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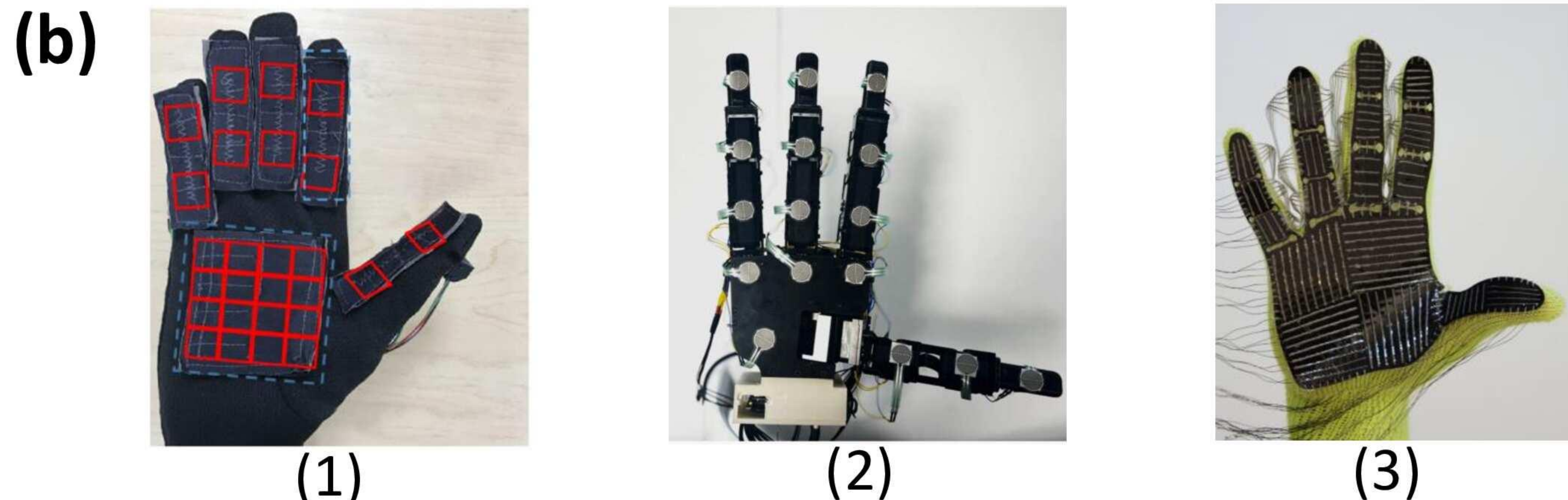
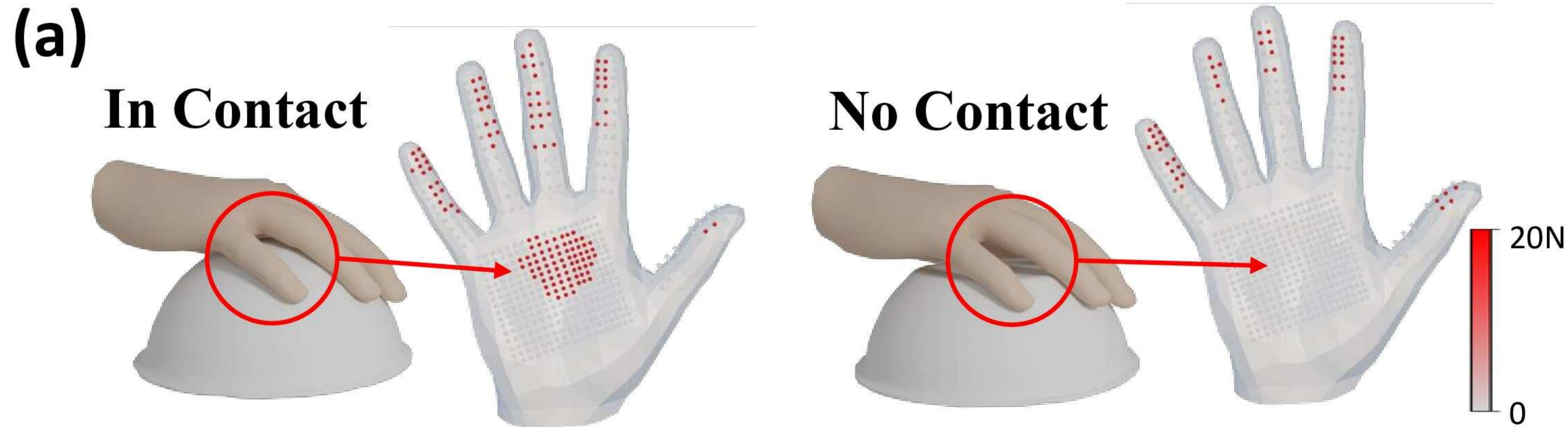


Dynamic Reconstruction of Hand-Object Interaction with Distributed Force-aware Contact Representation

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Introduction



Different types of distributed tactile sensing

Force-aware Contact Representation: DF-Field

- Hand-object reconstruction refinements with fore-aware optimization from distributed tactile information

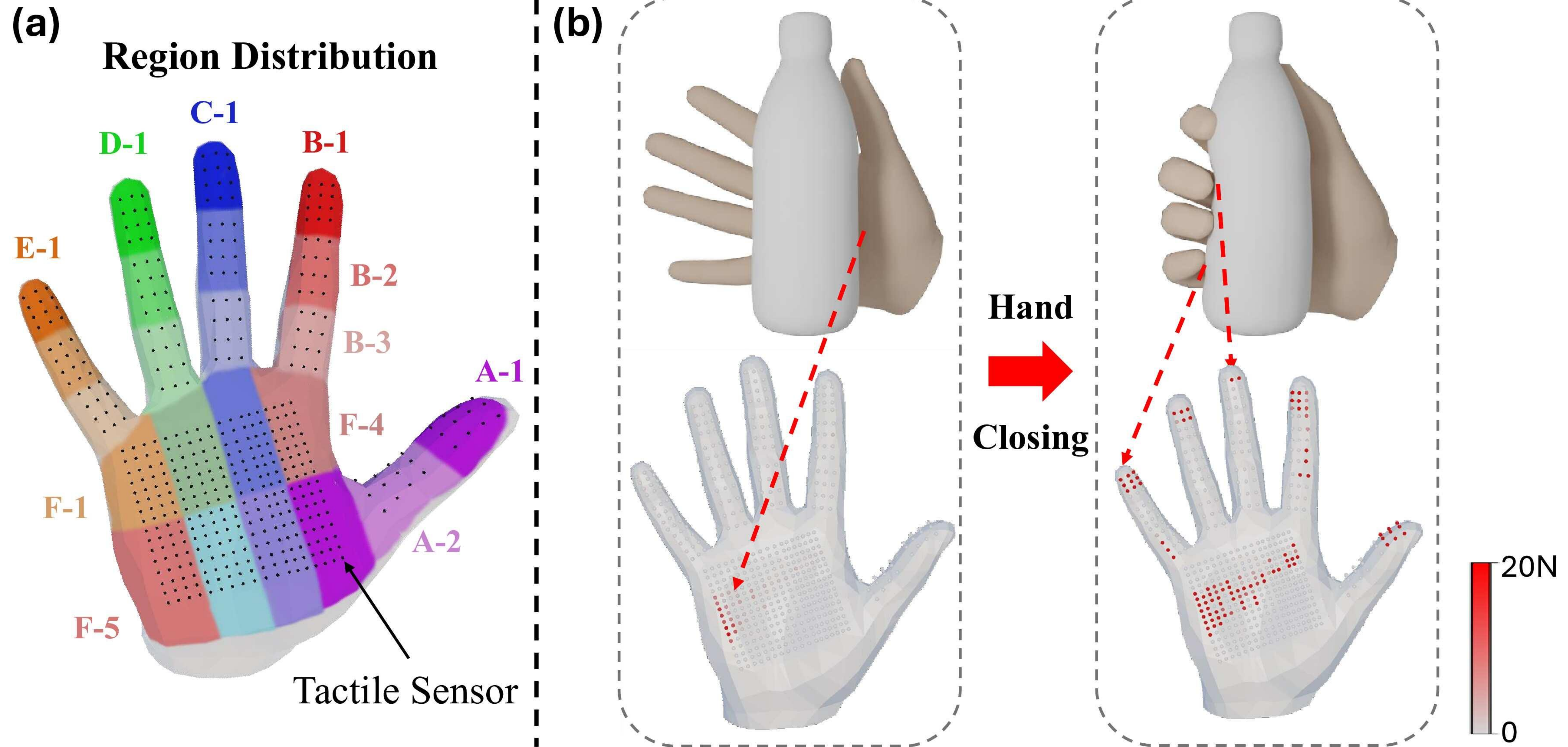
Visual-tactile learning Framework: ViTaM-D

- Dynamic 4D reconstruction of hand-object interactions with 3D visual perceptron and distributed tactile sensing (tactile gloves in (b))

Hand-Object-Tactile Dataset: HOT Dataset

- 600 RGB-D manipulation sequences on 30 deformable objects from 5 categories with penetration-free hand-object poses and accurate tactile information

Force-aware Contact Representation: DF-Field



Relative Potential Energy

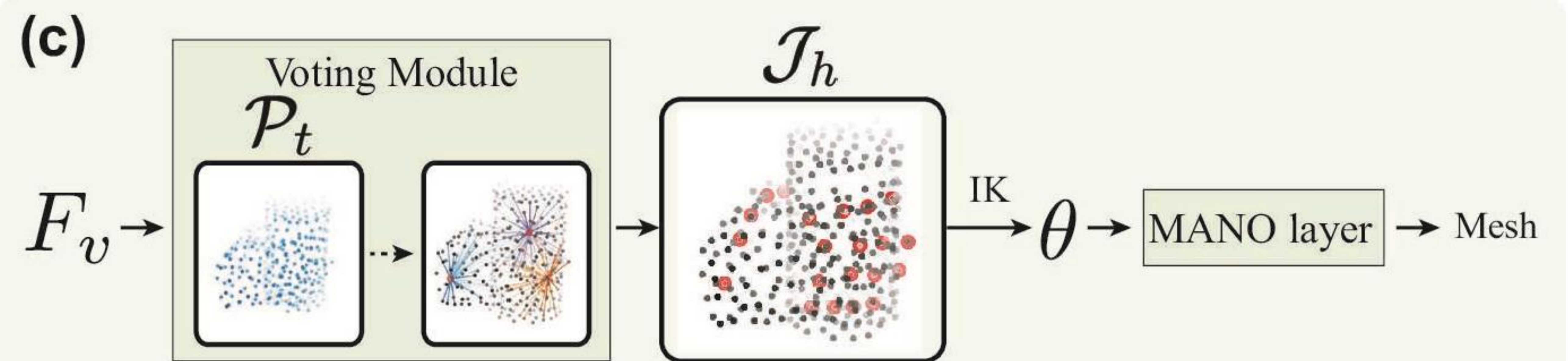
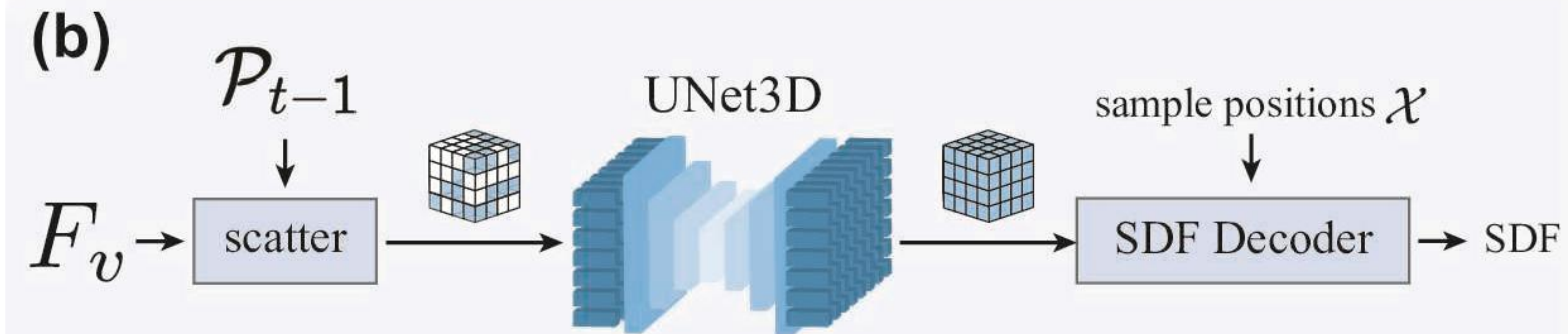
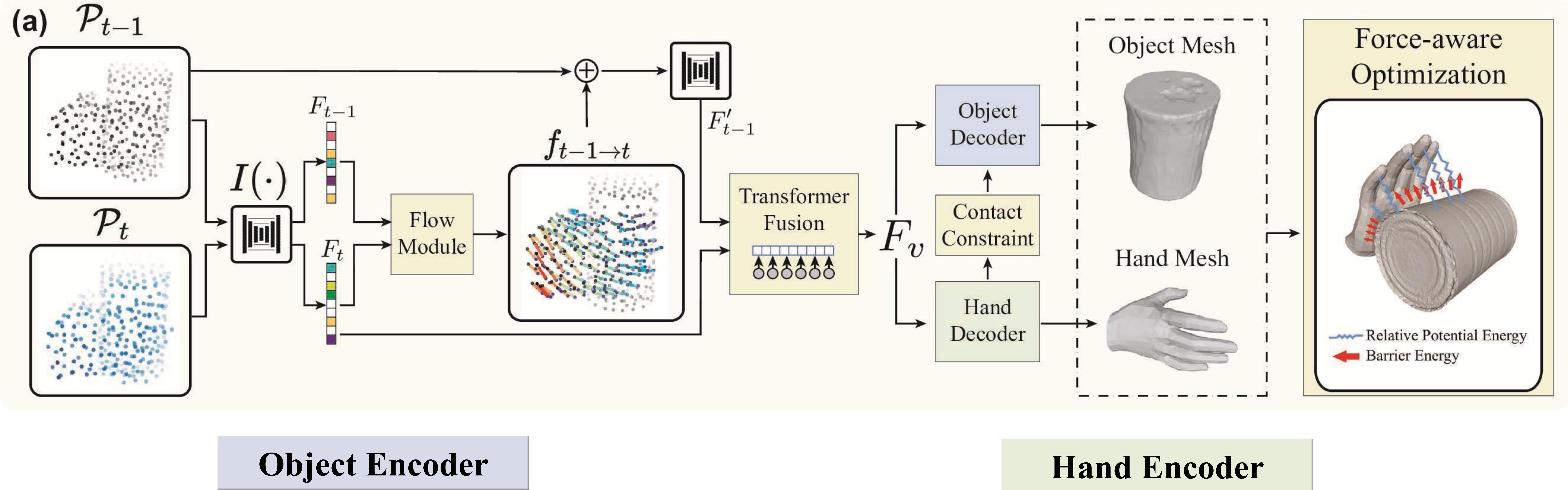
Overall Energy

Barrier Energy

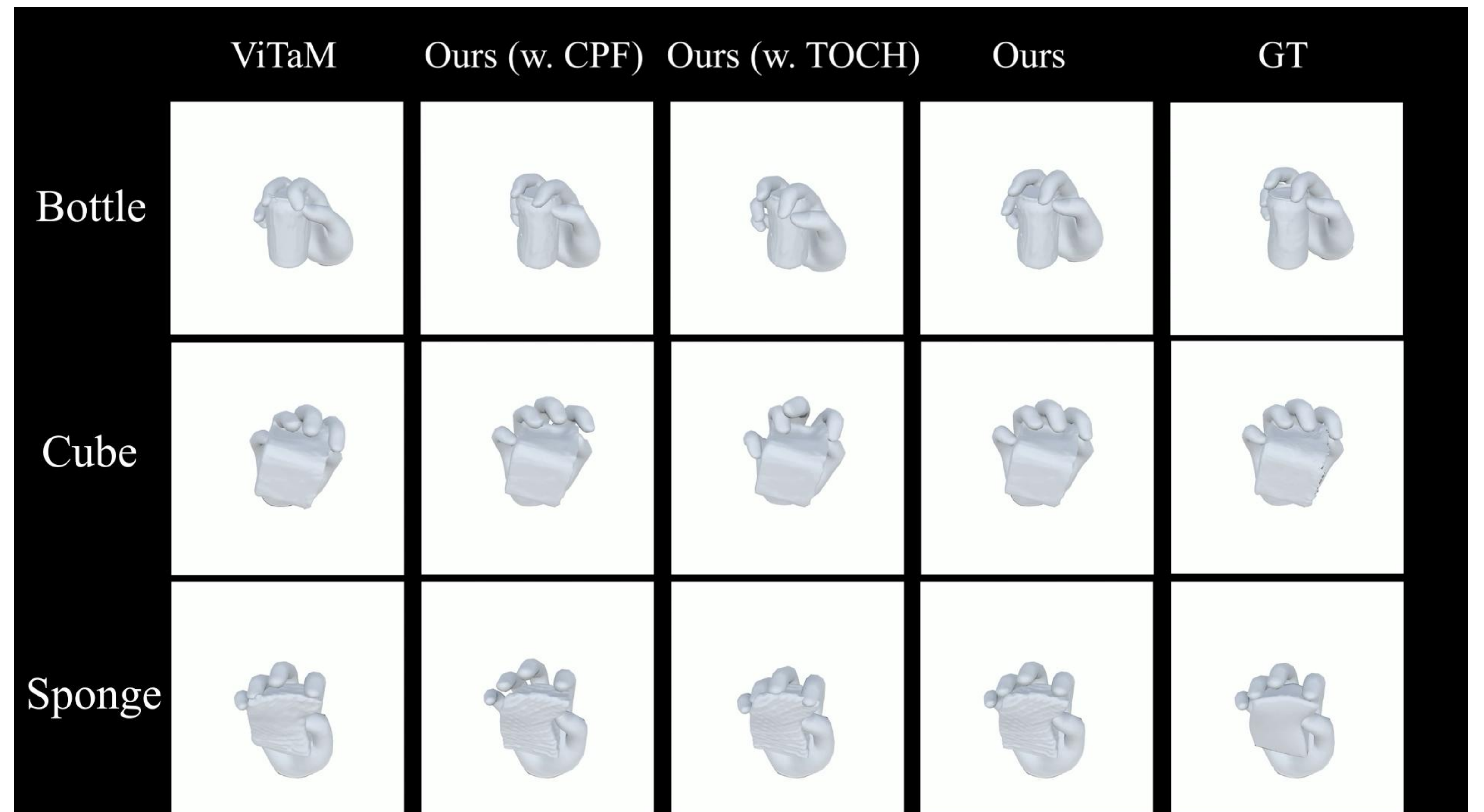
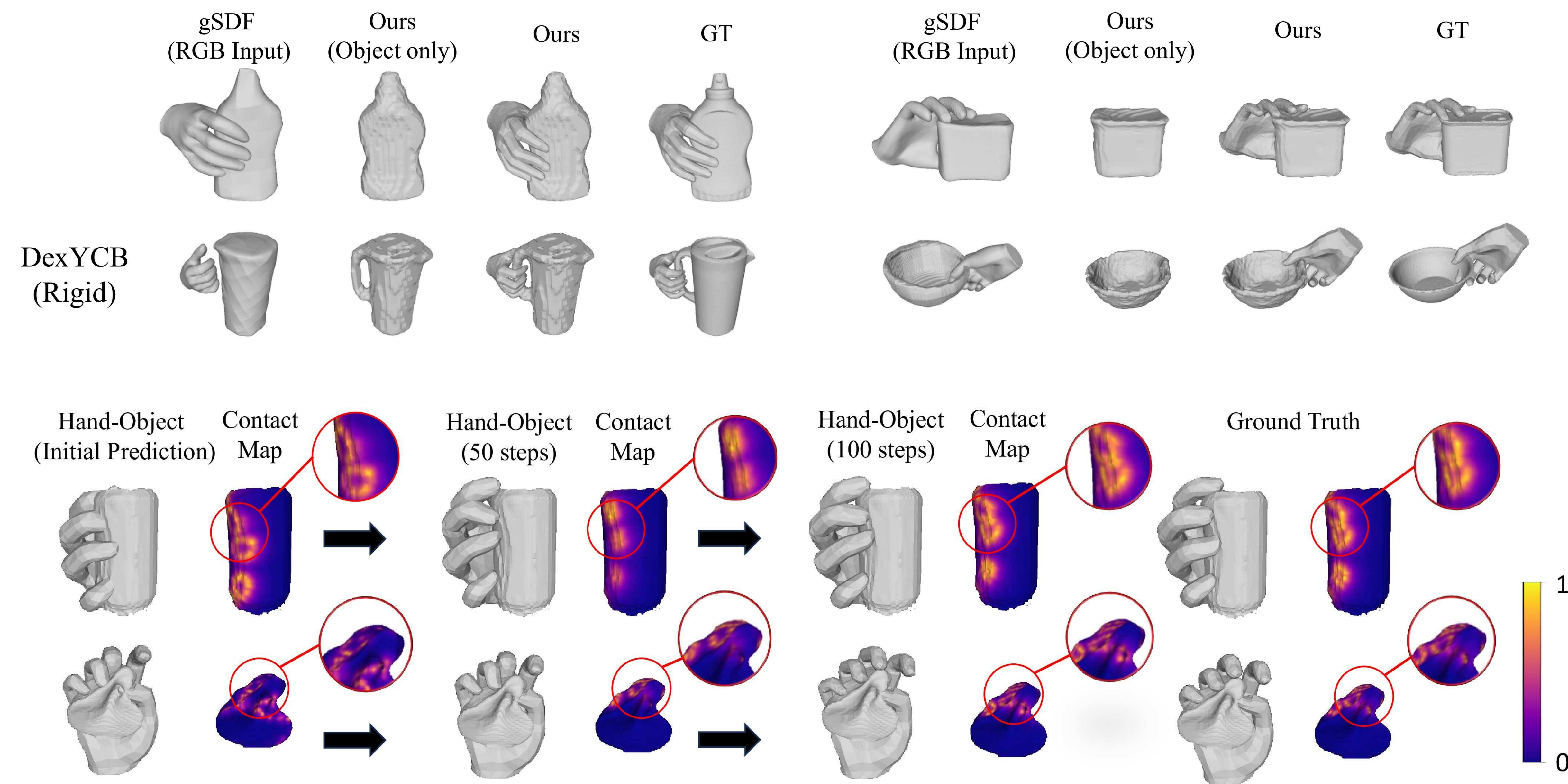
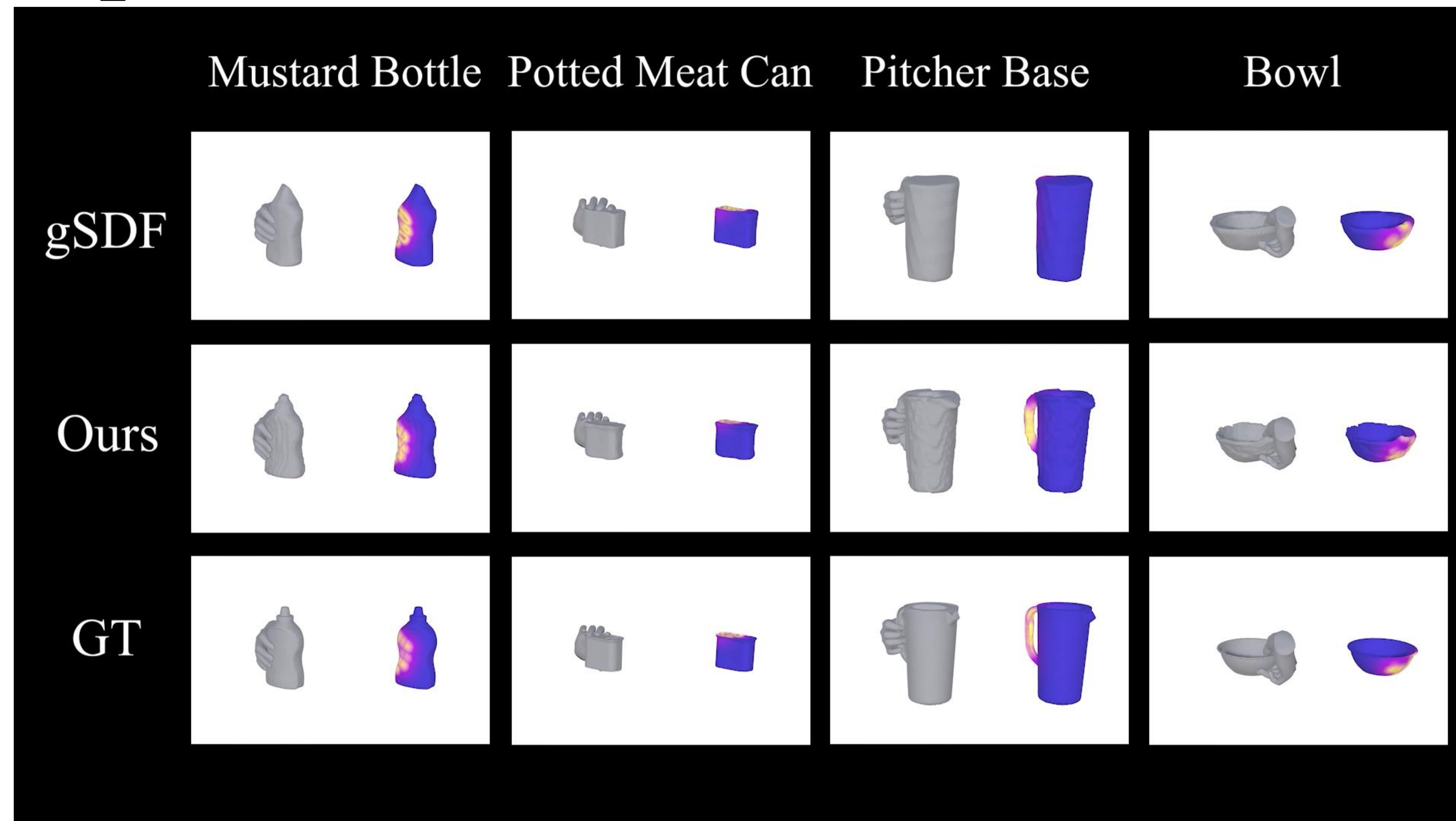
$$E_{ij} = \kappa l_{ij}^2 \quad \kappa \sim \frac{\overline{\mathcal{M}^j}}{l_{ij}}.$$

$$E = \sum_i \sum_j (E_{ij} + B_{ij})$$

$$B_{ij} = -e^{-\kappa} (l_{ij} - \hat{l})^2 \log\left(\frac{l_{ij}}{\hat{l}}\right)$$



Experimental Results



Input Point Cloud Reconstruction Tactile Readings

