

Supplementary Material: Closed-Form Optimal Two-View Triangulation Based on Angular Errors

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This is the supplementary material to the paper “Closed-Form Optimal Two-View Triangulation Based on Angular errors”. Tab. 2–9 present the results of the error criteria comparison from each individual dataset considered in the main paper. See Tab. 1 for the statistics of the datasets. Note that combining the results in Tab. 2–9 leads to Tab. 2 of the main paper.

	Orbital	Lateral	Forward	Dinosaur	Model House	Corridor	Fountain	Notre Dame
Cameras	16	2	2	36	10	11	14	715
Points	10^5	10^5	10^5	4,983	672	737	5,302	127,431
Matches	10^5	10^5	10^5	27,080	5,550	12,139	58,815	5,120,077

Table 1. Datasets used. “Matches” denotes the number of pairwise instances where a point is visible in two camera views. Generally, the number of matches is larger than the number of points because the points may be visible in more than two views.

		Midpoint	L_1 img	L_2 img	L_2 img 5 it.	L_∞ img	L_1 ang	L_2 ang	L_∞ ang
Error Criterion	$\theta_0 + \theta_1$	-	-	-	-	-	100,000	-	-
	$\theta_0^2 + \theta_1^2$	-	-	-	-	-	-	100,000	-
	$\sin^2(\theta_0) + \sin^2(\theta_1)$	-	-	-	-	-	-	100,000	-
	$\max(\theta_0, \theta_1)$	-	-	-	-	-	-	-	100,000
	$d_0 + d_1$	-	81,654	-	-	-	18,346	-	-
	$d_0^2 + d_1^2$	-	-	23,435	76,565	-	-	-	-
	$\max(d_0, d_1)$	-	-	-	-	100,000	-	-	-

Table 2. **[Orbital]** The number of matches for which each method yields the lowest error in given criterion.

		Midpoint	L_1 img	L_2 img	L_2 img 5 it.	L_∞ img	L_1 ang	L_2 ang	L_∞ ang
Error Criterion	$\theta_0 + \theta_1$	-	-	-	-	-	100,000	-	-
	$\theta_0^2 + \theta_1^2$	-	-	-	-	-	-	100,000	-
	$\sin^2(\theta_0) + \sin^2(\theta_1)$	-	-	-	-	-	-	100,000	-
	$\max(\theta_0, \theta_1)$	-	-	-	-	-	-	-	100,000
	$d_0 + d_1$	-	99,814	1	2	-	183	-	-
	$d_0^2 + d_1^2$	-	-	11,485	88,515	-	-	-	-
	$\max(d_0, d_1)$	-	-	-	-	100,000	-	-	-

Table 3. **[Lateral]** The number of matches for which each method yields the lowest error in given criterion.

		Midpoint	L_1 img	L_2 img	L_2 img 5 it.	L_∞ img	L_1 ang	L_2 ang	L_∞ ang
Error Criterion	$\theta_0 + \theta_1$	-	-	-	-	-	100,000	-	-
	$\theta_0^2 + \theta_1^2$	-	-	4	3	-	-	99,993	-
	$\sin^2(\theta_0) + \sin^2(\theta_1)$	-	-	-	-	-	-	100,000	-
	$\max(\theta_0, \theta_1)$	-	-	-	-	-	-	-	100,000
	$d_0 + d_1$	-	7,625	-	-	-	92,375	-	-
	$d_0^2 + d_1^2$	-	-	34,785	65,215	-	-	-	-
	$\max(d_0, d_1)$	-	-	-	-	100,000	-	-	-

Table 4. **[Forward]** The number of matches for which each method yields the lowest error in given criterion.

		Midpoint	L_1 img	L_2 img	L_2 img 5 it.	L_∞ img	L_1 ang	L_2 ang	L_∞ ang
Error Criterion	$\theta_0 + \theta_1$	-	-	-	-	-	27,080	-	-
	$\theta_0^2 + \theta_1^2$	-	-	-	-	-	-	27,080	-
	$\sin^2(\theta_0) + \sin^2(\theta_1)$	-	-	-	-	-	-	27,080	-
	$\max(\theta_0, \theta_1)$	-	-	-	-	-	-	-	27,080
	$d_0 + d_1$	-	27,080	-	-	-	-	-	-
	$d_0^2 + d_1^2$	-	-	6,598	20,482	-	-	-	-
	$\max(d_0, d_1)$	-	-	-	-	27,080	-	-	-

Table 5. **[Dinosaur]** The number of matches for which each method yields the lowest error in given criterion.

		Midpoint	L_1 img	L_2 img	L_2 img 5 it.	L_∞ img	L_1 ang	L_2 ang	L_∞ ang
Error Criterion	$\theta_0 + \theta_1$	-	-	-	-	-	5,550	-	-
	$\theta_0^2 + \theta_1^2$	-	-	-	-	-	-	5,550	-
	$\sin^2(\theta_0) + \sin^2(\theta_1)$	-	-	-	-	-	-	5,550	-
	$\max(\theta_0, \theta_1)$	-	-	-	-	-	-	-	5,550
	$d_0 + d_1$	-	3,563	-	-	-	1,987	-	-
	$d_0^2 + d_1^2$	-	-	2,766	2,784	-	-	-	-
	$\max(d_0, d_1)$	-	-	-	-	5,550	-	-	-

Table 6. **[Model House]** The number of matches for which each method yields the lowest error in given criterion.

		Midpoint	L_1 img	L_2 img	L_2 img 5 it.	L_∞ img	L_1 ang	L_2 ang	L_∞ ang
Error Criterion	$\theta_0 + \theta_1$	-	-	-	-	-	12,139	-	-
	$\theta_0^2 + \theta_1^2$	-	-	-	-	-	-	12,139	-
	$\sin^2(\theta_0) + \sin^2(\theta_1)$	-	-	-	-	-	-	12,139	-
	$\max(\theta_0, \theta_1)$	-	-	-	-	-	-	-	12,139
	$d_0 + d_1$	-	6,053	-	-	-	6,086	-	-
	$d_0^2 + d_1^2$	-	-	5,999	6,140	-	-	-	-
	$\max(d_0, d_1)$	-	-	-	-	12,139	-	-	-

Table 7. **[Corridor]** The number of matches for which each method yields the lowest error in given criterion.

		Midpoint	L_1 img	L_2 img	L_2 img 5 it.	L_∞ img	L_1 ang	L_2 ang	L_∞ ang
Error Criterion	$\theta_0 + \theta_1$	-	-	-	-	-	58,815	-	-
	$\theta_0^2 + \theta_1^2$	-	-	-	-	-	-	58,815	-
	$\sin^2(\theta_0) + \sin^2(\theta_1)$	-	-	-	-	-	-	58,815	-
	$\max(\theta_0, \theta_1)$	-	-	-	-	-	-	-	58,815
	$d_0 + d_1$	-	32,557	-	-	-	26,258	-	-
	$d_0^2 + d_1^2$	-	-	2,348	56,467	-	-	-	-
	$\max(d_0, d_1)$	-	-	-	-	58,815	-	-	-

Table 8. **[Fountain]** The number of matches for which each method yields the lowest error in given criterion.

		Midpoint	L_1 img	L_2 img	L_2 img 5 it.	L_∞ img	L_1 ang	L_2 ang	L_∞ ang
Error Criterion	$\theta_0 + \theta_1$	-	-	-	-	-	5,120,077	-	-
	$\theta_0^2 + \theta_1^2$	-	-	-	-	-	-	5,120,077	-
	$\sin^2(\theta_0) + \sin^2(\theta_1)$	-	-	-	-	-	-	5,120,077	-
	$\max(\theta_0, \theta_1)$	-	-	-	-	-	-	-	5,120,077
	$d_0 + d_1$	-	3,654,620	121	123	-	1,465,213	-	-
	$d_0^2 + d_1^2$	-	-	1,190,827	3,929,250	-	-	-	-
	$\max(d_0, d_1)$	-	-	-	-	5,120,077	-	-	-

Table 9. **[Notre Dame]** The number of matches for which each method yields the lowest error in given criterion.