DUST: Dual Union of Spatio-Temporal Subspaces for Monocular Multiple Object 3D Reconstruction Supplementary Material

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1. Evaluation with camera estimation

In Table 2 of the paper we compared the accuracy of our approach with that of state-of-the-art enforcing the same camera motion for all methods. This way, the comparison was focused solely on the 3D reconstruction capacity. In this supplemental material, we complement this analysis by allowing each approach to estimate the camera motion, following the methodologies described in the corresponding papers. The results for the case of two subjects are summarized in Table 1.

Additionally, the third- and second-to last columns of Table 1 report the results with a 70% of random missing data and a 20% of structured missing entries (rendered as several consecutive frames including patterns with 50% of missing entries, to simulate self-occlusions). The camera rotation is again automatically estimated. Note that the results show similar performance to other approaches that use complete data. Finally, we also corrupted the observations by adding Gaussian noise with std $\sigma_{noise} = 0.02 \max_{i,j,k} \{|d_{ijk}|\}$ (as typically done in the literature). The results shown in the last column of Table 1 demonstrate a good resilience.

Method / Data	CSF [3]	KSTA [4]	BMM [1]	EM-PND [5]	TUS [7]	GBNR [2]	CNR [6]	Ours (DUST)					
								0% missing data			sparse/structured/noise		
Metric:	e_X	e_X	e_X	e_X	e_X	e_X	e_X	e_X	e_S[%]	e_T[%]	e_X	e_X	e_X
Jump	**0.067**	0.104	1.228	0.311	0.072	1.236	0.172	**0.070**	0.0(2)	6.2(3)	0.075	0.079	0.115
Pull	0.168	0.129	0.985	0.246	0.103	1.034	0.169	**0.099**	0.0(2)	6.7(4)	0.107	0.124	0.123
Soldiers	0.649	0.754	0.704	0.175	0.095	0.566	0.256	**0.072**	0.0(2)	13.0(3)	0.074	0.081	0.109
Stares Down	0.046	0.034	0.144	**0.033**	0.044	0.219	0.047	**0.032**	0.0(2)	0.4(2)	0.036	0.035	0.094
Stumbles	0.213	0.164	0.189	0.096	0.098	0.238	0.105	**0.086**	0.0(2)	1.6(2)	0.090	0.128	0.128
Squats	**0.022**	0.095	1.298	0.119	0.442	1.193	0.039	0.028	4.8(2)	0.8(2)	0.032	0.035	0.091
Synchronized	0.175	0.539	1.188	0.512	0.097	1.178	0.297	**0.081**	0.0(2)	2.2(2)	0.085	0.098	0.116
Violence	0.147	0.169	0.288	**0.141**	0.297	0.339	0.154	0.267	0.0(2)	3.2(3)	0.268	0.281	0.288
Zombie	0.208	0.176	0.162	0.184	0.171	0.198	**0.120**	0.175	0.0(2)	9.8(3)	0.175	0.184	0.196
Average error:	0.188	0.240	0.687	0.202	0.157	0.689	0.151	**0.101**	0.6	5.2	0.105	0.116	0.140
Relative error:	1.85	2.36	6.77	1.99	1.55	6.78	1.49	**1.00**	-	-	1.03	1.15	1.38

Table 1. **Evaluation on CMU sequences with two subjects.** 3D reconstruction error e_X for the following NRSfM baselines considering 2D tracks without missing data: CSF [3], KSTA [4], SPM [1], EM-PND [5], TUS [7], GBNR [2] and CNR [6]; and ours. For our approach, we also show the clustering errors e_S and e_T, where we include the number of spatial and temporal clusters in brackets. The three right-most columns show the reconstruction accuracy under a 70% of random missing points, under an overall of 20% of structured entries with patterns of 50% of missing data and under noisy observations, respectively. EM-PND [5] is not reflection aware, and we use either the estimated shape or the reflection version that provides best results.

References

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