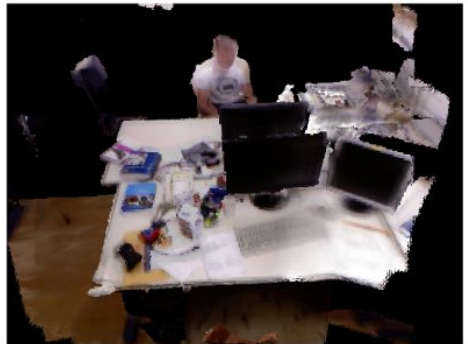
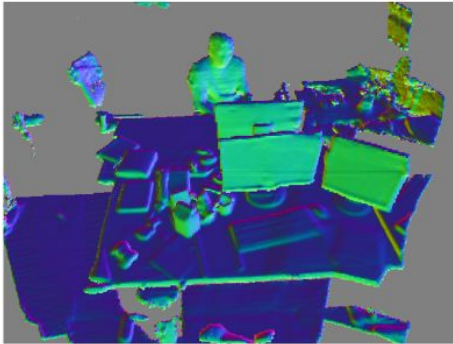
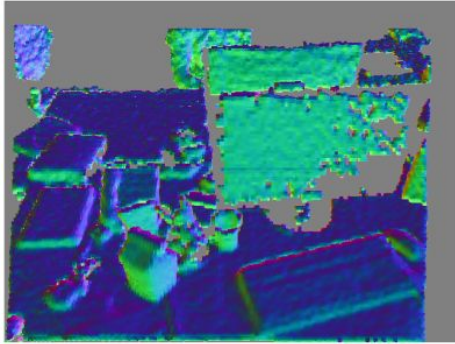
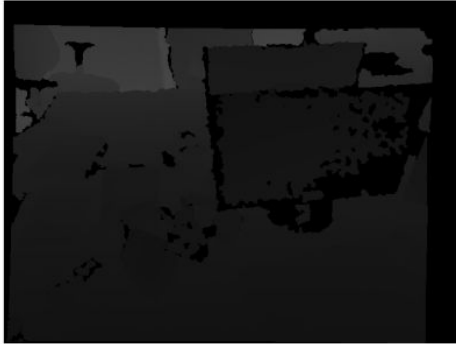


KinectFusion

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“Team 18”



KinectFusion: Real-Time Dense Surface Mapping and Tracking*

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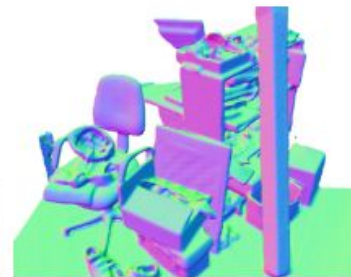
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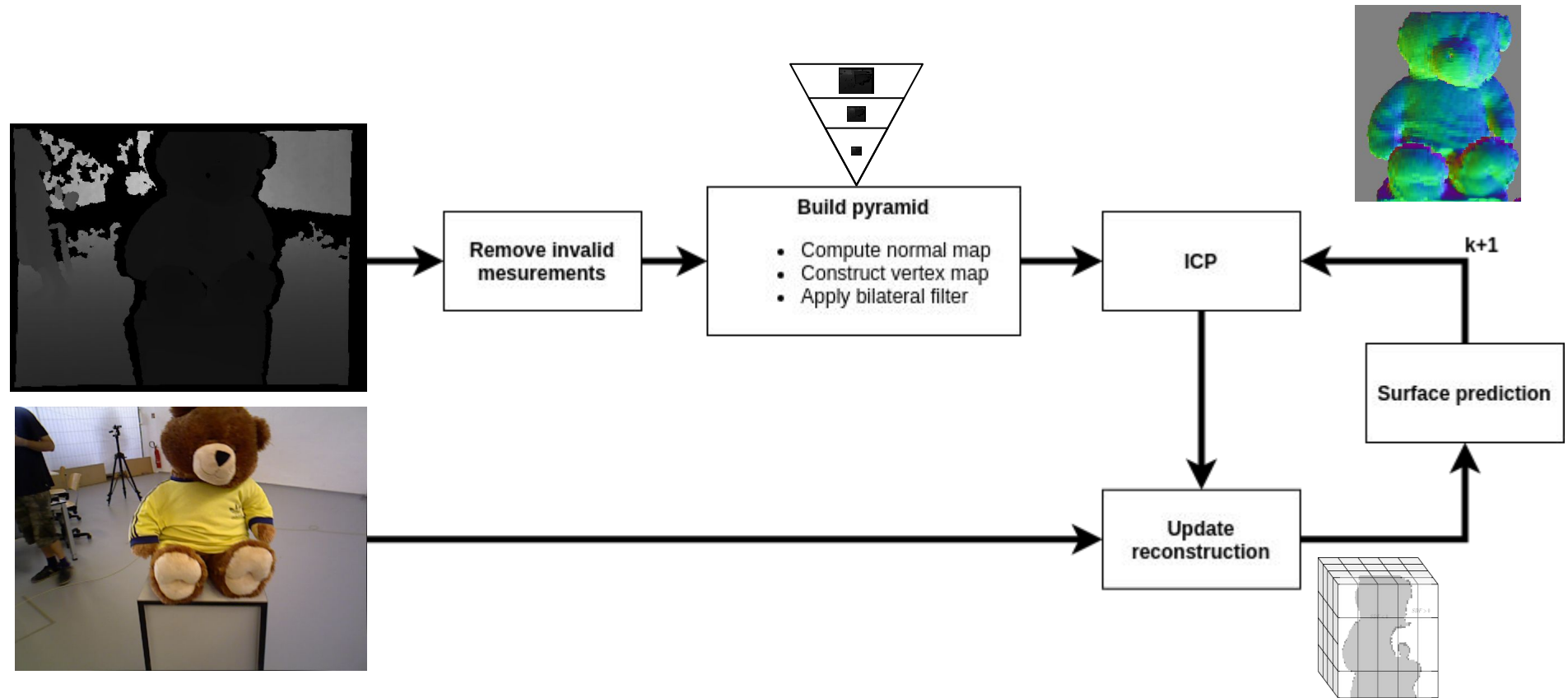
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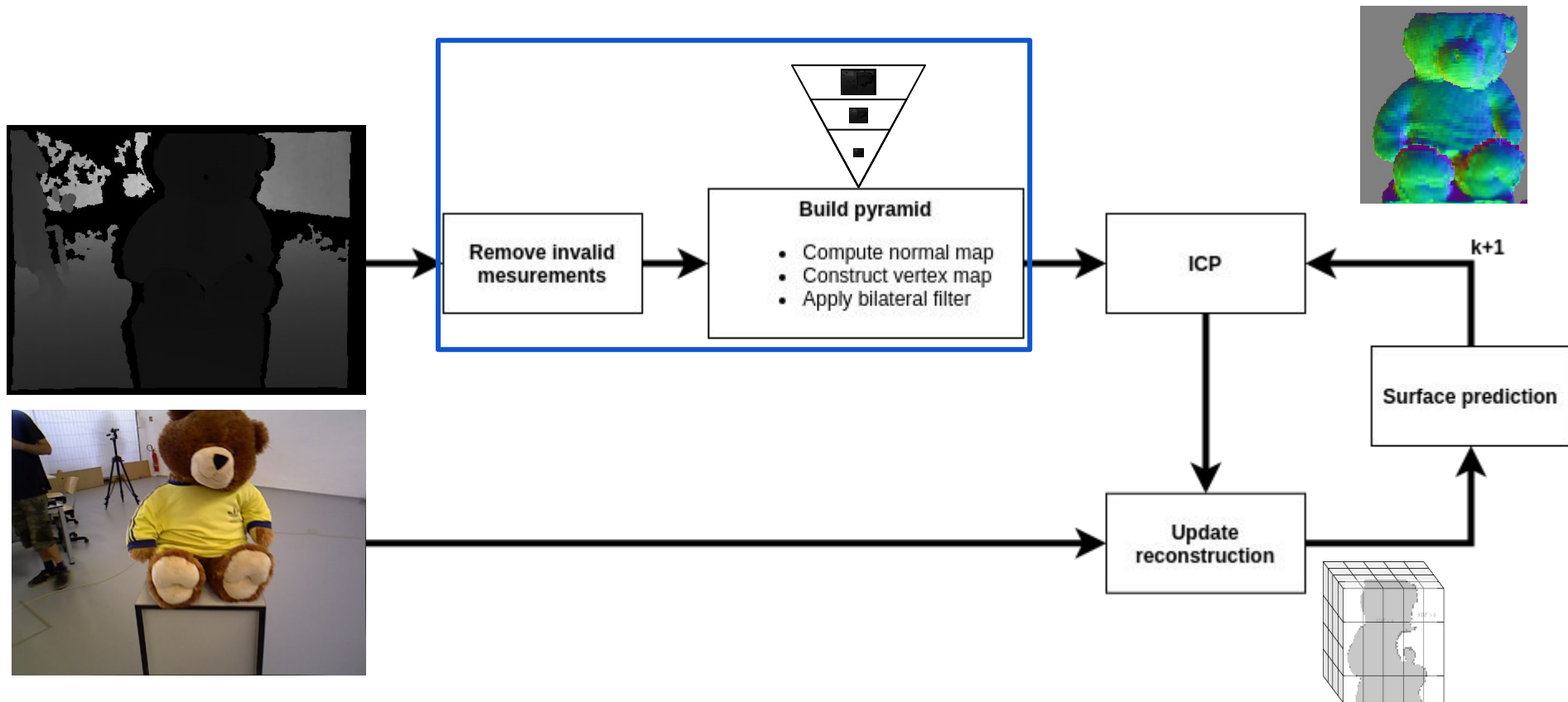
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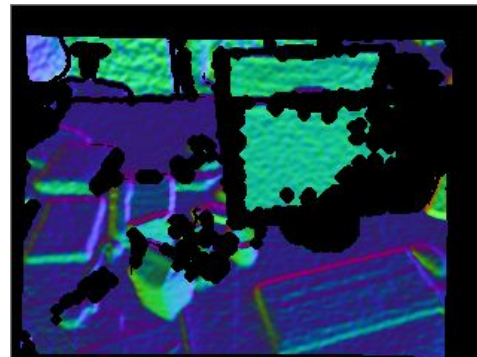
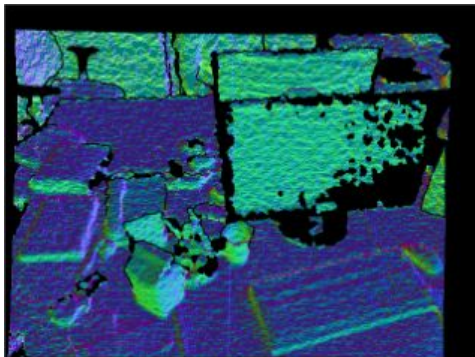
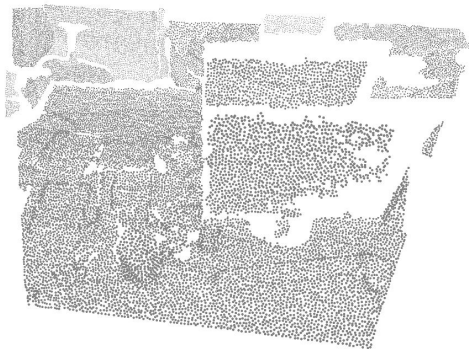




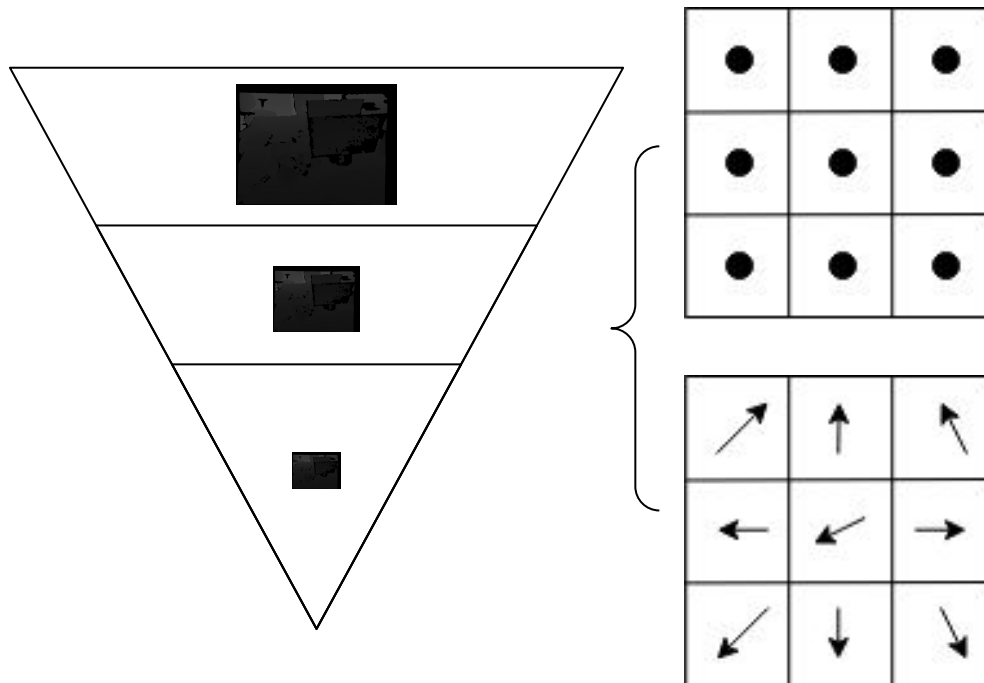
Method | Preprocessing



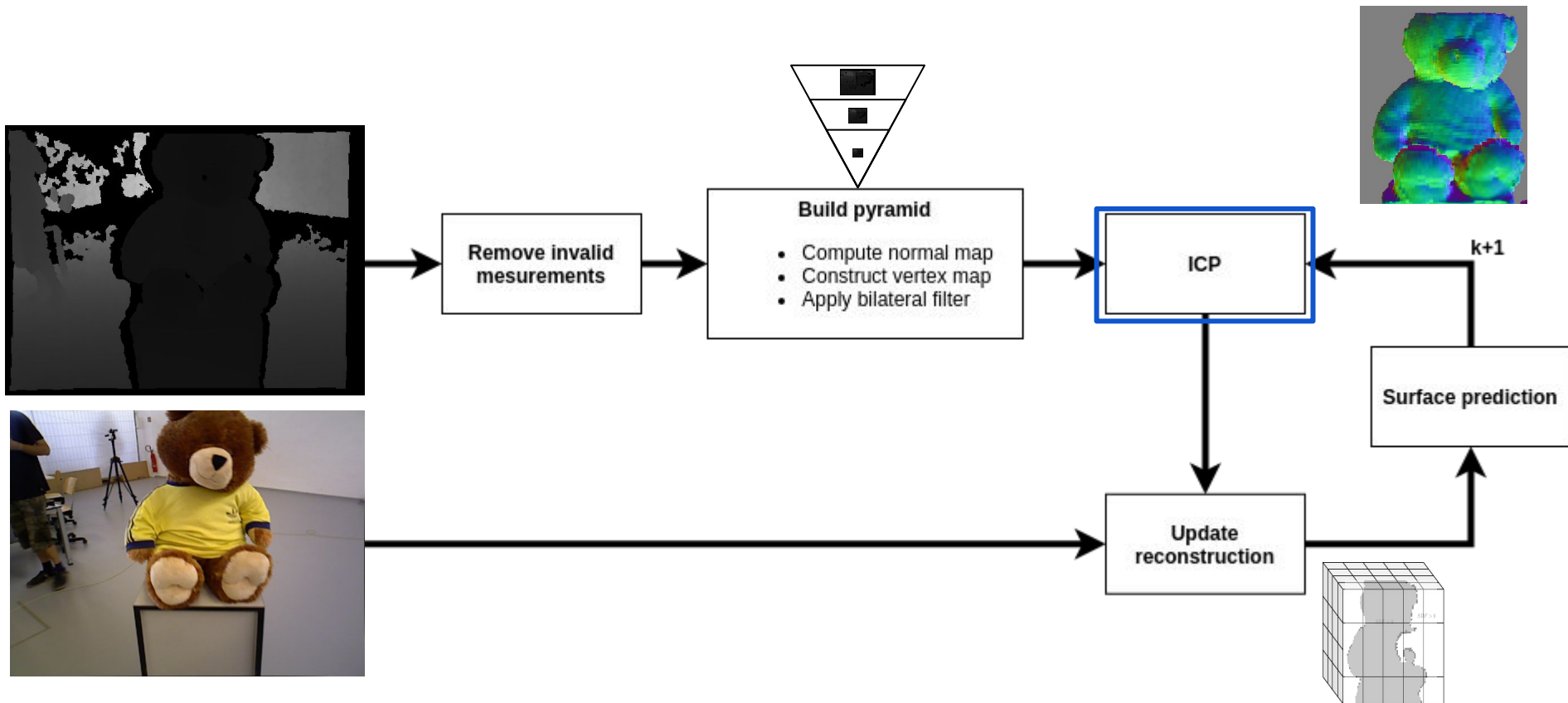
Method | Preprocessing



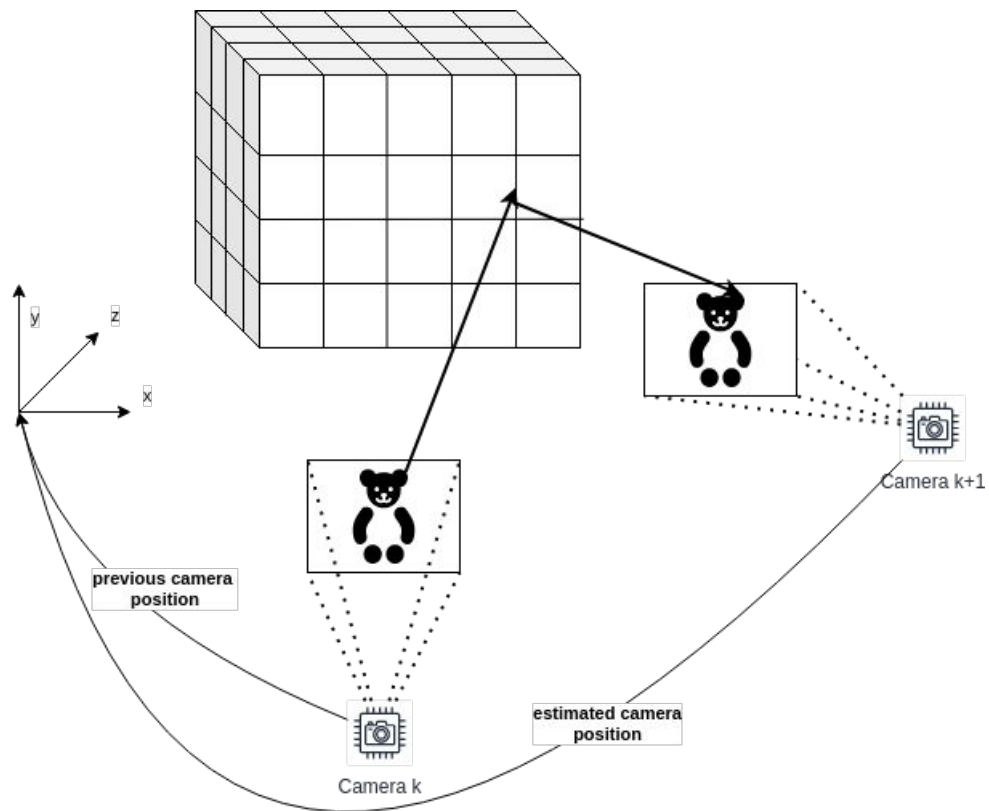
Method | Preprocessing



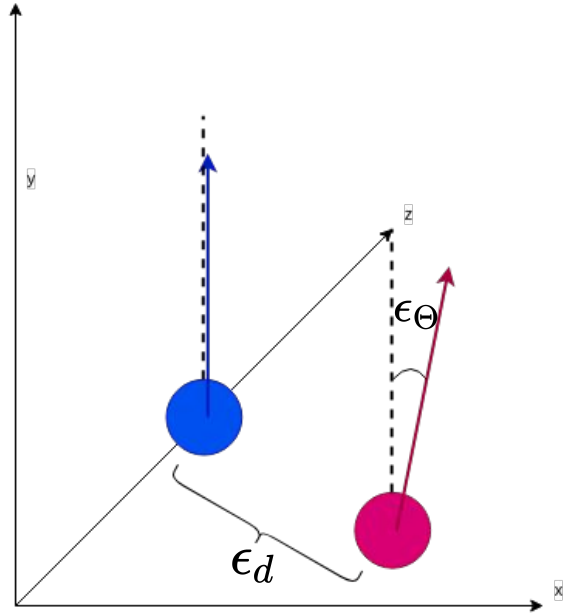
Method | Pose estimation



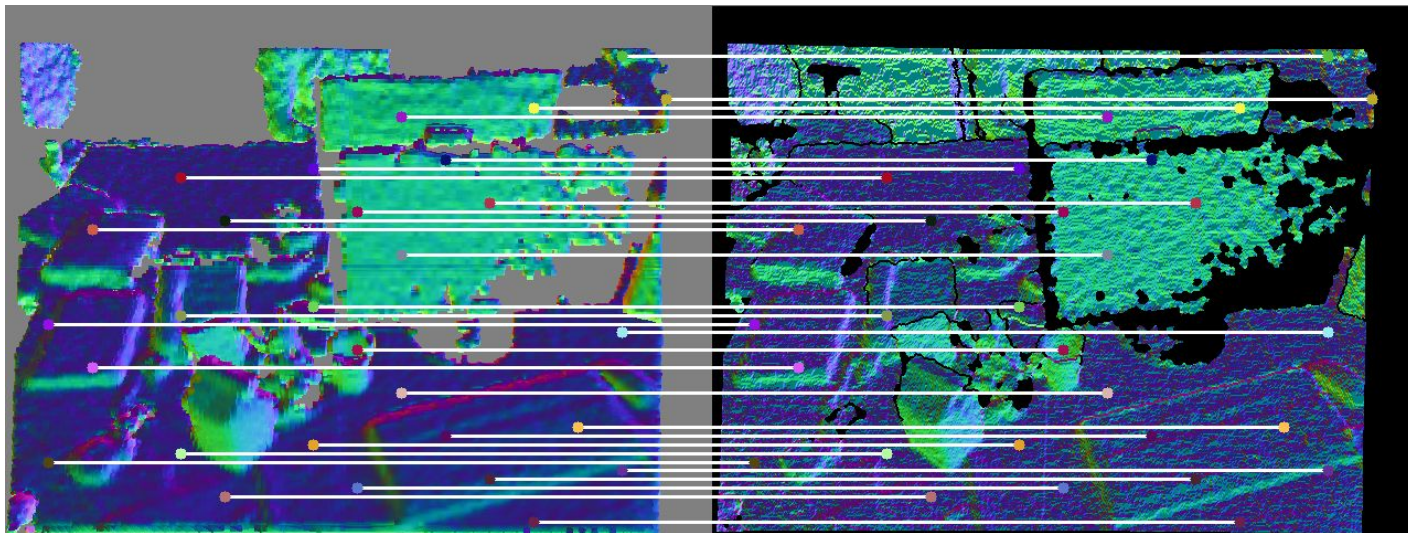
Method | Pose estimation



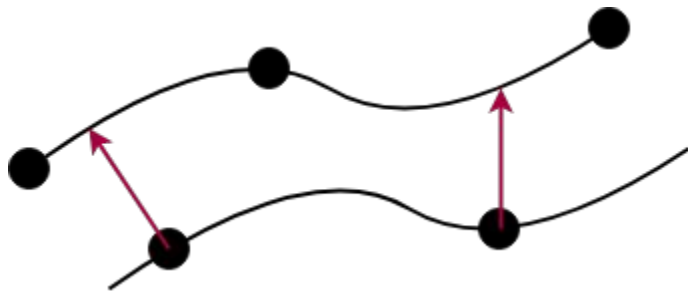
Method | Pose estimation



Method | Pose estimation



Method | Pose estimation



$$\mathbf{E}(\mathbf{T}_{g,k}) = \sum_{\substack{\mathbf{u} \in \mathcal{U} \\ \Omega_k(\mathbf{u}) \neq \text{null}}} \left\| \left(\mathbf{T}_{g,k} \dot{\mathbf{V}}_k(\mathbf{u}) - \hat{\mathbf{V}}_{k-1}^g(\hat{\mathbf{u}}) \right)^\top \hat{\mathbf{N}}_{k-1}^g(\hat{\mathbf{u}}) \right\|_2$$

$$E = \hat{\mathbf{N}}_{k-1}^g(\hat{\mathbf{u}})^\top \left(\mathbf{G}(\mathbf{u})\mathbf{x} + \widetilde{\mathbf{V}}_k^g(\mathbf{u}) - \hat{\mathbf{V}}_{k-1}^g(\hat{\mathbf{u}}) \right) \quad \mathbf{G}(\mathbf{u}) = \left[\left[\widetilde{\mathbf{V}}_k^g(\mathbf{u}) \right]_\times \mid \mathbf{I}_{3 \times 3} \right]$$

Method | Pose estimation

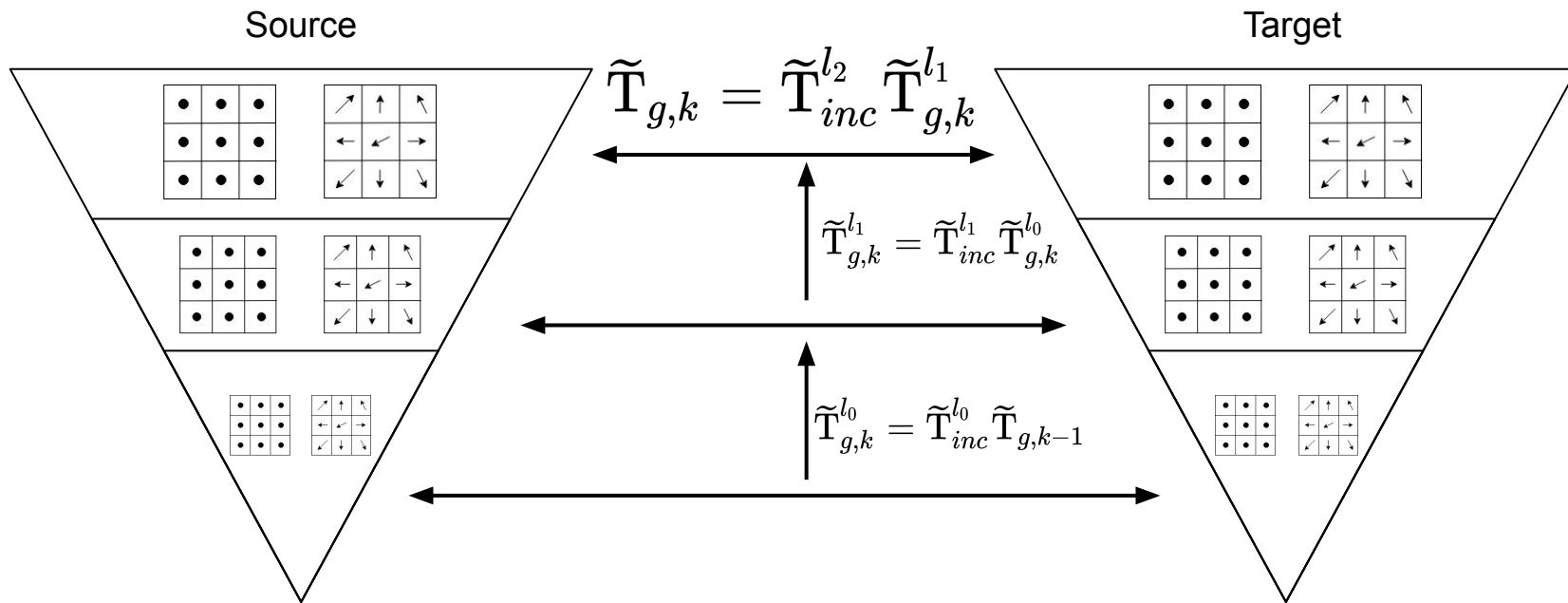
$$\mathbf{A} = \begin{pmatrix} \leftarrow & \tilde{\mathbf{V}}_k^g(\mathbf{u}_1) \times \hat{\mathbf{N}}_{k-1}^g(\hat{\mathbf{u}}_1) & \rightarrow & \leftarrow & \hat{\mathbf{N}}_{k-1}^g(\hat{\mathbf{u}}_1) & \rightarrow \\ \leftarrow & \tilde{\mathbf{V}}_k^g(\mathbf{u}_2) \times \hat{\mathbf{N}}_{k-1}^g(\hat{\mathbf{u}}_2) & \rightarrow & \leftarrow & \hat{\mathbf{N}}_{k-1}^g(\hat{\mathbf{u}}_2) & \rightarrow \\ & \vdots & & & \vdots & \end{pmatrix} \quad \mathbf{x} = \begin{pmatrix} \alpha \\ \beta \\ \gamma \\ t_x \\ t_y \\ t_z \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} -(\tilde{\mathbf{V}}_k^g(\mathbf{u}_1) - \hat{\mathbf{V}}_{k-1}^g(\hat{\mathbf{u}}_1)) \cdot \hat{\mathbf{N}}_{k-1}^g(\hat{\mathbf{u}}_1) \\ -(\tilde{\mathbf{V}}_k^g(\mathbf{u}_2) - \hat{\mathbf{V}}_{k-1}^g(\hat{\mathbf{u}}_2)) \cdot \hat{\mathbf{N}}_{k-1}^g(\hat{\mathbf{u}}_2) \\ \vdots \end{pmatrix}$$

$$\tilde{\mathbf{T}}_{\text{inc}} = [\tilde{\mathbf{R}} \mid \tilde{\mathbf{t}}] = \begin{bmatrix} 1 & \alpha & -\gamma & t_x \\ -\alpha & 1 & \beta & t_y \\ \gamma & -\beta & 1 & t_z \end{bmatrix}$$

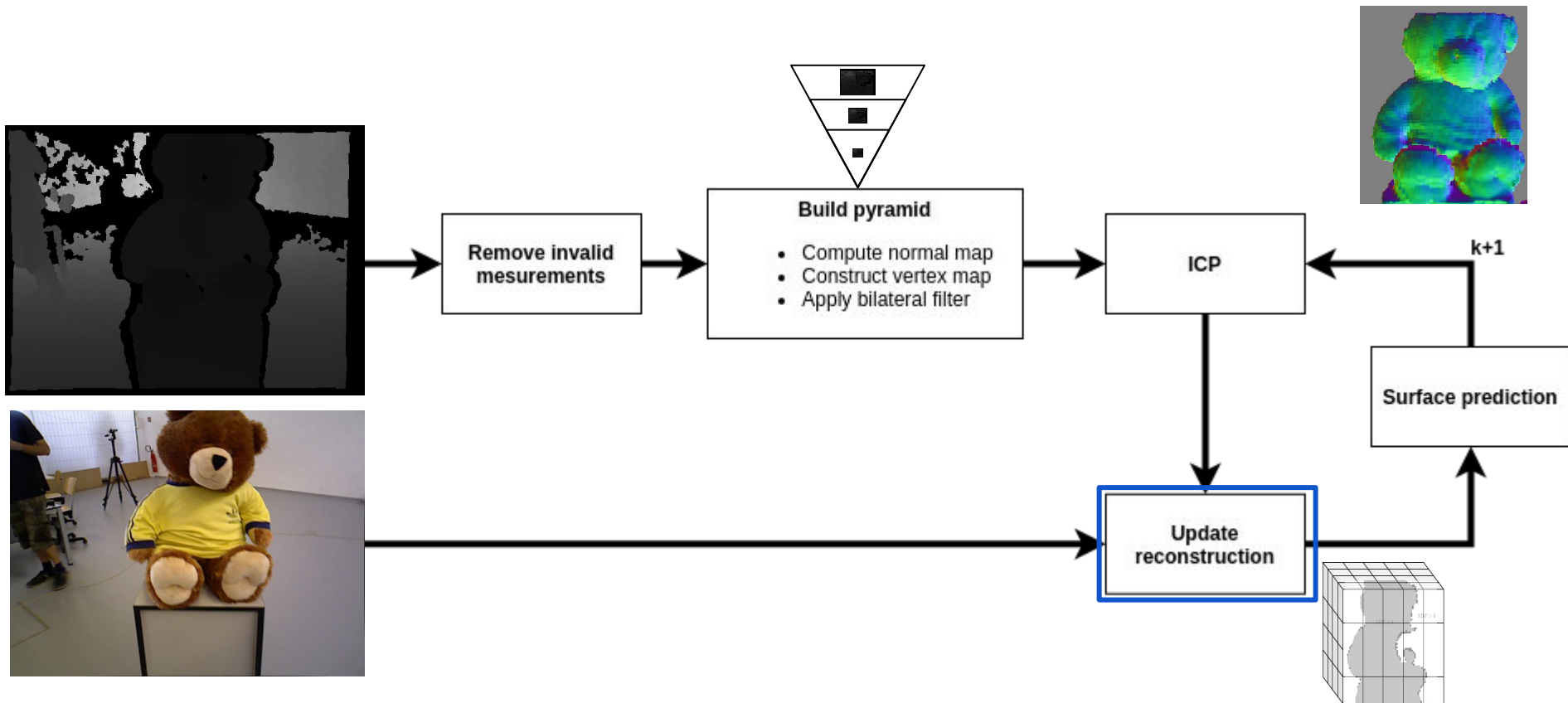
$$\min_{\mathbf{x} \in \mathbb{R}^6} \sum_{\Omega_k} \sum_{\mathbf{u} \neq \text{null}} \|\mathbf{E}\|_2^2$$

$$\mathbf{A}^T \mathbf{A} \mathbf{x} = \mathbf{A}^T \mathbf{b}$$

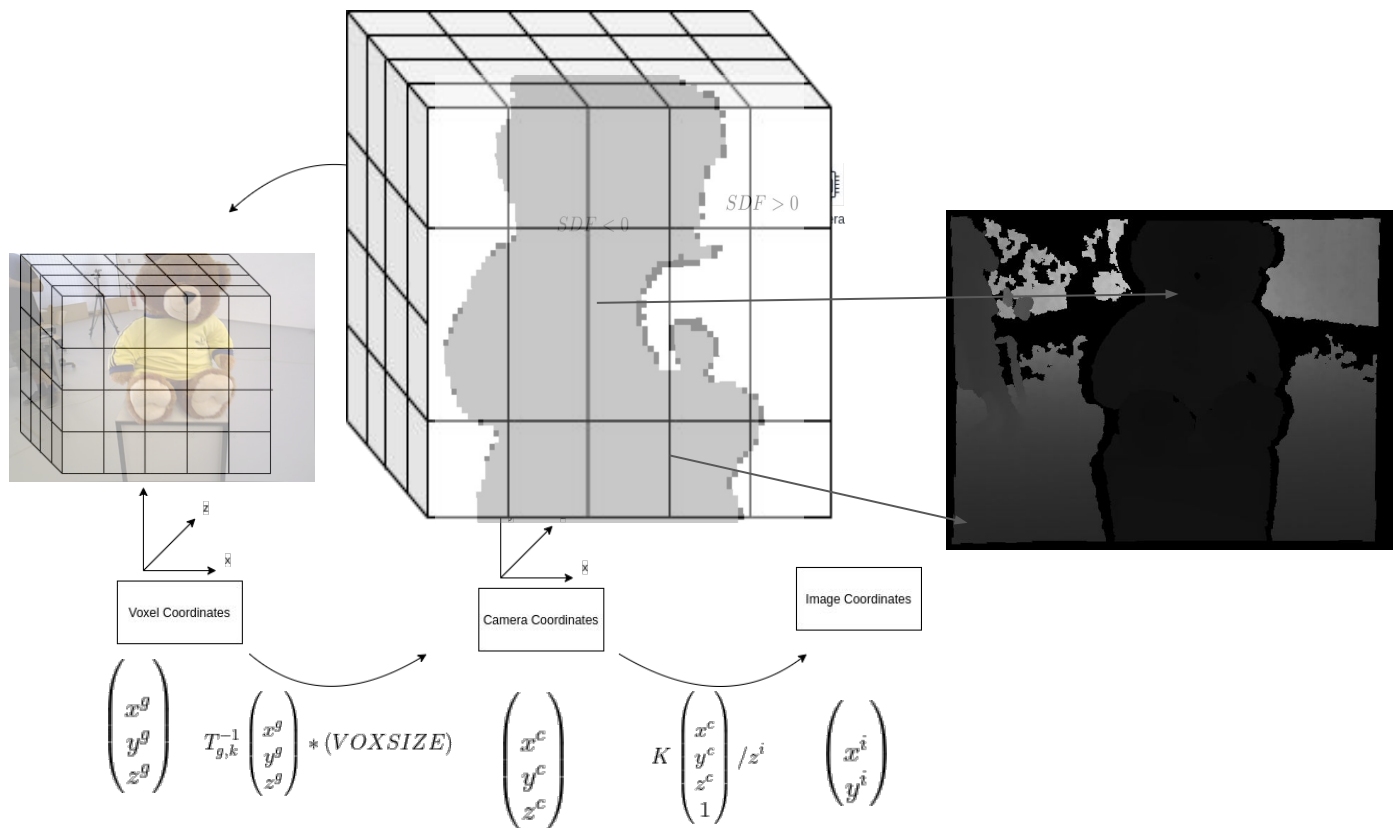
Method | Pose estimation



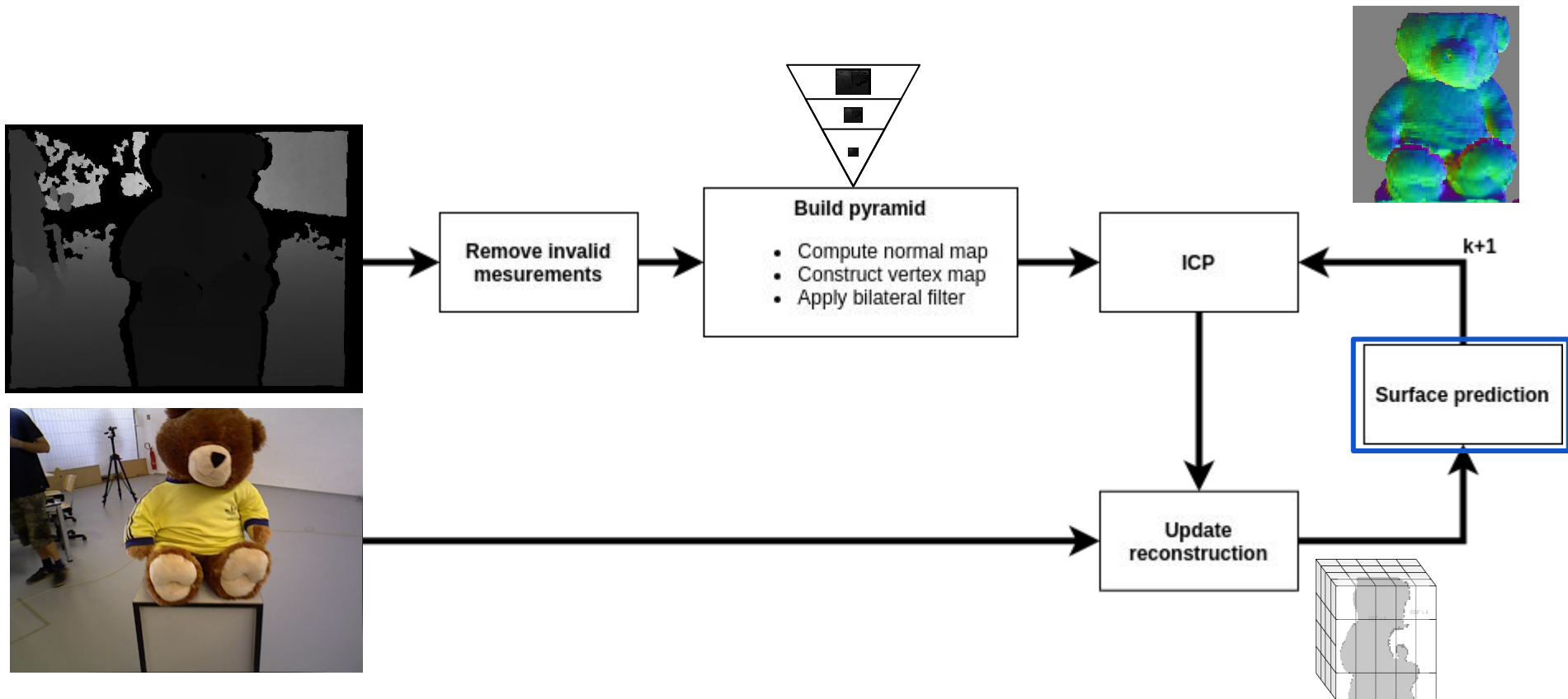
Method | Update reconstruction



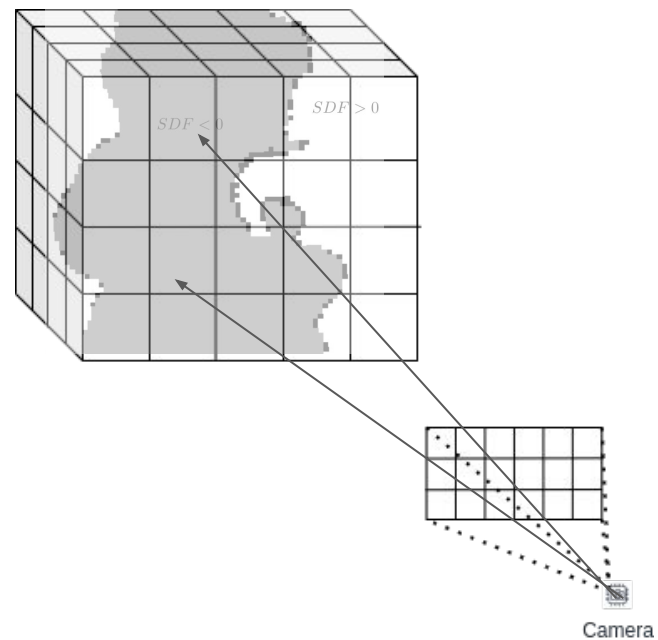
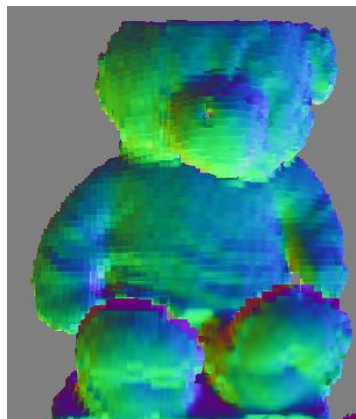
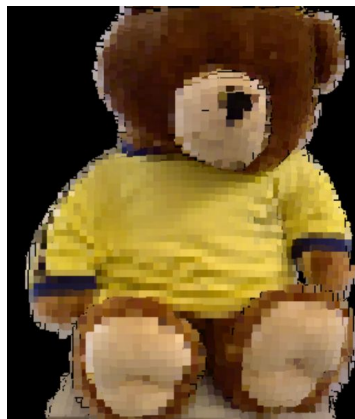
Method | Update reconstruction



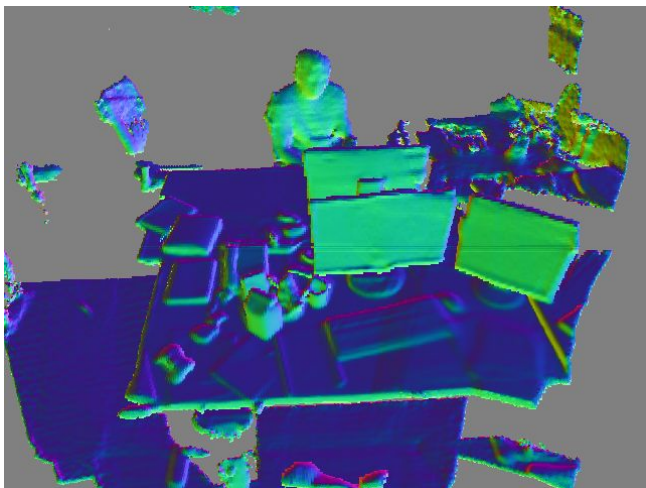
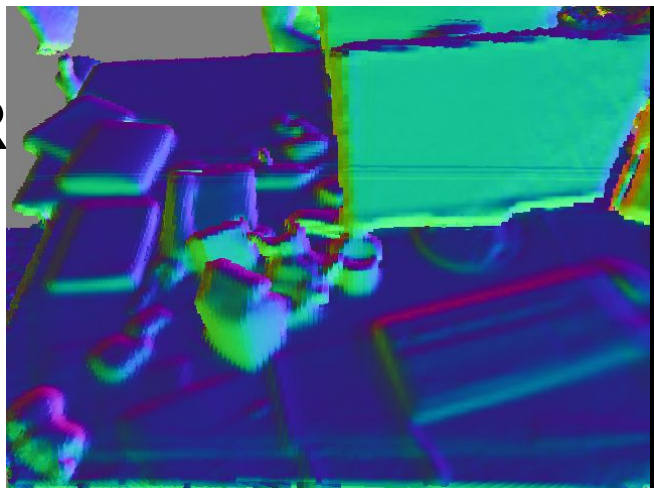
Method | Surface prediction



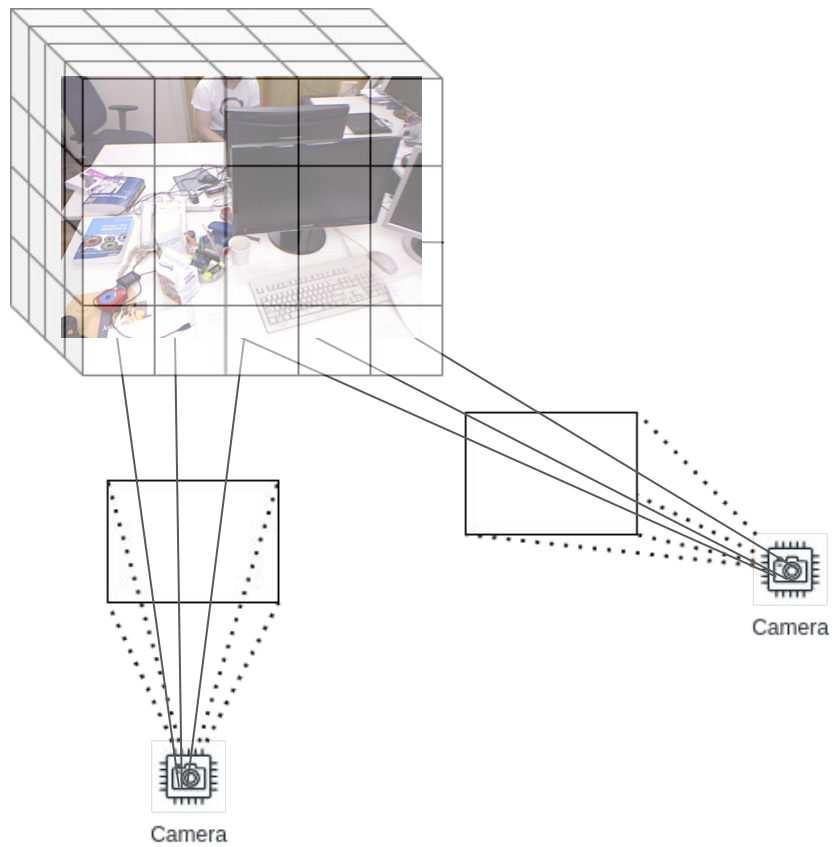
Method | Surface prediction



R



ent viewpoints



Results

