

Presenter

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FSGS: Real-Time Few-shot View Synthesis using Gaussian Splatting

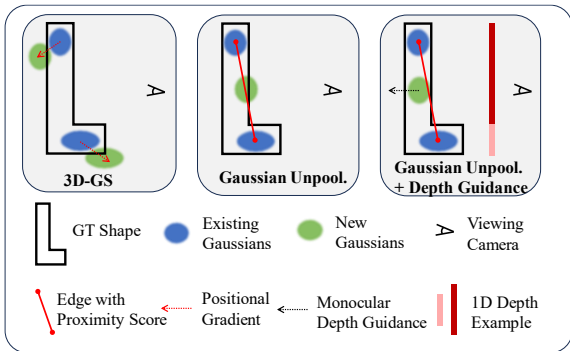
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Motivation

- (i) 3D-GS performs poorly in *sparse-view* settings due to the Adaptive Density Control (ADC), while NeRF-based methods significantly lag behind in the rendering speed (0.21 FPS for SparseNeRF)
- (ii) Better ADC strategy for cloning and growing Gaussians to fill missing regions in 3D.
- (iii) Adopt efficient priors into training to mitigate the problem of recovering 3D from very limited 2D images.

Techniques



Gaussian Unpooling:

We construct proximity graphs between existing 3D Gaussians, and clone new Gaussians between the top-K nearest Gaussians.

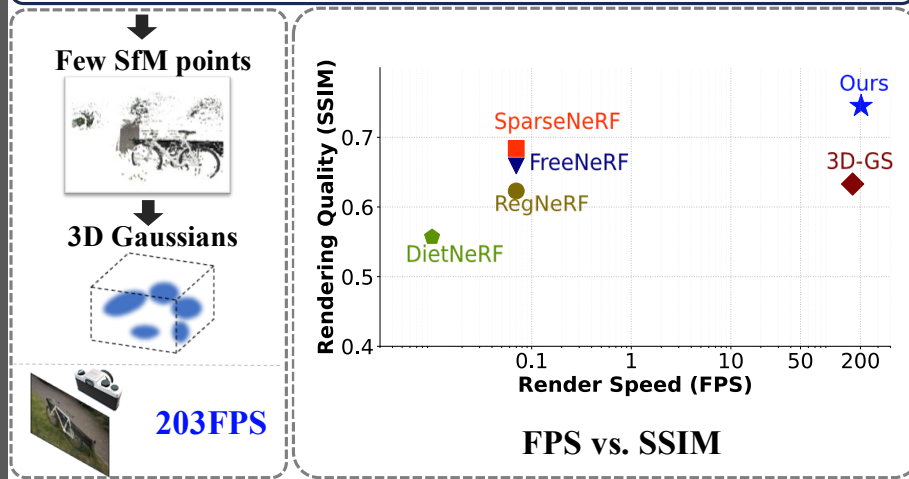
Geometric Regularizations:

The relative relationship of depth values is used for regularizing the scene geometry optimization.

Pseudo-view Augmentation:

Pseudo-views are sampled closed to the training camera location, to address the overfitting to sparse training views.

FSGS achieves superior **sparse-view** synthesis quality, while operating in **real-time**.



FSGS surpasses 3D-GS in both accuracy and FPS.

FSGS is ~2,000x faster than previous best SparseNeRF

Takeaways

- (i) 3D-GS is not good at handle sparse-view setting.
- (ii) ADC in 3D-GS requires significant hyperparameter tuning to achieve a good performance under sparse-view setting.

Experimental Results

Methods	Mip-NeRF360 (1/4 Resolution, 24-view)			
	FPS↑	PSNR↑	SSIM↑	LPIPS↓
Mip-NeRF	0.07	19.78	0.530	0.431
3D-GS	145	19.93	0.588	0.401
DietNeRF	0.03	19.11	0.482	0.452
RegNeRF	0.04	20.55	0.546	0.398
FreeNeRF	0.04	21.04	0.587	0.377
SparseNeRF	0.04	21.13	0.600	0.389
Ours	203	22.82	0.693	0.293

Methods	LLFF(1006 × 762, 3-view)			
	FPS↑	PSNR↑	SSIM↑	LPIPS↓
Mip-NeRF	0.14	15.22	0.351	0.540
3D-GS	312	16.94	0.488	0.402
DietNeRF	0.08	13.86	0.305	0.578
RegNeRF	0.14	18.66	0.535	0.411
FreeNeRF	0.14	19.13	0.562	0.384
SparseNeRF	0.14	19.07	0.564	0.392
Ours	351	19.71	0.642	0.283

Quantitative Results.

Gaussian Unpooling	Geometry Guidance	Pseudo Views	PSNR↑	SSIM↑	LPIPS↓
✗	✗	✗	17.83	0.582	0.321
✓	✗	✗	18.64	0.603	0.311
✓	✓	✗	19.93	0.644	0.283
✓	✓	✓	20.43	0.682	0.248

Ablation Study.