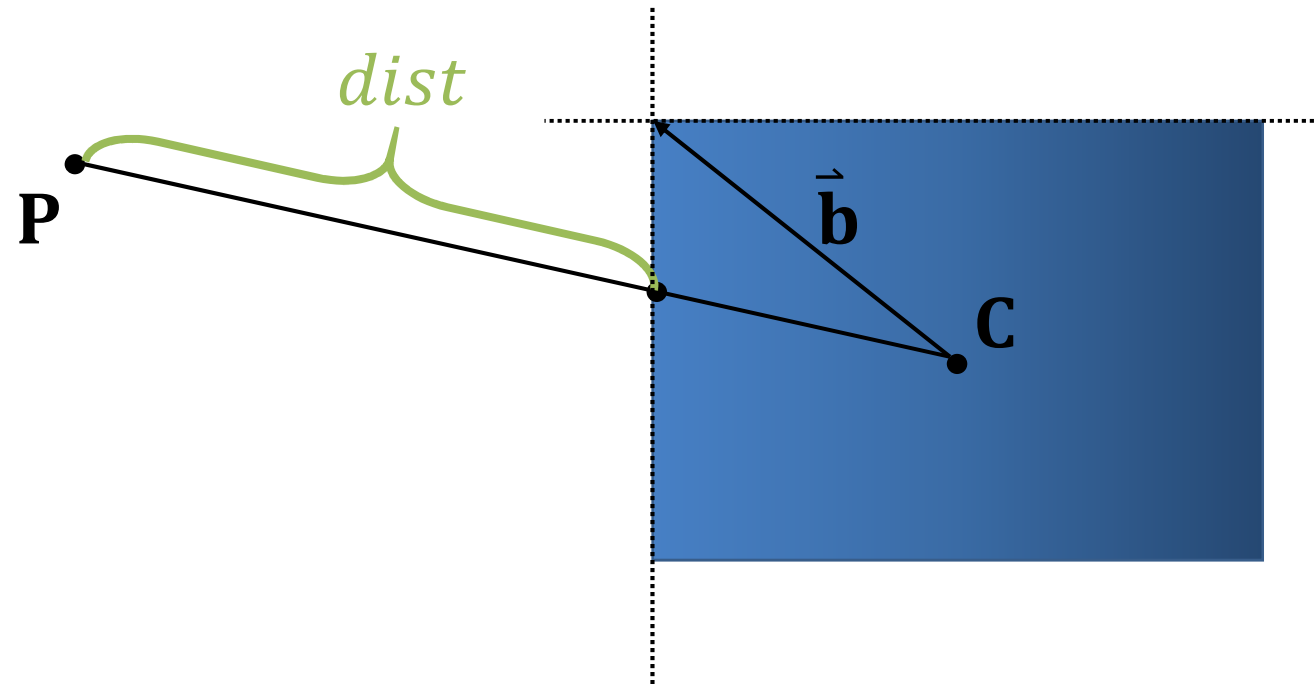
$$\text{dist}(\mathbf{P}_x) = \max(|\mathbf{P}_x - \mathbf{C}_x| - \vec{\mathbf{b}}_x, 0)$$



Distance Functions

- Distance function box

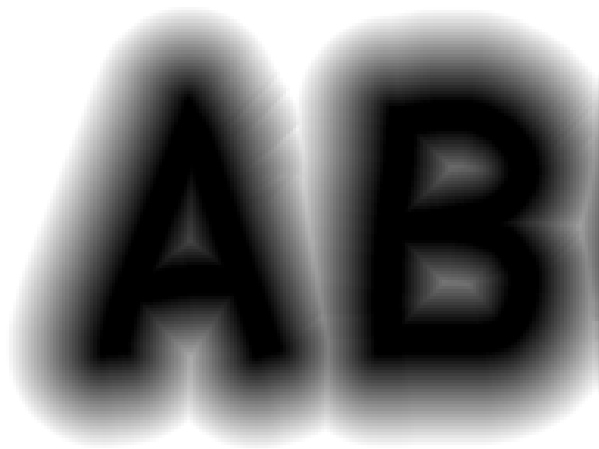
$$\text{dist}(\mathbf{P}) = \|\max(|\mathbf{P} - \mathbf{C}| - \vec{\mathbf{b}}, \vec{\mathbf{0}})\|$$



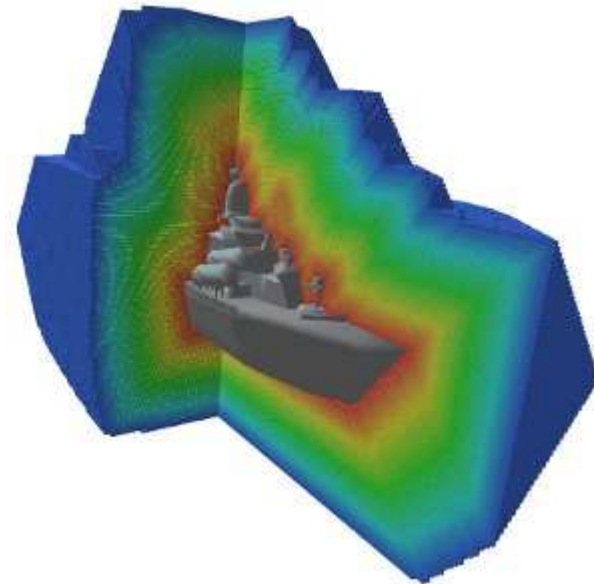
Distance Fields

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

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

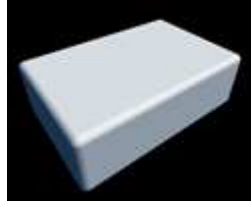


$$\mathbb{R}^3 \rightarrow \text{dist}(\mathbb{R}^3)$$



Operations on Distance Fields

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



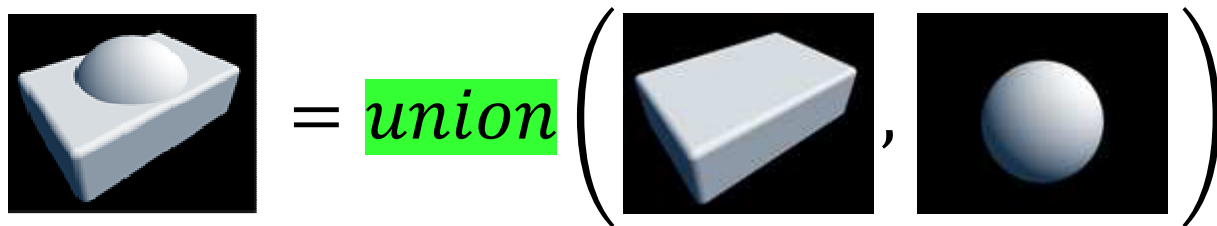
$$= dist(repeat(\mathbb{R}^3))$$

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

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

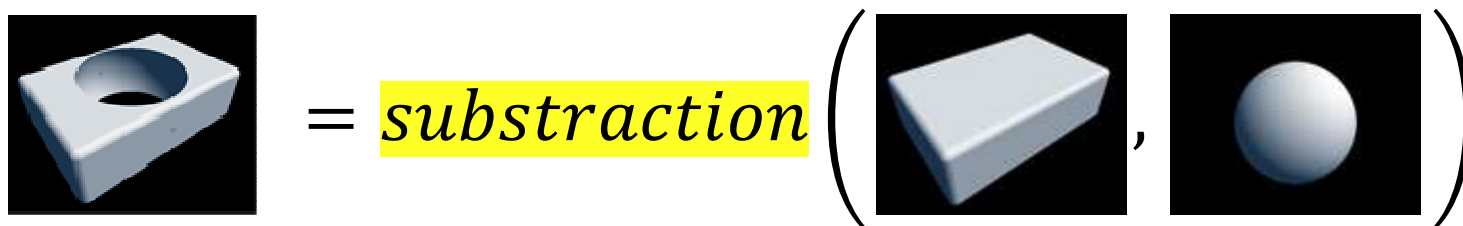
Operations on Distance Fields

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



The diagram illustrates the union operation. On the left is a 3D model of a white rectangular box with a white sphere on top. This is followed by an equals sign, the word "union" in green, and a large right parenthesis. Inside the parenthesis are two separate 3D models: a white rectangular box and a white sphere, each on a black background.

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



The diagram illustrates the subtraction operation. On the left is a 3D model of a white rectangular box with a circular hole in the center of its top surface. This is followed by an equals sign, the word "subtraction" in yellow, and a large right parenthesis. Inside the parenthesis are two separate 3D models: a white rectangular box and a white sphere, each on a black background.

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

Raymarching Distance Fields

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

