

Fix False Transparency by Noise Guided Splatting

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False Transparency

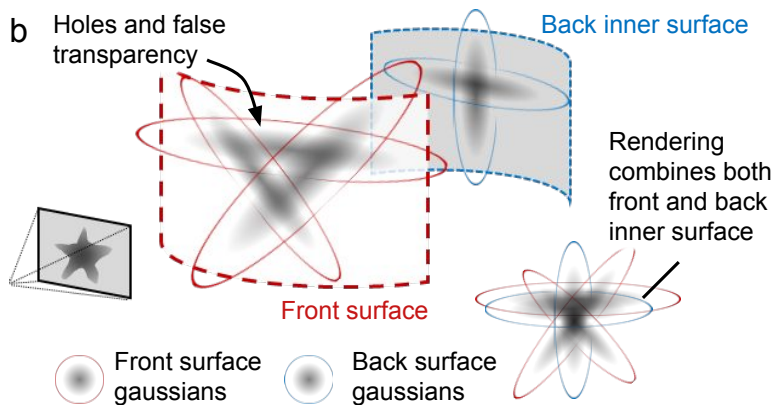
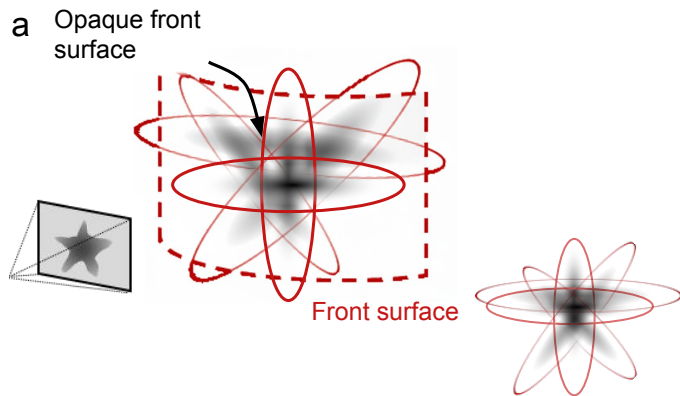
Opaque objects in 3DGS can incorrectly appear “see-through”.

It is most obvious during interactive viewing.

More pronounced in object-centric reconstructions, the focus of our work.



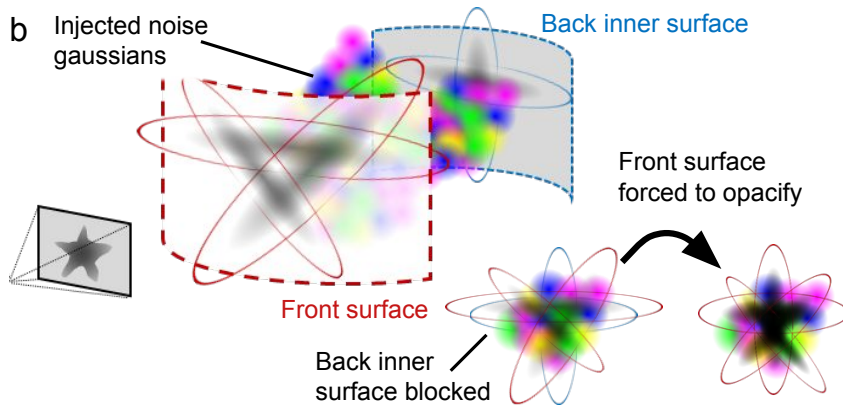
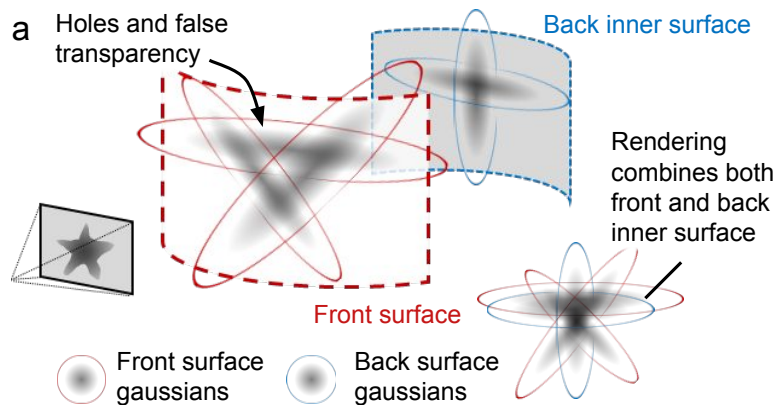
Optimization Ambiguity



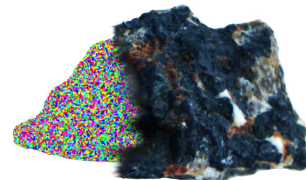
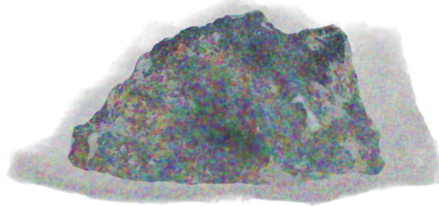
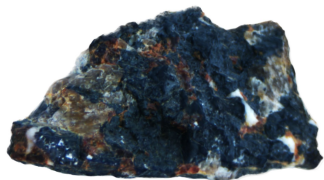
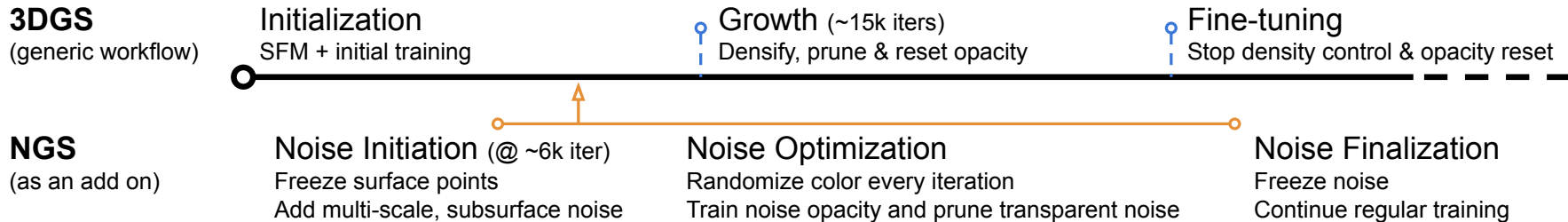
2D photometric loss only constrains final pixel color, not how it's formed.

The optimizer cannot distinguish between these two “correct” solutions.

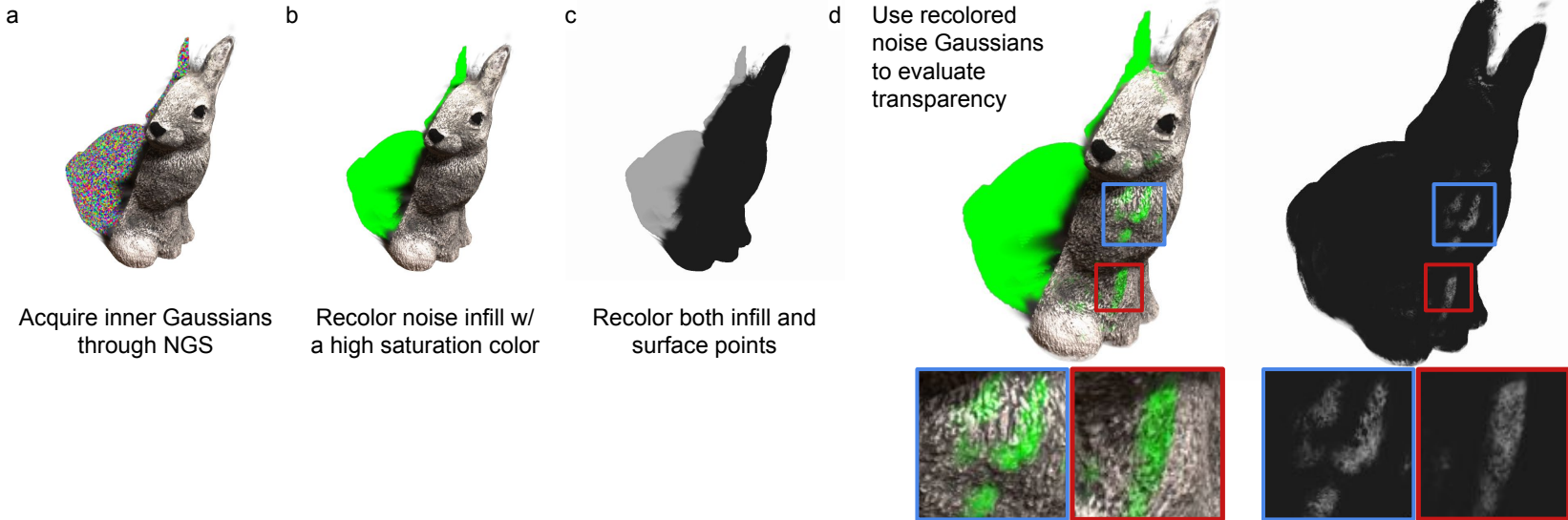
Noise Guided Splatting



The NGS Pipeline



Transparency Benchmark



1. **Baseline:** Evaluate NVS metrics (PSNR, SSIM, LPIPS).
2. **Perceptual Drop:** Add **recolored infill** (e.g., green) and re-evaluate (PSNR*, SSIM*, LPIPS*). The *drop* in score measures perceptual leakage.
3. **Transmittance Map:** Place surface and infill on separate color channels. Render and extract the infill channel to get a direct **Transmittance Map** (T).

Surface Opacity Score

Using the Transmittance Map from the previous step, we compute a final score.

$SOS = 1$: Perfectly opaque

$SOS = 0$: Fully transparent

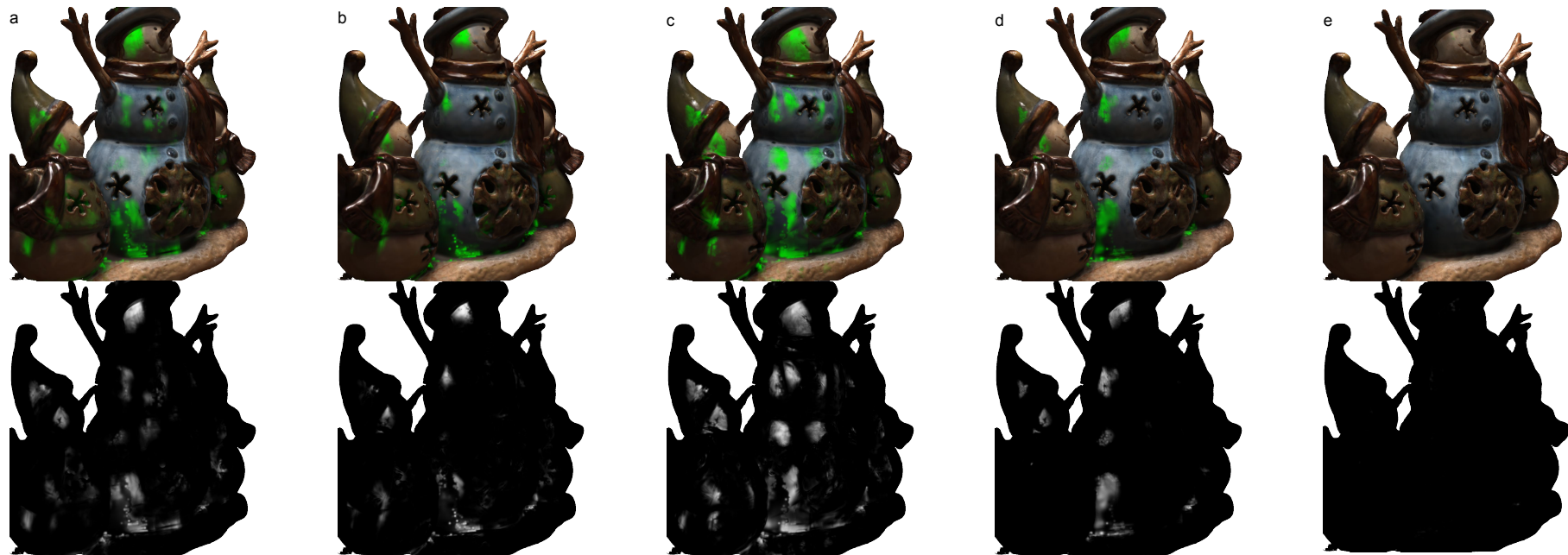
$$SOS = \frac{\log(\sum T / \sum M + \epsilon)}{\log(\epsilon)}$$

Transmittance Map

Foreground Mask

Used for numerical stability

Qualitative Results

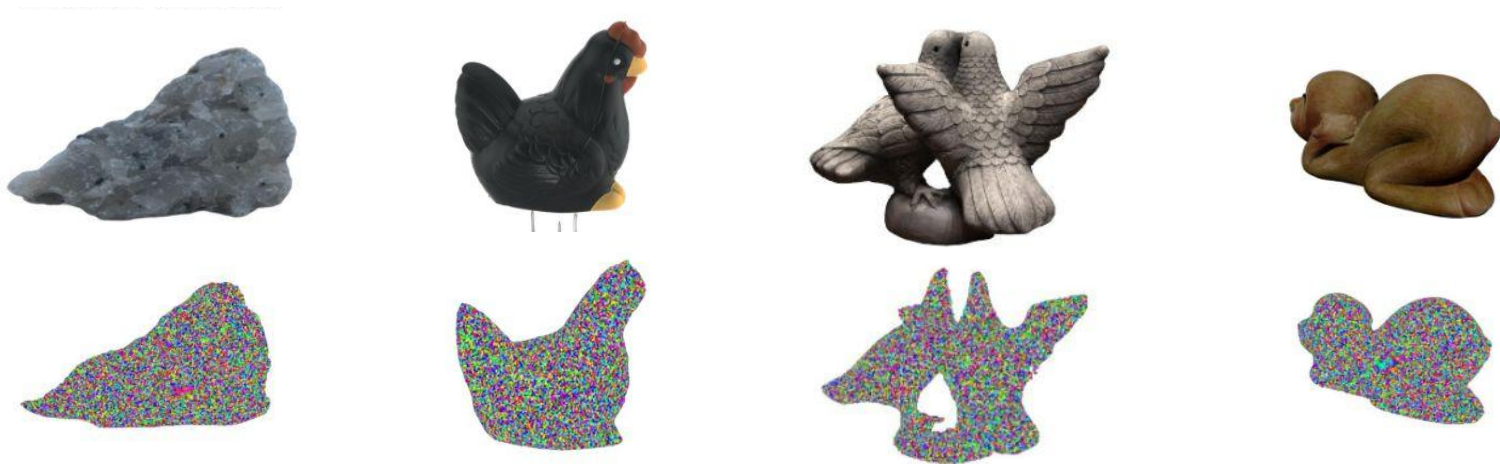


Renders with green infill revealing transparency (top) and corresponding transmittance maps (bottom) for (a) 3DGS, (b) GOF, (c) StopthePop, (d) Gsplat+ α and (e) NGS.

Quantitative Results

	Method	PSNR \uparrow	PSNR* \uparrow	SSIM \uparrow	SSIM* \uparrow	LPIPS \downarrow	LPIPS* \downarrow	SOS \uparrow
DTU	3DGS	25.575	22.967	0.891	0.874	0.180	0.250	0.147
	GOF	25.648	21.109	0.880	0.816	0.209	0.273	0.179
	StopThePop	22.817	18.885	0.852	0.780	0.213	0.315	0.135
	GSplat+ α	25.435	25.263	0.884	0.883	0.183	0.186	0.598
	NGS	25.428	25.427	0.881	0.881	0.192	0.192	0.749
Stone	3DGS	34.610	27.551	0.949	0.909	0.055	0.222	0.140
	GOF	31.469	21.998	0.893	0.780	0.186	0.324	0.126
	StopThePop	32.457	23.047	0.945	0.853	0.078	0.223	0.168
	GSplat+ α	33.832	33.823	0.948	0.948	0.062	0.062	0.891
	NGS	34.148	34.148	0.951	0.951	0.053	0.053	0.922
OmniObject	3DGS	29.300	27.456	0.940	0.929	0.069	0.116	0.215
	GOF	32.259	24.931	0.970	0.898	0.062	0.122	0.208
	StopThePop	32.274	25.095	0.970	0.900	0.050	0.113	0.265
	GSplat+ α	33.575	33.350	0.973	0.972	0.060	0.064	0.642
	NGS	33.619	33.578	0.972	0.972	0.060	0.060	0.736

Dataset release



Stone & Object Datasets: 200+ high-res object scans.

Noise Infills: Pre-generated noise for DTU and OmniObject3D.

Thank you!

