

# A Computer Vision-based System for a Tangram Game in a Social Robot: Supplementary Materials

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## 1 Combinations of pieces to test the detector

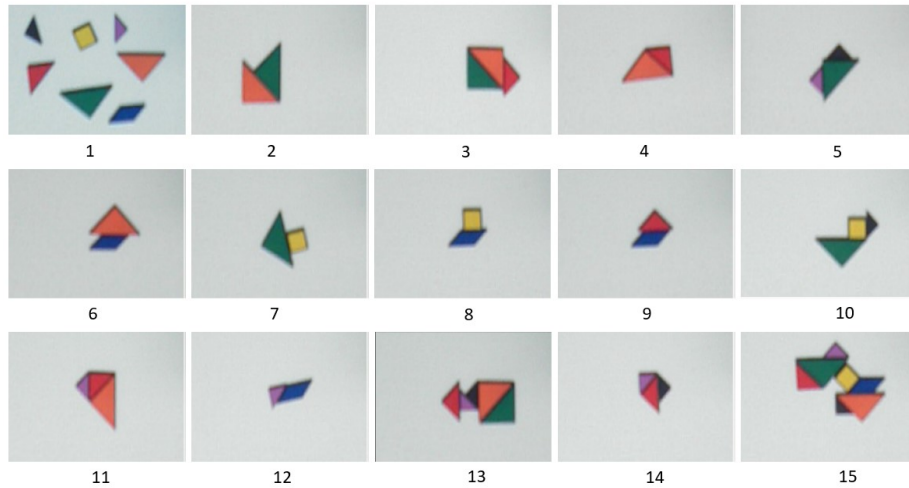


Fig. 1: Combinations to validate the recognition of Tangram pieces

## 2 Detailed results of the camera distance tests

Test	Test Description	Distance (cm)	Green T.	Orange T.	Red T.	Black T.	Purple T.	Yellow Q.	Blue R.
1	All figures offline	41	1000	1000	1000	1000	1000	1000	1000
		25	465	1000	1000	962	1000	876	890
2	Green and Orange Triangle with connection	41	881	881	-	-	-	-	-
		25	965	965	-	-	-	-	-
3	Green, Orange and Red Triangle	41	974	974	994	-	-	-	-
		25	1000	792	692	-	-	-	-
4	Orange and Red Triangle	41	-	963	963	-	-	-	-
		25	-	1000	1000	-	-	-	-
5	Green, Black and Purple Triangle	41	936	-	-	843	836	-	-
		25	841	-	-	745	1000	-	-
6	Orange Triangle and Blue Rhombus	41	-	824	-	-	-	-	452
		25	-	999	-	-	-	-	802
7	Green Triangle and Yellow Square	41	1000	-	-	-	-	999	-
		25	994	-	-	-	-	988	-
8	Blue Rhombus and Yellow Square	41	-	-	-	-	-	920	617
		25	-	-	-	-	-	1000	930
9	Red Triangle and Blue Rhombus	41	-	-	966	-	-	-	646
		25	-	-	997	-	-	-	745
10	Green, Black Triangle and Yellow Square	41	1000	-	-	895	-	820	-
		25	959	-	-	964	-	691	-
11	Orange, Red and Purple Triangle	41	-	736	697	-	939	-	-
		25	-	972	972	-	927	-	-
12	Purple Triangle and Blue Rhombus	41	-	-	-	-	818	-	424
		25	-	-	-	-	999	-	328
13	Red, Purple and Black Triangle	41	698	805	987	752	996	-	-
		25	1000	998	984	834	1000	-	-
14	All triangles	41	698	805	987	752	996	-	-
		25	1000	998	984	834	1000	-	-
15	All pieces with connection	41	968	999	631	865	983	956	899
		25	986	987	986	995	998	1000	322

Table 1: Result of the test of recognition of the pieces of the tangram when the camera is 41 cm and 25 cm high.

## 3 Detailed results of the illumination tests

Test	Test Description	Illumination	Green T.	Orange T.	Red T.	Black T.	Purple T.	Yellow Q.	Blue R.
1	All figures offline	High	1000	245	1000	957	32	25	922
		Low	928	1000	996	1000	935	38	987
2	Green and Orange Triangle with connection	High	513	513	-	-	-	-	-
		Low	600	705	-	-	-	-	-
3	Green , Orange and Red Triangle	High	595	324	200	-	-	-	-
		Low	474	217	730	-	-	-	-
4	Orange and Red Triangle	High	-	9	199	-	-	-	-
		Low	-	280	77	-	-	-	-
5	Green, Black and Purple Triangle	High	722	-	-	606	265	-	-
		Low	761	-	-	71	998	-	-
6	Orange Triangle and Blue Rhombus	High	-	576	-	-	-	-	783
		Low	-	686	-	-	-	-	888
7	Green Triangle and Yellow Square	High	997	-	-	-	-	34	-
		Low	1000	-	-	-	-	220	-
8	Blue Rhombus and Yellow Square	High	-	-	-	-	-	230	995
		Low	-	-	-	-	-	400	989
9	Red Triangle and Blue Rhombus	High	-	-	782	-	-	-	755
		Low	-	-	13	-	-	-	6
10	Green, Black Triangle and Yellow Square	High	1000	-	-	1000	-	7	-
		Low	1000	-	-	1000	-	10	-
11	Orange, Red and Purple Triangle	High	-	47	188	-	128	-	-
		Low	-	118	111	-	189	-	-
12	Purple Triangle and Blue Rhombus	High	-	-	-	-	479	-	550
		Low	-	-	-	-	812	-	641
13	Red, Purple and Black Triangle	High	-	-	473	609	480	-	-
		Low	-	-	70	77	367	-	-
14	All triangles	High	452	382	593	993	130	-	-
		Low	385	247	250	839	486	-	-
15	All pieces with connection	High	778	221	609	731	25	0	1
		Low	7	0	65	1000	80	76	0

Table 2: Result of the test of recognition of the pieces of the tangram when illumination is high or low.