

Gaussian Pancakes: Geometrically-Regularized 3D Gaussian Splatting for Realistic Endoscopic Reconstruction

Sierra Bonilla^{1,2}, Shuai Zhang^{1,3}, Dimitrios Psychogios^{1,2}, Danail Stoyanov^{1,2},
Francisco Vasconcelos^{1,2}, and Sophia Bano^{1,2}

¹ Wellcome/EPSRC Centre for Interventional and Surgical Sciences(WEISS)
{sierra.bonilla.21,shuai.z}@ucl.ac.uk

² Department of Computer Science, University College London, London, UK

³ Department of Medical Physics and Biomedical Engineering, University College
London, UK

1 Appendix

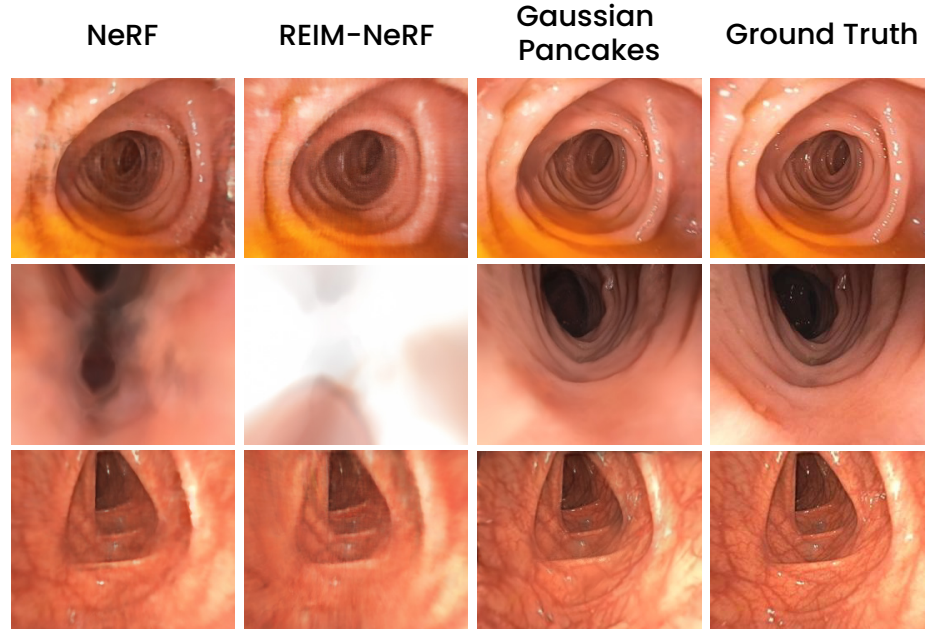
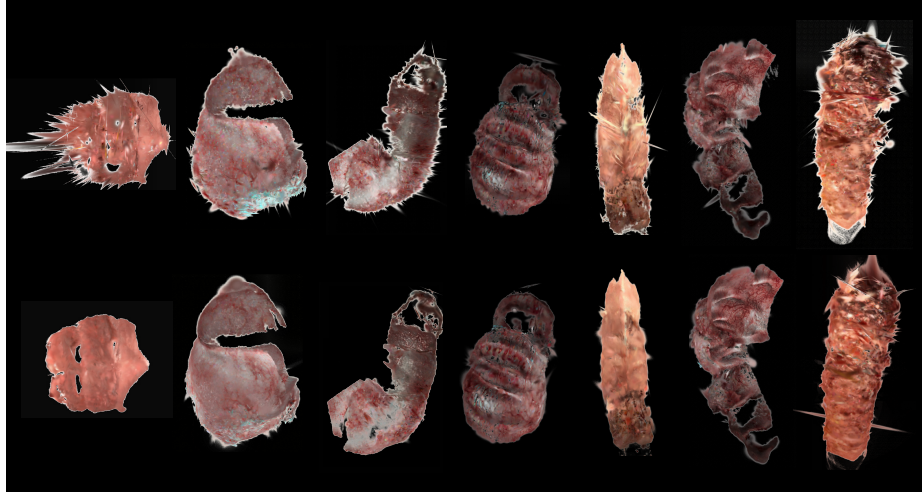


Fig. A.1. Test images from the In-Vivo dataset showcasing the artifacts that arise in other methods.

Table A.1. Full ablation study showing effect of systematically adding all changes to the basic 3D GS method.

Dataset	Method	PSNR \uparrow	Depth \uparrow SSIM	Depth \downarrow MSE	GPU \downarrow min
Simulation	GS	40.579	0.786	0.017	0.806
	GS+Depth	40.789	0.782	0.011	0.810
	GS+Pancaking	40.285	0.814	0.008	0.837
	GS+Pancaking+Depth (ours)	40.336	0.815	0.007	0.832
Phantom	GS	32.091	0.811	1.869	1.078
	GS+Depth	32.394	0.813	1.728	1.368
	GS+Pancaking	32.117	0.868	0.685	1.124
	GS+Pancaking+Depth (ours)	32.306	0.873	0.498	1.703
In-vivo	GS	26.116	0.444	0.158	1.211
	GS+Depth	26.062	0.446	0.145	1.206
	GS+Pancaking	26.211	0.460	0.154	1.329
	GS+Pancaking+Depth (ours)	26.248	0.458	0.156	1.249

**Fig. A.2.** Image showing the surface reconstruction from the basic 3D GS method (top) and from Gaussian Pancakes (bottom).

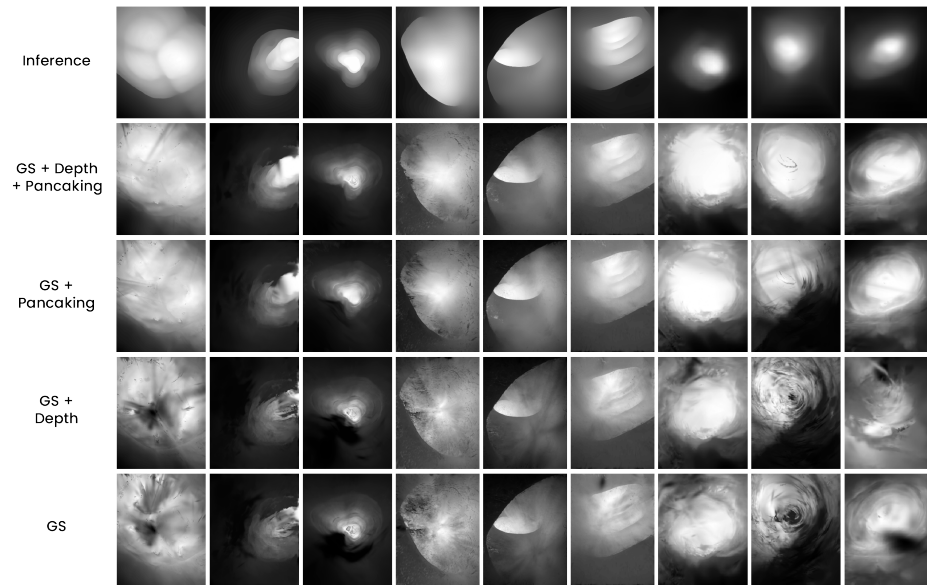


Fig. A.3. Depth renderings showing effect of systematically adding all changes to the basic 3D GS method.