PlaneFormers: From Sparse View Planes to 3D Reconstruction

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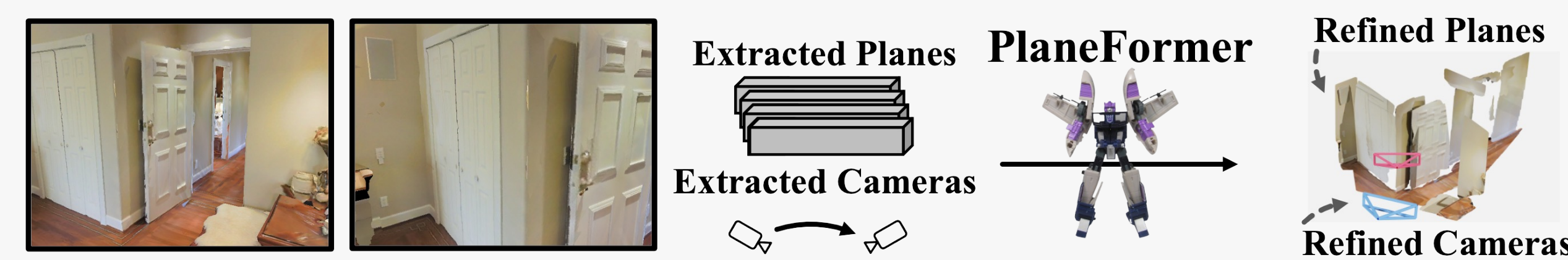Computer Science & Engineering, University of Michigan

Overview

Objective: Planar surface reconstruction of a scene from images with limited overlap

How can we reconstruct scenes using planes?

- Detect planes in each image
- Estimate the relative pose of cameras that took the images
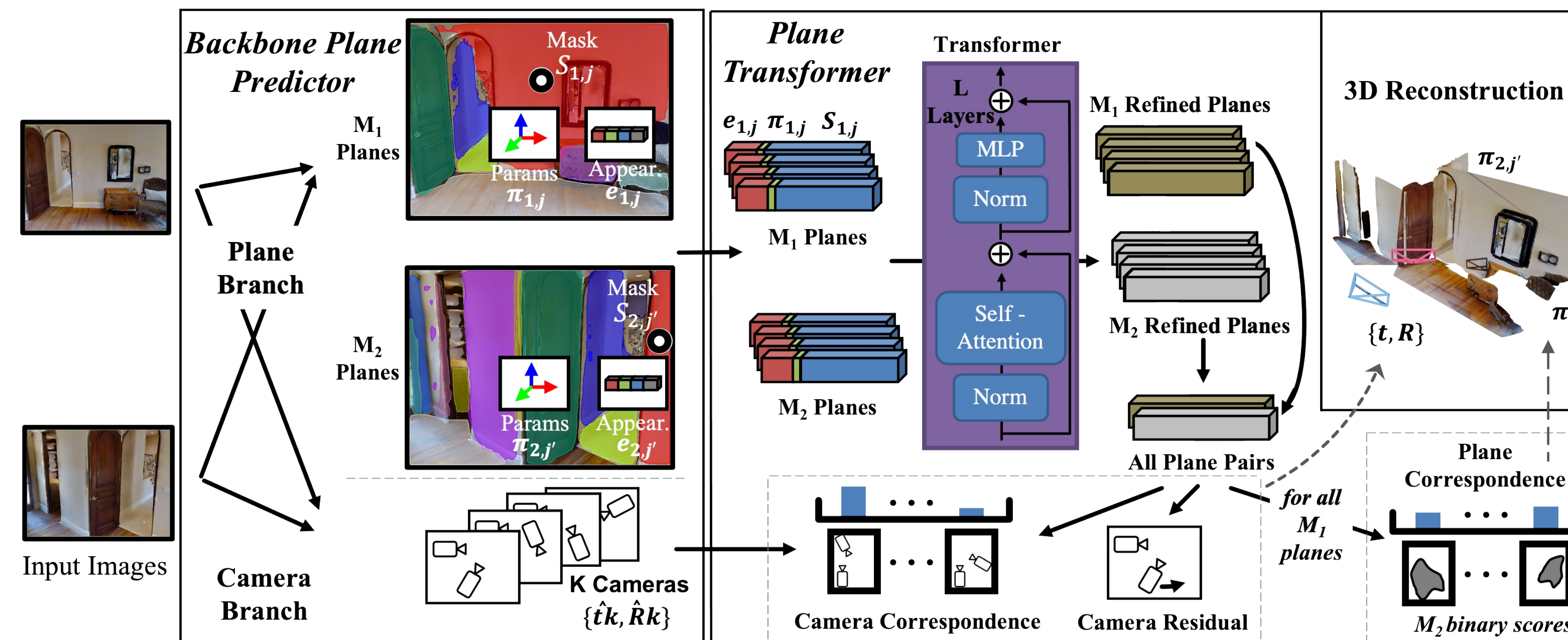- Find correspondences between planes across images

Related Work

- Associative3D (Qian et al.): Uses synthetic data and complex RANSAC-like search
- Sparse Planes (Jin et al.): Uses complex hand-designed optimization steps

Dataset

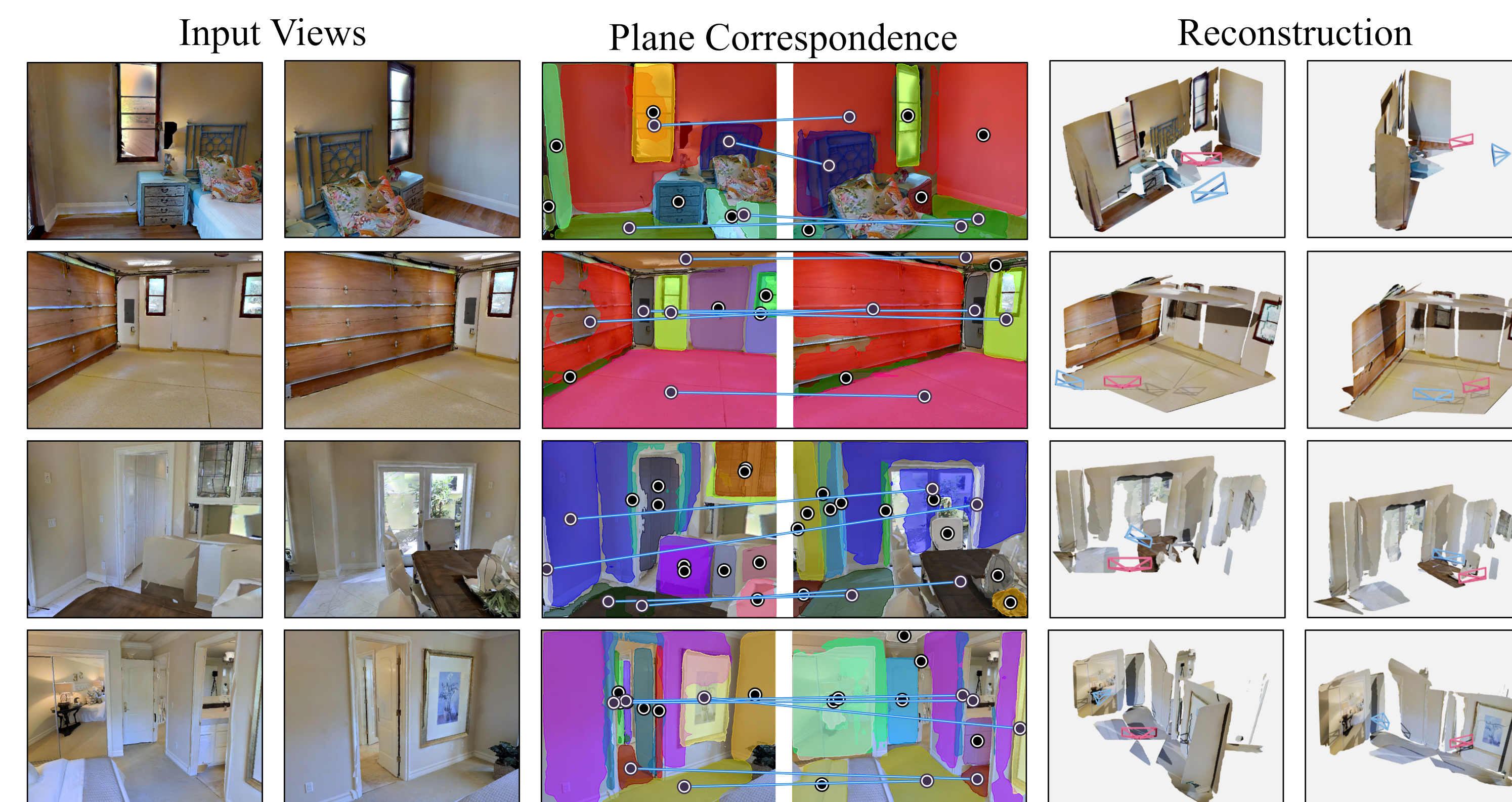- Matterport3D dataset which contains real 3D indoor scenes
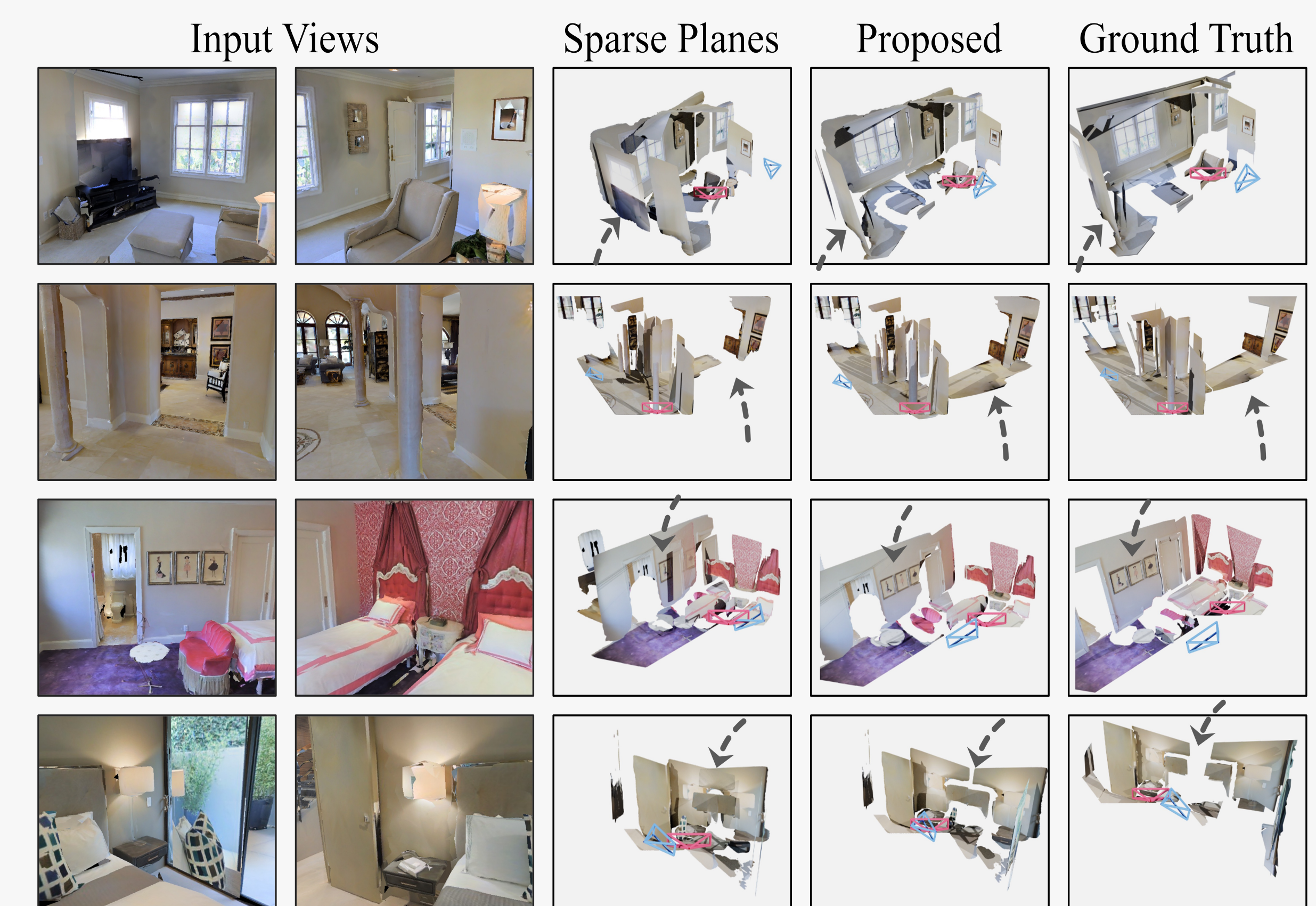

Method

Results

Two-View Case

Multi-View Case

Experiments

Qualitative Evaluation

Plane correspondence (IPAA-90)

	Proposed	Appearance	Sparse Planes
2-views	**40.6**	23.5	28.1
3-views	**32.69**	20.28	23.77
5-views	**20.66**	13.68	16.58

Relative camera pose (mean error)

Rotation Error (°)	Proposed	Camera Branch	Sparse Planes (No Cont.)
2-views	**22.20**	24.57	22.84
3-views	32.22	37.08	**30.89**
5-views	**43.22**	48.07	44.99

Translation Error (m)	Proposed	Camera Branch	Sparse Planes (No Cont.)
2-views	**1.19**	1.40	1.36
3-views	**1.81**	2.21	2.02
5-views	**2.33**	2.80	2.73