Co-SLAM: Joint Coordinate and Sparse Parametric Encodings for Neural Real-Time SLAM

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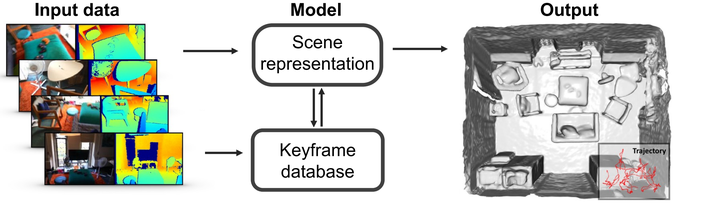
SCAN ME

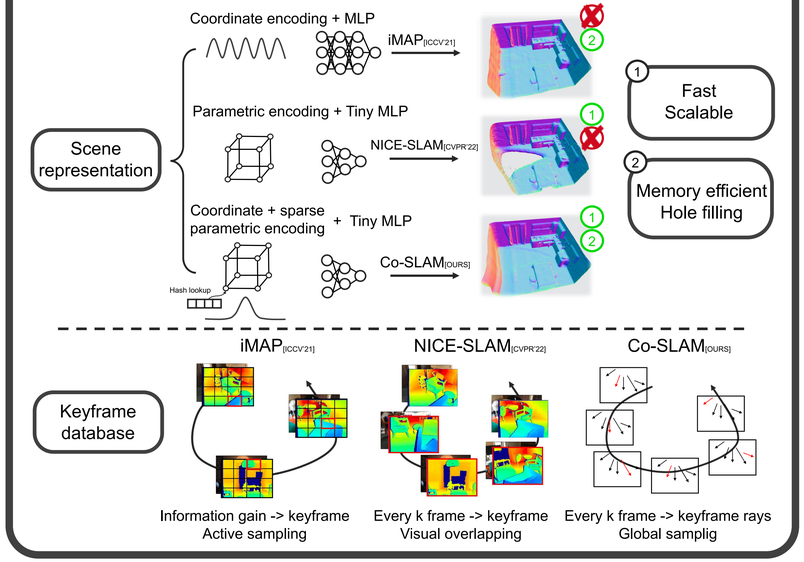
Paper, code, and additional results can be found at
https://hengyiwang.github.io/projects/CoSLAM.html

1. Introduction

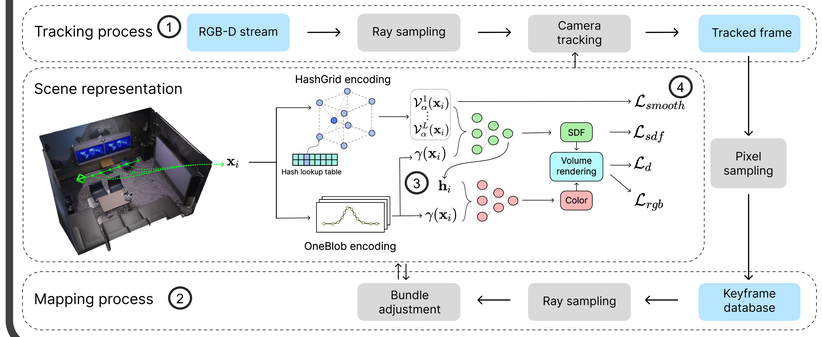
RGB-D based Neural SLAM



2. Motivation



3. Pipeline



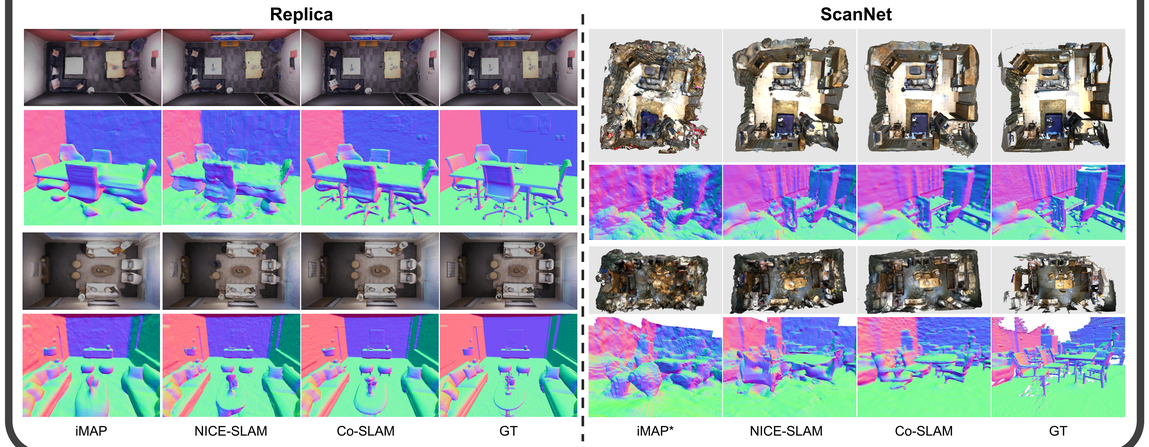
1. Tracking: Update camera pose only

2. Mapping: Update camera pose and model parameters by sampling rays from all keyframe rays (NeuralRGBD[CVPR'22])

3. Model: HashGrid+OneBlob for SDF, feature+OneBlob for color

4. Smoothness: Regularize feature to avoid free space noise (hash collision)

4. Results



5. Performance Analysis

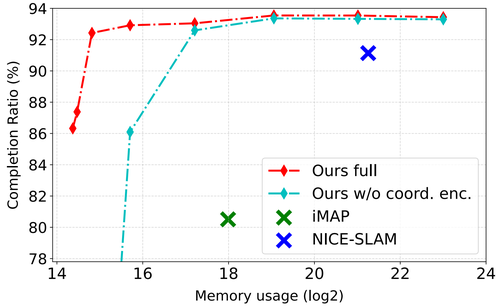
1) Reconstruction (Better, Faster)

Dataset	Method	Acc (cm)	Comp (cm)	Comp. Ratio	FPS	#Param.
Replica	iMAP	3.62	4.93	80.51	9.9	**0.3**
	NICE-SLAM	2.37	2.64	91.13	0.9	17.4
	Co-SLAM	**2.10**	**2.08**	**93.44**	**17.4**	**0.3**
Synthetic RGBD	iMAP*	18.30	26.41	20.73	0.3	**0.2**
	NICE-SLAM	5.96	5.30	77.46	1.3	3.1
	Co-SLAM	**2.95**	**2.96**	**86.88**	**15.6**	0.3

2) Tracking (Better, Faster)

Dataset	Method	ATE RMSE (cm)	FPS	#Param.
ScanNet (6 scenes)	iMAP*	36.7	0.4	**0.2**
	NICE-SLAM	9.6	0.7	101.6
	Co-SLAM	**8.7**	**12.8**	1.6
TUM RGBD (3 scenes)	iMAP	4.2	9.9	**0.2**
	NICE-SLAM	2.5	0.1	3.1
	Co-SLAM	**2.4**	**13.3**	1.6

3) Memory ablation



Joint encoding helps the memory compression