

Making Sidon's method auto-differentiable

Making Siddon's method auto-differentiable

Reformulate as an analytical function of the 3D pose

- From $\theta, \varphi, \gamma, b_x, b_y, b_z$, make X-ray source (\mathbf{s}) and detector plane (\mathbf{P})

- Calculate intersections:
$$\mathbf{A} = \left(\begin{pmatrix} b_x \\ b_y \\ b_z \end{pmatrix} + \begin{pmatrix} i \\ j \\ k \end{pmatrix} \otimes \begin{pmatrix} \Delta X \\ \Delta Y \\ \Delta Z \end{pmatrix} - \mathbf{s} \right) \oslash (\mathbf{P} - \mathbf{s})$$

- Synthesize DRR:
$$I = \|\mathbf{P} - \mathbf{s}\|_2 \sum_{m=1}^{M-1} (\alpha_{m+1} - \alpha_m) \mathbf{V} \left[\mathbf{s} + \frac{\alpha_{m+1} + \alpha_m}{2} (\mathbf{P} - \mathbf{s}) \right]$$

Evaluation