

Supplementary Material for Using Synthetic Data Generation to Probe Multi-View Stereo Networks

Appendix

A. Code Release

The Unity project source files we use to load datasets and generate flythroughs can be found at <https://github.com/vivianross06/Synthetic-Data-Generation-ICCV-2021>

Note: We do not (and cannot) provide source files for the SUNCG, Matterport3D, or ArchViz datasets.

B. Supplementary Video

We created a short (under 2 minutes) video visualizing our data generation process. A figure which also visualizes the differences between different parameter values can be found in our main paper.

Using Synthetic Data Generation to Probe Multi-View Stereo Networks: Supplemental Video

<https://www.youtube.com/watch?v=0LC-WQYZyN0>

C. Supplementary Tables

C.1. Camera Height

Height(m)	Pairnet	Fusionnet	PMVS	GPMVS	FMVS
0	0.418	0.431	1.919	0.827	1.819
0.15	0.409	0.388	2.249	0.831	2.164
0.3	0.347	0.319	1.966	0.677	1.856
0.45	0.302	0.281	1.692	0.519	1.573
0.6	0.304	0.287	1.463	0.445	1.352
0.75	0.303	0.284	1.455	0.465	1.338
0.9	0.325	0.303	1.320	0.441	1.223
1.05	0.338	0.312	1.271	0.410	1.177
1.2	0.348	0.318	1.236	0.393	1.144
1.35	0.354	0.317	1.297	0.411	1.193
1.5	0.366	0.331	1.205	0.404	1.119
1.65	0.375	0.339	1.218	0.413	1.131
1.8	0.377	0.341	1.334	0.437	1.226
1.95	0.394	0.350	1.305	0.428	1.218
2.1	0.387	0.362	1.341	0.437	1.258
Average	0.356	0.331	1.485	0.502	1.386
Stdev	0.044	0.050	0.326	0.155	0.322

Table 1. Average Error vs. Camera Height for each network across 3D datasets.

Height(m)	Pairnet	Fusionnet	PointMVS	GPMVS	FastMVS
0	0.424	0.494	2.56	1.075	2.532
0.15	0.458	0.447	2.874	1.066	2.879
0.30	0.399	0.372	2.573	0.915	2.511
0.45	0.321	0.322	2.105	0.611	2.04
0.60	0.306	0.316	1.853	0.479	1.781
0.75	0.312	0.32	1.715	0.455	1.644
0.90	0.64	0.335	1.617	0.437	1.551
1.05	0.358	0.345	1.545	0.413	1.479
1.20	0.378	0.354	1.484	0.395	1.424
1.35	0.389	0.357	1.445	0.406	1.388
1.50	0.402	0.36	1.426	0.404	1.378
1.65	0.412	0.366	1.448	0.41	1.4
1.80	0.426	0.361	1.487	0.404	1.434
1.95	0.442	0.365	1.527	0.417	1.488
2.10	0.451	0.361	1.497	0.409	1.48

Table 2. Error vs. Height for SUNCG

Height(m)	Pairnet	Fusionnet	PointMVS	GPMVS	FastMVS
0	0.37	0.333	1.484	0.75	1.309
0.15	0.32	0.275	1.533	0.624	1.354
0.3	0.302	0.265	1.3	0.476	1.184
0.45	0.304	0.267	1.232	0.466	1.096
0.6	0.316	0.284	1.137	0.436	1.004
0.75	0.329	0.297	1.094	0.505	0.981
0.9	0.343	0.312	1.069	0.502	0.958
1.05	0.349	0.321	1.066	0.457	0.955
1.2	0.353	0.329	1.073	0.438	0.959
1.35	0.359	0.33	1.072	0.461	0.96
1.5	0.366	0.341	1.061	0.467	0.948
1.65	0.375	0.351	1.049	0.485	0.939
1.8	0.373	0.366	1.066	0.518	0.949
1.95	0.375	0.364	1.143	0.488	1.036
2.1	0.382	0.384	1.224	0.512	1.096

Table 3. Error vs. Height for Matterport3D

Height(m)	Pairnet	Fusionnet	PointMVS	GPMVS	FastMVS
0	0.461	0.466	1.712	0.655	1.615
0.15	0.448	0.443	2.341	0.802	2.258
0.3	0.339	0.319	2.026	0.639	1.872
0.45	0.28	0.254	1.739	0.48	1.584
0.6	0.291	0.261	1.399	0.42	1.271
0.75	0.268	0.236	1.557	0.435	1.39
0.9	0.293	0.263	1.275	0.384	1.16
1.05	0.306	0.271	1.203	0.359	1.096
1.2	0.313	0.272	1.15	0.346	1.049
1.35	0.315	0.264	1.373	0.366	1.23
1.5	0.33	0.293	1.128	0.34	1.032
1.65	0.339	0.299	1.157	0.345	1.055
1.8	0.333	0.295	1.448	0.39	1.296
1.95	0.365	0.322	1.244	0.378	1.131
2.1	0.327	0.34	1.302	0.389	1.197

Table 4. Error vs. Height for ArchViz

C.2. Camera Yaw

Angle (°)	Pairnet	Fusionnet	PMVS	GPMVS	FMVS
-135	0.338	0.320	1.253	0.381	1.230
-90	0.349	0.306	1.352	0.394	1.306
-45	0.345	0.309	1.318	0.404	1.285
0	0.366	0.331	1.205	0.404	1.119
45	0.354	0.315	1.170	0.395	1.136
90	0.362	0.313	1.369	0.460	1.299
135	0.350	0.328	1.384	0.446	1.333
180	0.342	0.289	1.299	0.382	1.217
Average	0.351	0.314	1.294	0.408	1.241
Stdev	0.018	0.025	0.110	0.049	0.115

Table 5. Average Error vs. Camera Yaw for each network across 3D datasets.

Angle (°)	Pairnet	Fusionnet	PointMVS	GPMVS	FastMVS
-135	0.378	0.353	1.611	0.401	1.624
-90	0.387	0.348	1.652	0.385	1.62
-45	0.397	0.362	1.662	0.43	1.622
0	0.402	0.36	1.426	0.404	1.378
45	0.403	0.363	1.372	0.381	1.322
90	0.397	0.322	1.446	0.393	1.396
135	0.385	0.311	1.527	0.386	1.472
180	0.374	0.323	1.599	0.415	1.574

Table 6. Error vs. Camera Yaw for SUNCG

Angle (°)	Pairnet	Fusionnet	PointMVS	GPMVS	FastMVS
-135	0.297	0.278	0.999	0.385	0.994
-90	0.288	0.267	1.145	0.331	1.056
-45	0.304	0.27	1.143	0.356	1.096
0	0.366	0.341	1.061	0.467	0.948
45	0.321	0.296	1.004	0.448	1.005
90	0.325	0.302	1.232	0.517	1.165
135	0.335	0.327	1.318	0.507	1.288
180	0.332	0.292	1.15	0.416	1.021

Table 7. Error vs. Camera Yaw for Matterport3D

Angle (°)	Pairnet	Fusionnet	PointMVS	GPMVS	FastMVS
-135	0.34	0.329	1.148	0.356	1.073
-90	0.372	0.302	1.259	0.466	1.241
-45	0.333	0.295	1.15	0.426	1.137
0	0.33	0.293	1.128	0.34	1.032
45	0.338	0.285	1.135	0.357	1.08
90	0.365	0.316	1.43	0.469	1.335
135	0.331	0.346	1.308	0.446	1.24
180	0.32	0.252	1.147	0.314	1.056

Table 8. Error vs. Camera Yaw for ArchViz

C.3. Camera Pitch

Angle (°)	Pairnet	Fusionnet	PMVS	GPMVS	FMVS
-90	0.247	0.210	1.689	0.636	1.620
-60	0.305	0.270	1.661	0.527	1.649
-30	0.377	0.310	1.360	0.448	1.316
0	0.366	0.331	1.205	0.404	1.119
30	0.313	0.182	1.329	0.284	1.240
60	0.296	0.168	1.411	0.297	1.408
90	0.294	0.195	1.572	0.396	1.536
Average	0.313	0.239	1.447	0.421	1.399
Stdev	0.064	0.079	0.218	0.149	0.236

Table 9. Average Error vs. Camera Pitch for each network across 3D datasets.

Angle (°)	Pairnet	Fusionnet	PointMVS	GPMVS	FastMVS
-90	0.139	0.131	1.736	0.413	1.633
-60	0.272	0.265	1.84	0.338	1.787
-30	0.385	0.326	1.569	0.397	1.508
0	0.402	0.36	1.426	0.404	1.378
30	0.383	0.249	1.548	0.286	1.467
60	0.347	0.208	1.714	0.329	1.689
90	0.345	0.236	1.922	0.495	1.858

Table 10. Error vs. Camera Pitch for SUNCG

Angle (°)	Pairnet	Fusionnet	PointMVS	GPMVS	FastMVS
-90	0.245	0.184	1.732	1.199	1.804
-60	0.27	0.212	1.542	0.927	1.577
-30	0.337	0.284	1.248	0.632	1.237
0	0.366	0.341	1.061	0.467	0.948
30	0.267	0.157	0.927	0.28	0.873
60	0.282	0.175	0.996	0.345	1.032
90	0.27	0.186	1.239	0.451	1.256

Table 11. Error vs. Camera Pitch for Matterport3D

Angle (°)	Pairnet	Fusionnet	PointMVS	GPMVS	FastMVS
-90	0.357	0.316	1.598	0.296	1.424
-60	0.372	0.332	1.6	0.317	1.584
-30	0.41	0.321	1.263	0.316	1.202
0	0.33	0.293	1.128	0.34	1.032
30	0.29	0.141	1.512	0.286	1.38
60	0.26	0.12	1.523	0.216	1.504
90	0.267	0.162	1.556	0.242	1.493

Table 12. Error vs. Camera Pitch for ArchViz

Sample Dis-tance(m)	Pairnet	Fusionnet	PointMVS	GPMVS	FastMVS
0.2	0.402	0.36	1.426	0.404	1.378
0.3	0.39	0.351	1.428	0.411	1.34
0.4	0.377	0.346	1.4	0.431	1.266
0.5	0.374	0.337	1.383	0.429	1.237
0.6	0.362	0.337	1.354	0.422	1.181
0.7	0.352	0.33	1.311	0.43	1.134
0.8	0.346	0.334	1.278	0.444	1.124
0.9	0.344	0.32	1.288	0.45	1.104
1.0	0.341	0.327	1.228	0.489	1.006
1.1	0.335	0.331	1.237	0.44	0.964
1.2	0.325	0.313	1.168	0.382	0.893
1.3	0.319	0.302	1.157	0.423	0.869
1.4	0.301	0.295	1.121	0.431	0.818
1.5	0.312	0.297	1.122	0.427	0.78
1.6	0.308	0.297	1.063	0.402	0.762
1.7	0.303	0.302	1.062	0.424	0.72
1.8	0.306	0.285	1.145	0.417	0.776
1.9	0.287	0.279	1.034	0.413	0.671
2.0	0.308	0.299	1.059	0.55	0.744

Table 14. Error vs. Sample Distance for SUNCG

C.4. Sample Distance

Sample Dis-tance(m)	Pairnet	Fusionnet	PMVS	GPMVS	FMVS
0.2	0.366	0.331	1.205	0.404	1.119
0.3	0.349	0.318	1.182	0.422	1.063
0.4	0.338	0.313	1.136	0.415	1.017
0.5	0.330	0.309	1.095	0.446	0.972
0.6	0.320	0.306	1.045	0.488	0.916
0.7	0.311	0.303	0.985	0.527	0.860
0.8	0.308	0.299	0.961	0.501	0.844
0.9	0.301	0.301	0.968	0.473	0.822
1.0	0.305	0.311	0.956	0.512	0.798
1.1	0.292	0.302	0.951	0.488	0.770
1.2	0.284	0.292	0.905	0.450	0.727
1.3	0.279	0.290	0.906	0.428	0.716
1.4	0.286	0.300	0.895	0.432	0.704
1.5	0.287	0.300	0.917	0.407	0.692
1.6	0.288	0.303	0.876	0.401	0.672
1.7	0.285	0.304	0.866	0.402	0.660
1.8	0.283	0.300	0.931	0.406	0.691
1.9	0.276	0.303	0.865	0.388	0.651
2.0	0.305	0.328	0.906	0.475	0.673
Average	0.305	0.306	0.976	0.446	0.809
Stdev	0.028	0.019	0.115	0.056	0.155

Table 13. Average Error vs. Sample Distance for each network across 3D datasets.

Sample Dis-tance(m)	Pairnet	Fusionnet	PointMVS	GPMVS	FastMVS
0.2	0.366	0.341	1.061	0.467	0.948
0.3	0.343	0.326	1.048	0.527	0.92
0.4	0.331	0.322	0.991	0.497	0.906
0.5	0.322	0.329	0.945	0.59	0.839
0.6	0.313	0.323	0.877	0.727	0.776
0.7	0.3	0.32	0.804	0.841	0.67
0.8	0.302	0.307	0.802	0.752	0.651
0.9	0.292	0.326	0.817	0.66	0.629
1.0	0.305	0.338	0.836	0.728	0.677
1.1	0.28	0.318	0.826	0.721	0.644
1.2	0.272	0.311	0.794	0.658	0.61
1.3	0.261	0.312	0.812	0.553	0.645
1.4	0.292	0.341	0.834	0.552	0.674
1.5	0.298	0.354	0.899	0.472	0.701
1.6	0.299	0.348	0.858	0.486	0.671
1.7	0.292	0.343	0.823	0.473	0.69
1.8	0.302	0.364	0.935	0.495	0.747
1.9	0.292	0.364	0.824	0.428	0.677
2.0	0.345	0.406	0.893	0.531	0.671

Table 15. Error vs. Sample Distance for Matterport3D

Sample Distance(m)	Pairnet	Fusionnet	PMVS	GPMVS	FMVS
0.2	0.33	0.293	1.128	0.34	1.032
0.3	0.314	0.278	1.071	0.327	0.93
0.4	0.305	0.27	1.016	0.318	0.878
0.5	0.295	0.261	0.957	0.32	0.839
0.6	0.286	0.259	0.905	0.314	0.791
0.7	0.28	0.26	0.839	0.311	0.776
0.8	0.277	0.255	0.803	0.308	0.756
0.9	0.266	0.258	0.798	0.309	0.733
1.0	0.269	0.268	0.803	0.319	0.712
1.1	0.261	0.256	0.789	0.303	0.702
1.2	0.254	0.253	0.753	0.309	0.678
1.3	0.258	0.256	0.75	0.308	0.635
1.4	0.264	0.264	0.73	0.313	0.621
1.5	0.25	0.249	0.73	0.322	0.596
1.6	0.258	0.263	0.708	0.316	0.584
1.7	0.261	0.266	0.712	0.31	0.569
1.8	0.24	0.251	0.712	0.307	0.551
1.9	0.25	0.265	0.737	0.322	0.605
2.0	0.261	0.278	0.765	0.344	0.605

Table 16. Error vs. Sample Distance for ArchViz