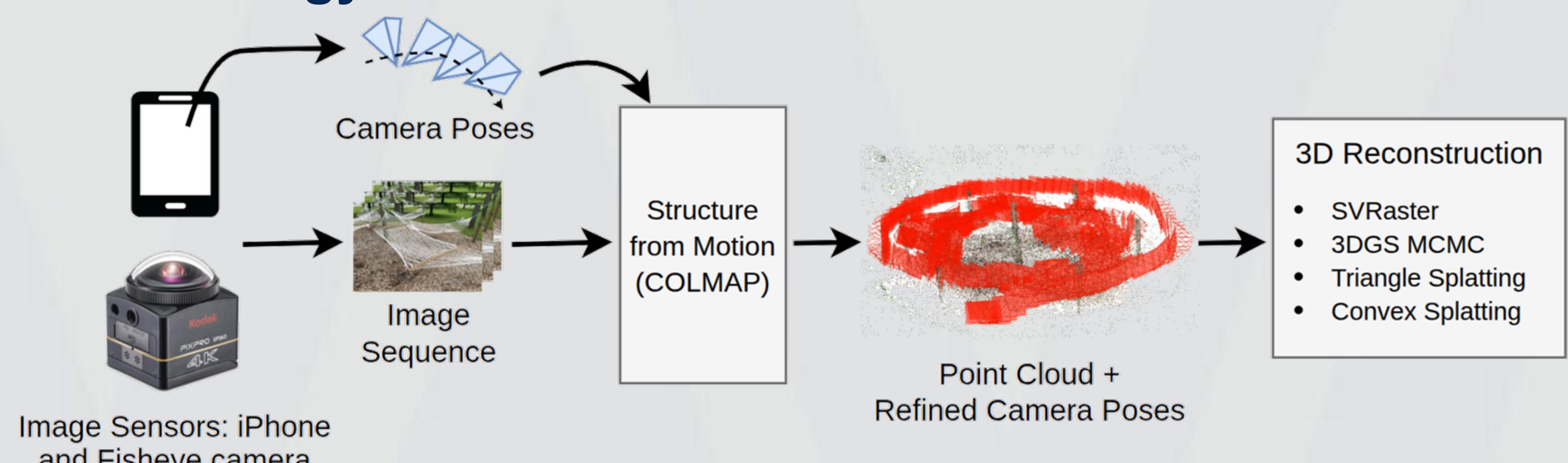


Introduction

- 3D reconstruction techniques enable creation of photorealistic 3D renders of objects or scenes.
- Current reconstruction studies focus on indoor or urban outdoor datasets.
- We highlight the best SOTA reconstruction technique for outdoor non-urban outdoor scenes.
- Quantitative comparison with Peak-Signal-to-Noise-Ratio (PSNR), Learned Perceptual Image Patch Similarity (LPIPS), and Structural Similarity Index Measure (SSIM)
- Comparison between camera poses derived from Structure from Motion (SfM) vs iPhone sensors

Methodology



Results

Table 1: Performance Comparison

Method	Primitive Type	Tree Line					Hammock				
		LPIPS ↓	PSNR ↑	SSIM ↑	Train ↓	FPS ↑	LPIPS ↓	PSNR ↑	SSIM ↑	Train ↓	FPS ↑
3DGSMCMC[2]	Gaussians	0.495	17.90	0.441	11:02	3	0.320	16.73	0.511	10:16	3
3DCS[3]	Convex Hulls	0.482	17.43	0.392	26:48	3	0.308	16.50	0.491	34:55	3
SVRaster[4]	Voxels	0.362	17.75	0.485	12:43	7	0.274	17.09	0.535	11:26	6
Triangle Splatting[5]	Triangles	0.385	15.33	0.474	30:19	4	0.271	16.58	0.529	30:51	3

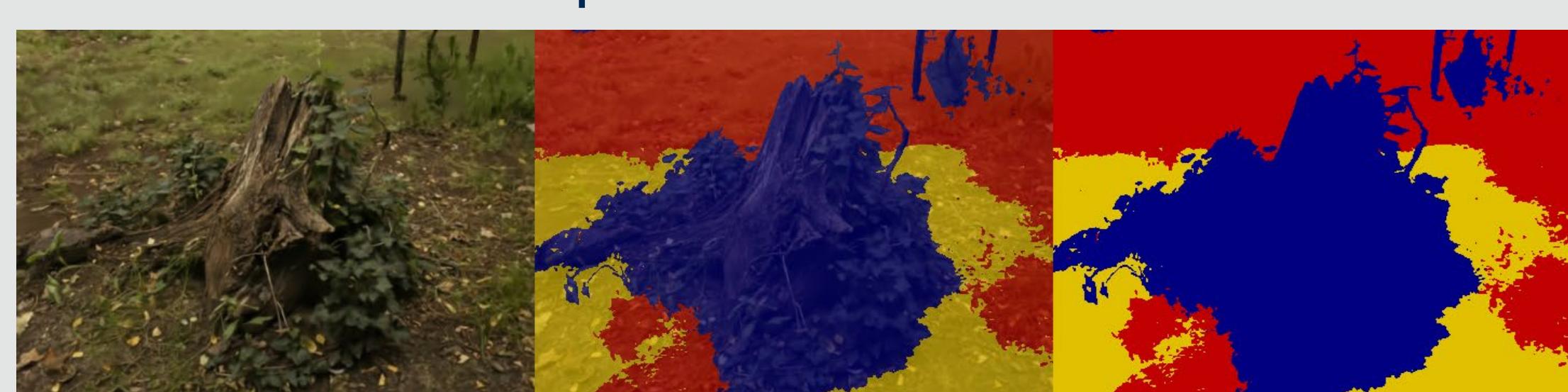


Pose Aided Reconstruction



3D Semantic Segmentation

- Example reconstruction segmented using language based segmentation model (LSeg)
- Can be used for various downstream tasks in robotics and computer vision



Conclusion

- Poses derived from sensors are closer to reality, resulting in fewer floaters
- Poses derived from SfM are more consistent with each other due to a lack of sensor drift, resulting in sharper images
- Voxels performed the best on the nature focused Tree Line scene
- Triangles performed the best on the artificial focused Hammock scene

Future Work

- Combining SfM with sensors for improved camera poses
- Accurately segmenting reconstructions into different semantic classes
- Incorporating reconstructions into high fidelity simulations

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