

# CoGS : Controllable Gaussian Splatting

## Supplementary Material

### 6. Overview

This supplementary material offers comprehensive quantitative data and further qualitative insights, highlighting the advantages of our newly developed Dynamic 3D Gaussian Splatting (GS) and Controllable GS methods. In addition, we have included illustrative videos on the attached webpage, providing a dynamic visual representation of our methods in action.

### 7. Per-Scene Quantitative Results

For completeness, we provide detailed per-scene quantitative results for reconstruction quality metrics, including PSNR, SSIM, and LPIPS. These are presented for both synthetic (Tab. 3) and real (Tab. 4) dynamic scenes. This extension to Tables 1 and 2 from the main paper offers a more nuanced view, as it disaggregates the average performance metrics across different scenes. Our analysis reveals that our Dynamic GS method exhibits superior performance in synthetic scene datasets while achieving comparable results in real scenes. This difference in performance might be attributed to the challenges inherent in modeling the movement of Gaussians using a single camera setup.

### 8. More Qualitative Results

Additional qualitative results can be found on the project's website (<https://cogs2024.github.io>). For optimal viewing, please open the link using the Chrome browser.

Table 3. Per-scene quantitative results on synthetic dynamic scenes. We color code each row as **best**, **second best**, and **third best**.

Method	Hell Warrior			Mutant			Hook			Bouncing Balls		
	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$
NeRF[24]	13.52	0.8100	0.2500	20.31	0.9100	0.0900	16.65	0.8400	0.1900	20.26	0.9100	0.2000
DirectVoxGo[34]	13.51	0.7500	0.2500	19.45	0.8900	0.1200	16.16	0.8000	0.2100	20.20	0.8700	0.2200
Plenoxels[8]	15.19	0.7800	0.2700	21.44	0.9100	0.0900	17.90	0.8100	0.2100	21.30	0.8900	0.1800
T-NeRF[32]	23.19	0.9300	0.0800	30.56	0.9600	0.0400	27.21	0.9400	0.0600	37.81	0.9800	0.1200
D-NeRF[32]	25.10	0.9500	0.0600	31.29	0.9700	0.0200	29.25	0.9600	0.1100	38.93	0.9800	0.1000
TiNeuVox-S[7]	27.00	0.9500	0.0900	31.09	0.9600	0.0500	29.30	0.9500	0.0700	39.05	0.9900	0.0600
TiNeuVox-B[7]	28.17	0.9700	0.0700	33.61	0.9800	0.0300	31.45	0.9700	0.0500	40.73	0.9900	0.0400
3D GS [14]	29.72	0.9129	0.1215	23.59	0.9318	0.0631	21.88	0.8847	0.1104	23.03	0.9583	0.0737
Ours	40.43	0.9812	0.0267	42.14	0.9937	0.0063	36.43	0.9838	0.0174	40.98	0.9958	0.0103

  

Method	Lego			T-Rex			Stand Up			Jumping Jacks		
	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$
NeRF [24]	20.30	0.7900	0.2300	24.29	0.9300	0.1300	18.19	0.8900	0.1400	18.28	0.8800	0.2300
DirectVoxGo [34]	21.13	0.9000	0.1000	23.27	0.9200	0.0900	17.58	0.8600	0.1600	17.80	0.8400	0.2000
Plenoxels [8]	21.97	0.9000	0.1100	25.18	0.9300	0.0800	18.76	0.8700	0.1500	20.18	0.8600	0.1900
T-NeRF [32]	23.82	0.9000	0.1500	30.19	0.9600	0.1300	31.24	0.9700	0.0200	32.01	0.9700	0.0300
D-NeRF [32]	21.64	0.8300	0.1600	31.75	0.9700	0.0300	32.79	0.9800	0.0200	32.80	0.9800	0.0300
TiNeuVox-S [7]	24.35	0.8800	0.1300	29.95	0.9600	0.0600	32.89	0.9800	0.0300	32.33	0.9700	0.0400
TiNeuVox-B [7]	25.02	0.9200	0.0700	32.70	0.9800	0.0300	35.43	0.9900	0.0200	34.23	0.9800	0.0300
3D GS [14]	22.73	0.9282	0.0679	21.92	0.9537	0.0498	21.54	0.9283	0.0854	20.16	0.9279	0.0855
Ours	25.16	0.9451	0.0421	37.25	0.9923	0.0115	43.35	0.9929	0.0092	37.48	0.9891	0.0158

Table 4. Per-scene quantitative results on real dynamic scenes. We color code each row as **best**, **second best**, and **third best**.

Method	torchocolate			cut-lemon			chickchicken			hand		
	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$	PSNR $\uparrow$	SSIM $\uparrow$	LPIPS $\downarrow$
NeRF [24]	22.5	0.866	0.373	24.1	0.826	0.437	18.8	0.761	0.453	23.8	0.773	0.469
NV [21]	24.6	0.917	0.189	28.8	0.951	0.190	22.6	0.861	0.243	29.3	0.912	0.213
NSFF [19]	22.3	0.883	0.253	28.0	0.904	0.238	27.7	0.939	0.173	24.9	0.797	0.329
Nerfies [29]	27.8	0.959	0.169	30.8	0.946	0.223	28.7	0.948	0.141	29.9	0.940	0.171
HyperNeRF [30]	28.0	0.962	0.172	31.8	0.956	0.210	28.7	0.948	0.156	30.7	0.950	0.150
TiNeuVox-S [7]	21.5	0.754	0.478	23.4	0.642	0.604	25.3	0.761	0.485	24.2	0.604	0.614
TiNeuVox-B [7]	27.1	0.824	0.395	28.6	0.694	0.509	29.0	0.812	0.408	27.3	0.678	0.493
3D GS [14]	21.8	0.787	0.402	22.6	0.667	0.482	20.2	0.719	0.517	23.6	0.723	0.351
Ours	28.3	0.949	0.174	31.4	0.945	0.205	28.8	0.942	0.146	30.8	0.947	0.161