

Problem:

- Reconstruction of 3D objects from multi-view RGB/RGB-D data.
- Issues: The reconstructed objects often appear in incomplete situation



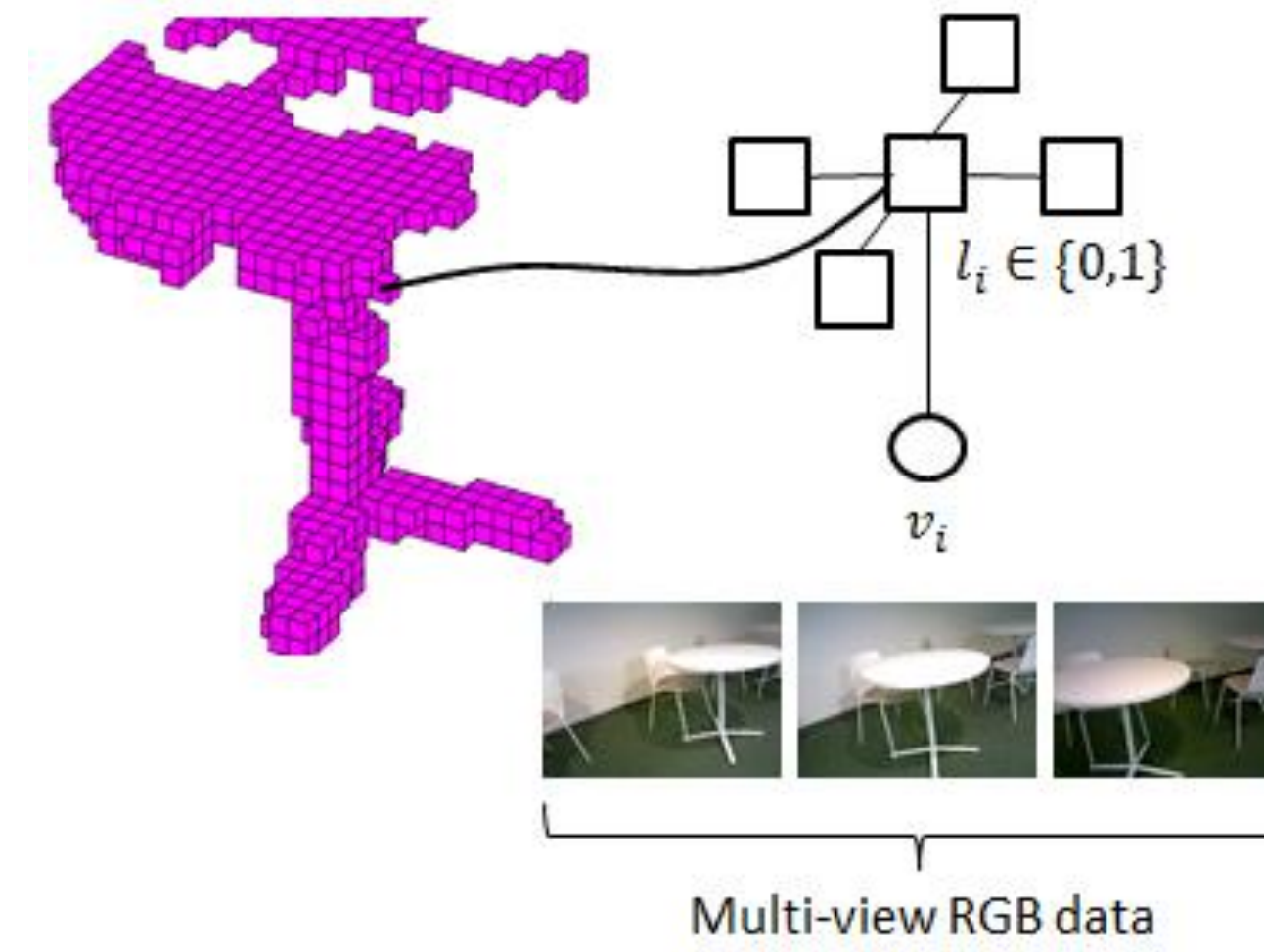
Reasons:

- ❑ Depth may be missing when multi-view RGB-D data is employed, e.g. SLAM
- ❑ Matching of the RGB data in structure-from-motion based reconstruction methods could not be done accurately for objects of uniform colours

Contributions:

- An Markov Random Field (MRF) model to represent 3D shapes in multiple viewpoints
- A new formulation for shape repairing via maximum a posteriori (MAP) estimation in the MRF model.
- An efficient inference method for approximation of MAP estimation using variational mean field approach.
- A new 3D object dataset including objects present in different levels of incompleteness. Compared with existing datasets, our dataset is enriched to include 3D models, 2D images and 2D-3D correspondences.

MRF Model

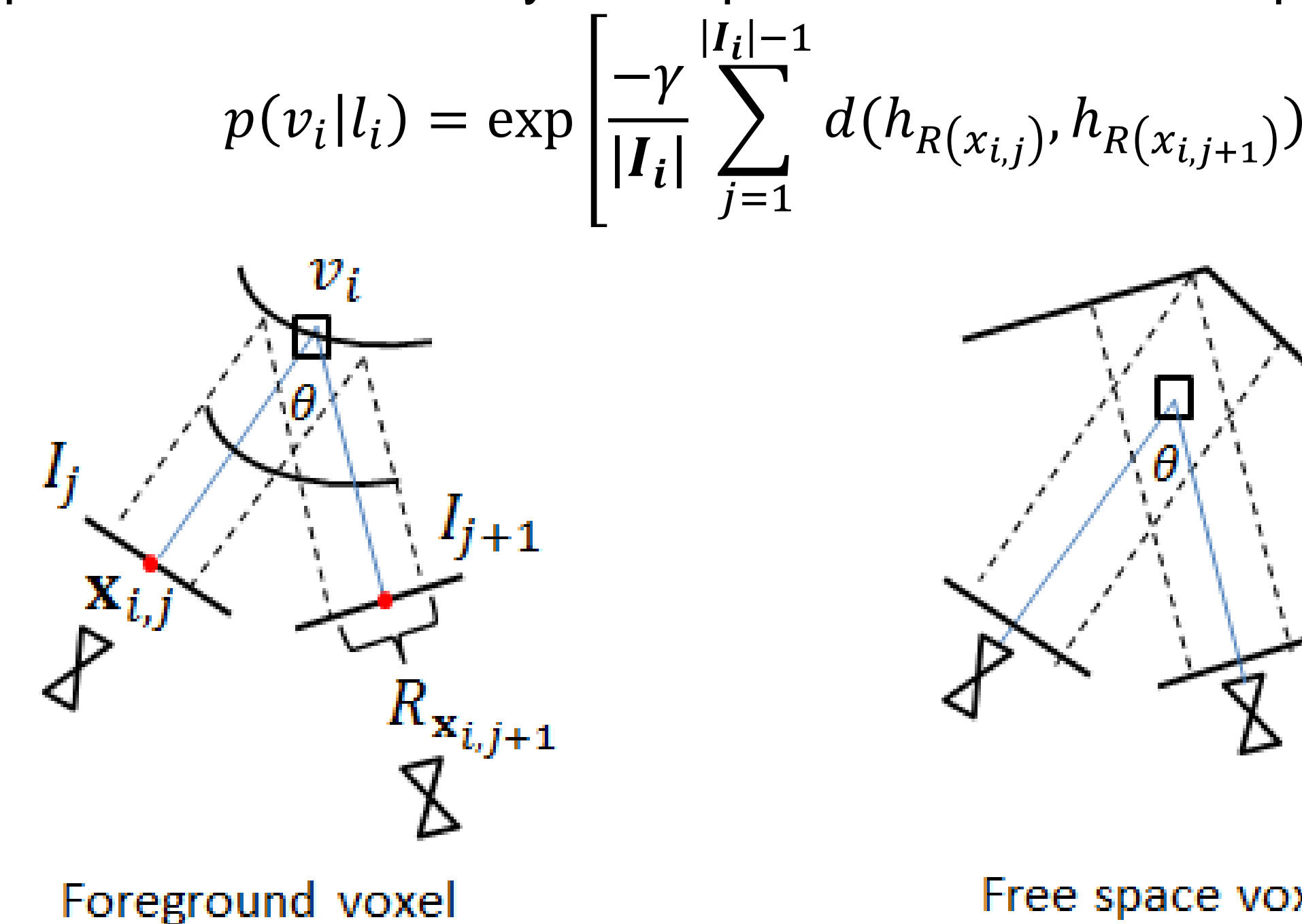


- The pairwise priors capture local geometric structures of a shape and can be learnt from 3D templates using a convolutional deep belief network (CDBN).

$$p(L) = \frac{1}{Z} \prod_{(v_i, v_j) \in E} \psi_{ij}(l_i, l_j) \prod_{v_i \in V} \psi_i(l_i)$$

3D distance transforms are used to compute

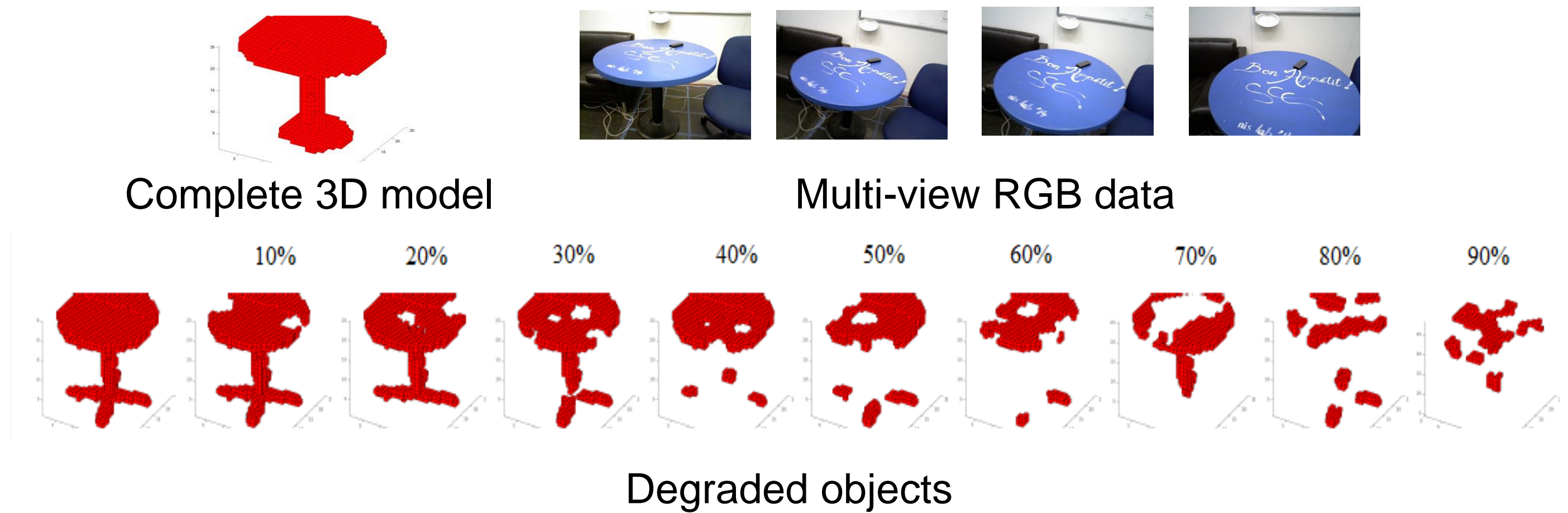
- The likelihoods are constructed from multi-view RGB data to capture the consistency of 3D points in various viewpoints.



Experiments:

Dataset

- A new 3D object dataset including 77 (complete) objects is created. Each object is degraded at 9 different levels (10% - 90%) → 693 objects



Evaluation and comparison

Inaccuracy: #points/voxels added wrongly

Incompleteness: #points/voxels missed

