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สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย



APPENDICES

สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

APPENDIX A

COLORIMETRIC VALUES

AND

VISUAL ASSESSMENT VALUES



สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
5R1	3.98	3.78	80.86	5.49	43.56	63.33	66.67	-66.10	33.33	-70.00	-62.71	-69.49	-33.33	-66.67	-45.76	-83.33	-72.88
5R2	14.15	9.17	81.11	16.86	32.94	80.00	90.00	-11.86	65.00	-46.67	6.67	-69.49	50.00	-86.67	10.00	-26.67	0.00
5R3	3	0.84	71.47	3.12	15.57	-36.67	13.33	-76.67	-40.00	0.00	-43.33	8.47	-56.67	13.33	-66.67	-86.67	-46.67
5R4	16.31	7.37	70.15	17.9	24.32	33.33	50.00	-15.25	5.08	20.00	-10.00	5.08	-20.00	-18.64	-16.67	-40.00	-20.34
5R5	37	17.01	69.74	40.72	24.69	93.33	63.33	63.33	79.66	66.67	90.00	-3.33	90.00	20.00	86.67	86.67	80.00
5R6	10.27	3.95	42.35	11	21.04	-83.33	-43.33	-37.93	-86.67	96.67	-26.67	96.67	-80.00	93.33	-72.88	-86.67	13.79
5R7	26.15	13.16	46.99	29.28	26.71	-36.67	-20.00	20.00	-80.00	90.00	-36.67	86.67	-63.33	73.33	-30.00	-40.00	33.33
5R8	51.66	22.82	56.21	56.48	23.83	100.00	13.33	70.00	70.00	66.67	93.33	13.33	100.00	43.33	86.67	96.67	96.67
5R9	10.99	2.49	21.43	11.27	12.77	-96.67	-83.33	-20.00	-100.00	100.00	23.33	96.67	-83.33	100.00	-80.00	-73.33	63.33
5R10	29.41	11.31	33.42	31.51	21.04	-43.33	-60.00	43.33	-80.00	90.00	23.33	83.33	-60.00	90.00	-10.00	-6.67	73.33
5R11	44.49	17.04	32.77	47.64	20.96	56.67	-60.00	86.67	-33.33	100.00	70.00	90.00	56.67	86.67	70.00	80.00	93.33
5R12	62.27	26.06	40.59	67.5	22.71	100.00	-3.33	86.67	43.33	86.67	93.33	50.00	93.33	66.67	96.67	96.67	96.67
10R1	5.48	6.89	79.96	8.8	51.49	83.33	83.33	-60.00	56.67	-80.00	-73.33	-93.33	-53.33	-80.00	-63.33	-93.33	-83.33
10R2	10.47	13.42	89.9	17.02	52.03	86.67	86.67	-30.00	76.67	-80.00	23.33	-86.67	36.67	-66.67	10.00	-63.33	-43.33
10R3	3.81	4.16	72.15	5.65	47.51	-53.33	52.54	-70.00	-45.76	13.33	-83.33	-3.33	-83.33	10.00	-89.83	-100.00	-70.00
10R4	23.12	18.69	66.58	29.73	38.95	76.67	56.67	13.33	10.00	30.00	30.00	-11.86	3.33	10.00	30.00	-8.47	43.33

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
10R5	29.87	30.14	72.12	42.44	45.26	96.67	46.67	53.33	80.00	40.00	83.33	-13.33	86.67	-10.00	70.00	70.00	73.33
10R6	10.94	7.93	48.26	13.52	35.93	-90.00	-46.67	-53.33	-100.00	93.33	-33.33	100.00	-96.67	73.33	-80.00	-90.00	10.00
10R7	22.81	16.47	52.68	28.13	35.82	0.00	-20.00	20.00	-70.00	90.00	-20.00	73.33	-63.33	60.00	-20.00	-36.67	23.33
10R8	46.86	42.58	58.18	63.31	42.26	93.33	-16.67	86.67	63.33	86.67	86.67	51.67	86.67	60.00	90.00	83.33	96.67
10R9	7.43	4.52	25.32	8.7	31.33	-96.67	-86.67	-50.00	-93.33	96.67	10.00	96.67	-73.33	100.00	-76.67	-66.67	66.67
10R10	27.97	21.05	30.08	32.66	40.13	-73.33	-93.33	26.67	-83.33	96.67	3.33	93.33	-60.00	90.00	-30.00	-26.67	63.33
10R11	42.59	38.08	40.04	57.13	41.8	60.00	-63.33	83.33	-43.33	96.67	53.33	73.33	23.33	73.33	70.00	66.67	96.67
10R12	58.23	55.72	49.76	80.59	43.74	100.00	-53.33	96.67	50.00	90.00	96.67	63.33	93.33	70.00	93.33	100.00	100.00
5YR1	3.53	9.15	74.3	9.81	68.89	60.00	70.00	-83.33	20.00	-50.00	-70.00	-60.00	-70.00	-56.67	-73.33	-90.00	-80.00
5YR2	15.22	28.21	79.88	32.06	61.65	96.67	90.00	-6.67	90.00	-46.67	23.33	-66.67	60.00	-53.33	23.33	-10.00	3.33
5YR3	5.08	7.02	69.66	8.67	54.15	23.33	53.33	-60.00	-30.00	-20.00	-70.00	-33.33	-70.00	-10.00	-80.00	-96.67	-66.67
5YR4	14.37	23.29	65.48	27.36	58.33	73.33	3.33	43.33	-20.00	60.00	10.00	50.00	3.33	20.00	6.67	-3.33	26.67
5YR5	25.72	39.21	77.38	46.89	56.74	90.00	50.00	66.67	76.67	30.00	73.33	-26.67	73.33	3.33	63.33	63.33	70.00
5YR6	7.12	8.31	40.98	10.94	49.41	-83.33	-56.67	-49.15	-83.33	93.33	-23.33	93.33	-86.67	80.00	-70.00	-80.00	40.00
5YR7	21.42	28.84	58.4	35.92	53.4	30.00	-10.00	33.33	-40.00	80.00	23.33	70.00	-23.33	46.67	13.33	-3.33	56.67
5YR8	38.26	60.63	59.98	71.69	57.74	86.67	-43.33	93.33	43.33	90.00	93.33	70.00	90.00	73.33	86.67	100.00	100.00

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
5YR9	7.57	6.61	24.7	10.04	41.12	-96.67	-76.67	-38.98	-96.67	100.00	30.00	96.67	-83.33	80.00	-76.67	-76.67	76.67
5YR10	21.06	32.45	39.3	38.68	57.02	-3.33	-60.00	33.33	-70.00	93.33	10.00	86.67	-50.00	86.67	-6.67	-13.33	56.67
5YR11	27.1	49.62	51.35	56.54	61.36	86.67	-23.33	80.00	0.00	66.67	66.67	46.67	46.67	66.67	70.00	73.33	86.67
5YR12	35.78	56.27	52.99	66.69	57.55	86.67	-40.00	86.67	23.33	73.33	93.33	60.00	90.00	70.00	73.33	96.67	100.00
10YR1	1.6	9.07	80.32	9.21	80	83.33	70.00	-73.33	46.67	-73.33	-50.00	-76.67	-40.00	-76.67	-60.00	-96.67	-83.33
10YR2	3.5	20.29	88.16	20.59	80.23	90.00	83.33	-33.33	83.33	-83.33	13.33	-93.33	20.00	-70.00	-33.33	-86.67	-56.67
10YR3	2.54	8.21	59.89	8.59	72.78	-80.00	-10.00	-86.67	-83.33	60.00	-56.67	73.33	-100.00	50.00	-83.33	-96.67	-6.67
10YR4	5.4	27.23	66.02	27.76	78.78	50.00	23.33	-10.00	-43.33	40.00	-10.00	40.00	-53.33	13.33	-13.33	-53.33	-16.67
10YR5	13.58	57.46	79.15	59.04	76.7	100.00	26.67	80.00	83.33	36.67	93.33	-6.67	96.67	33.33	90.00	93.33	86.67
10YR6	4.81	10.71	51.05	11.74	65.83	-90.00	-20.00	-76.67	-93.33	86.67	-33.33	93.33	-93.33	60.00	-73.33	-93.33	13.33
10YR7	14.86	41.79	53.74	44.35	70.43	16.67	-50.00	50.00	-46.67	93.33	23.33	90.00	-40.00	66.67	20.00	16.67	66.67
10YR8	14.76	89.28	76.44	90.49	80.61	90.00	-13.33	83.33	76.67	63.33	93.33	3.33	86.67	46.67	90.00	86.67	90.00
10YR9	3.56	8.44	25.18	9.16	67.13	-96.67	-66.67	-50.00	-93.33	100.00	26.67	96.67	-83.33	83.33	-90.00	-90.00	63.33
10YR10	7.22	27.95	40.58	28.87	75.51	-46.67	-56.67	-28.33	-73.33	83.33	0.00	83.33	-83.33	70.00	-43.33	-63.33	26.67
5Y1	1.04	13.13	81.48	13.17	85.45	63.33	73.33	-70.00	16.67	-70.00	-70.00	-80.00	-53.33	-60.00	-80.00	-96.67	-80.00
5Y2	-2.04	27.32	88.85	27.4	94.27	96.67	86.67	-33.33	63.33	-60.00	13.33	-83.33	53.33	-76.67	-16.67	-53.33	-26.67

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
5Y3	1.14	9.66	71.45	9.72	83.26	-53.33	6.67	-76.67	-60.00	56.67	-66.67	46.67	-93.33	20.00	-83.33	-96.67	-40.00
5Y4	-2.59	28.59	79.1	28.71	95.17	66.67	46.67	-13.33	26.67	3.33	-26.67	-6.67	-30.00	-30.00	-13.33	-63.33	-16.67
5Y5	-2.88	61.05	54.22	61.12	92.7	100.00	16.67	60.00	86.67	76.67	96.67	23.33	100.00	23.33	83.33	90.00	93.33
5Y6	0.18	13.13	52.04	13.13	89.2	-96.67	-50.00	-63.33	-90.00	93.33	-46.67	96.67	-90.00	83.33	-73.33	-90.00	10.00
5Y7	-0.76	42.69	60.46	42.7	91.03	43.33	-30.00	50.00	-43.33	93.33	10.00	83.33	-20.00	66.67	13.33	13.33	56.67
5Y8	5.15	73.55	68.59	73.73	85.99	80.00	-20.00	70.00	16.67	90.00	66.67	56.67	63.33	70.00	66.67	90.00	90.00
5Y9	0.49	10.14	29.97	10.15	87.23	-96.67	-83.33	-26.67	-96.67	100.00	6.67	100.00	-83.33	93.33	-83.33	-83.33	66.67
5Y10	5	47.46	49.84	47.13	83.99	-16.67	-60.00	26.67	-70.00	93.33	16.67	86.67	-66.67	86.67	-13.33	-26.67	56.67
10Y1	-2.27	11.09	78.04	11.32	101.6	80.00	70.00	-80.00	33.33	-66.67	-33.33	-80.00	-40.00	-56.67	-60.00	-90.00	-76.67
10Y2	-7.86	28.92	91.1	29.97	105.2	93.33	93.33	-16.67	86.67	-73.33	43.33	-83.33	80.00	-63.33	6.67	-23.33	-20.00
10Y3	-2.34	5.98	63.55	6.42	111.3	-63.33	-16.67	-83.33	-80.00	76.67	-56.67	66.67	-93.33	60.00	-90.00	-96.67	-23.33
10Y4	-8.09	33.08	70.92	34.06	103.8	66.67	43.33	-30.00	16.67	16.67	6.67	-6.67	-6.67	-6.67	0.00	-26.67	23.33
10Y5	-14.31	67.91	85.03	69.4	101.9	96.67	33.33	43.33	83.33	53.33	93.33	-13.33	96.67	6.67	90.00	93.33	100.00
10Y6	-3.82	13.03	39.49	13.58	106.3	-100.00	-63.33	-53.33	-90.00	96.67	-20.00	93.33	-100.00	83.33	-76.67	-96.67	23.33
10Y7	-7.6	45.76	68.35	46.39	99.43	63.33	13.33	0.00	-10.00	66.67	16.67	36.67	6.67	23.33	36.67	10.00	30.00
10Y8	-12.44	89.39	83.1	90.25	97.92	86.67	-3.33	56.67	76.67	60.00	96.67	23.33	100.00	33.33	83.33	90.00	96.67

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
10Y9	-2.14	8.76	25.44	9.02	103.7	-96.67	-73.33	-46.67	-96.67	96.67	10.00	100.00	-80.00	90.00	-86.67	-76.67	66.67
10Y10	-7.69	33.85	42.07	34.92	102.8	-60.00	-36.67	-53.33	-73.33	96.67	-6.67	86.67	-73.33	93.33	-10.00	-53.33	56.67
5GY1	-3.67	9.66	81.27	10.33	110.8	73.33	63.33	-73.33	23.33	-70.00	-53.33	-70.00	-50.00	-46.67	-66.67	-93.33	-96.67
5GY2	-6.56	23.27	87.95	24.17	105.8	90.00	73.33	-30.00	76.67	-66.67	20.00	-86.67	46.67	-73.33	23.33	-56.67	-16.67
5GY3	-4.14	6.75	60.45	7.92	121.5	-76.67	-20.00	-56.67	-73.33	73.33	-36.67	53.33	-90.00	53.33	-70.00	-93.33	10.00
5GY4	-14.94	30.62	75.95	34.07	116	86.67	76.67	-30.00	66.67	13.33	53.33	-43.33	70.00	-10.00	63.33	30.00	63.33
5GY5	-20.94	49.11	82.57	53.39	113.1	93.33	76.67	-3.33	93.33	6.67	96.67	-43.33	93.33	43.33	83.33	83.33	86.67
5GY6	-8.59	12.85	51.77	15.46	123.8	-93.33	-56.67	-70.00	-80.00	80.00	-46.67	83.33	-86.67	76.67	-80.00	-83.33	36.67
5GY7	-17.09	33.73	54.56	37.81	116.9	13.33	5.08	-50.00	-28.81	80.00	38.98	66.67	-3.33	66.10	1.69	-10.34	55.93
5GY8	-34.92	79.26	79.01	86.61	113.8	100.00	30.00	20.00	93.33	60.00	100.00	-16.67	100.00	46.67	96.67	100.00	100.00
5GY9	-4.96	8.03	30.4	9.44	121.7	-96.67	-73.33	-36.67	-76.67	96.67	-16.67	93.33	-86.67	83.33	-76.67	-66.67	46.67
5GY10	-16.28	34.5	46.89	38.15	115.3	-33.33	-30.00	-43.33	-83.33	96.67	6.67	90.00	-53.33	83.33	-13.33	-33.33	50.00
5GY11	-27.56	68.95	69.24	74.25	111.8	100.00	46.67	6.67	70.00	66.67	93.33	-3.33	93.33	50.00	86.67	93.33	100.00
5GY12	-37.51	71.9	73.47	81.1	117.5	100.00	36.67	13.33	80.00	53.33	93.33	-10.00	96.67	33.33	93.33	100.00	96.67
10GY1	-6.91	4.28	82.52	8.12	148.2	76.67	86.67	-73.33	46.67	-76.67	-10.00	-73.33	-36.67	-46.67	-46.67	-76.67	-50.00
10GY2	-13.06	12.96	88.89	18.4	135.2	93.33	83.33	-66.67	86.67	-63.33	23.33	-76.67	63.33	-70.00	3.33	-70.00	-26.67

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
10GY3	-6.59	4.25	67.17	7.84	147.2	-80.00	-6.67	-73.33	-66.67	56.67	-66.67	56.67	-93.33	40.00	-83.05	-93.33	-53.33
10GY4	-23.21	17.93	72.81	29.33	142.3	80.00	80.00	-56.67	63.33	13.33	33.33	-36.67	56.67	6.67	33.33	-33.33	16.67
10GY6	-11	9.07	47.37	14.26	140.5	-100.00	-50.00	-60.00	-96.67	96.67	-46.67	96.67	-93.33	86.67	-86.44	-86.67	30.00
10GY7	-33.57	29.1	62.2	44.43	139.1	90.00	66.67	-40.00	66.67	66.67	86.67	30.00	73.33	53.33	62.71	60.00	90.00
10GY9	-7.97	4.91	23.92	9.36	148.4	-93.33	-86.67	-30.00	-93.33	100.00	43.33	100.00	-66.67	93.33	-86.44	-63.33	70.00
10GY10	-28.41	20.55	40.11	35.06	144.1	-26.67	-60.00	-53.33	-80.00	96.67	40.00	96.67	-20.00	90.00	-18.64	-20.00	70.00
10GY11	-46.54	34.92	53.84	58.19	143.1	80.00	16.67	-13.33	40.00	90.00	100.00	46.67	90.00	73.33	83.33	73.33	96.67
5G1	-6.61	5.45	84.11	8.57	140.5	90.00	73.33	-73.33	60.00	-90.00	-43.33	-90.00	-33.33	-80.00	-60.00	-90.00	-80.00
5G2	-10.61	8.02	89.58	13.3	142.9	96.67	93.33	-56.67	83.33	-83.33	16.67	-90.00	40.00	-63.33	10.00	-73.33	-50.00
5G3	-9.9	3.84	75.08	9.69	156.6	-3.33	30.00	-80.00	-3.33	30.00	-43.33	10.00	-76.67	-20.00	-63.33	-96.67	-50.00
5G4	-24.45	8.48	70.39	25.88	160.9	86.67	60.00	-60.00	23.33	50.00	53.33	6.67	60.00	0.00	46.67	3.33	43.33
5G6	-6.08	1.42	46.54	6.25	166.9	-96.67	-60.00	-53.33	-86.67	93.33	-30.00	90.00	-96.67	80.00	-90.00	-96.67	6.67
5G7	-31.76	9.03	56.71	33.02	164.1	60.00	40.00	-46.67	23.33	70.00	60.00	33.33	50.00	40.00	53.33	23.33	56.67
5G9	-8.59	1.91	27.38	8.8	167.5	-96.67	-70.00	-40.00	-90.00	100.00	20.00	100.00	-90.00	90.00	-80.00	-73.33	63.33
5G10	-32.17	8.28	36.41	33.22	165.6	-23.33	-23.33	-26.67	-53.33	100.00	53.33	90.00	16.67	93.33	13.33	13.33	86.67
5G11	-48.82	17.48	43.39	51.85	160.3	63.33	-3.33	-10.00	-3.33	90.00	96.67	53.33	86.67	76.67	60.00	60.00	93.33

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
10G1	-8.95	3.94	83.39	9.78	156.2	90.00	83.33	-60.00	73.33	-93.33	-40.00	-90.00	-23.33	-83.33	-46.67	-83.33	-76.67
10G2	-21.84	5.49	82.72	22.52	165.9	93.33	86.67	-59.32	86.67	-30.00	53.33	-70.00	76.67	-40.00	30.00	-3.33	26.67
10G3	-5.99	1.82	73.54	6.26	163.1	-13.33	30.00	-76.67	-36.67	6.67	-63.33	-16.67	-76.67	6.67	-56.67	-93.33	-60.00
10G4	-25.05	4.54	72.85	25.45	169.7	86.67	70.00	-56.67	46.67	10.00	40.00	-26.67	60.00	-23.33	40.00	-10.00	30.00
10G6	-5.64	0.67	46.48	5.68	173.3	-93.33	-36.67	-63.33	-93.33	86.67	-33.33	93.33	-96.67	63.33	-90.00	-86.67	16.67
10G7	-39.96	5.59	63.35	34.42	170.7	73.33	46.67	-46.67	43.33	60.00	50.00	0.00	66.67	16.67	43.33	36.67	73.33
10G9	-13.73	2.29	24.03	13.92	170.5	-86.67	-66.67	-23.33	-93.33	93.33	40.00	90.00	-60.00	90.00	-56.67	-43.33	66.67
10G10	-27.42	3.09	33.79	27.59	173.6	-53.33	-50.00	-50.00	-76.67	96.67	43.33	90.00	-16.67	90.00	-6.67	-6.67	76.67
10G11	-43.61	5.17	52.02	43.91	173.2	66.67	46.67	-30.00	30.00	66.67	83.33	23.33	73.33	50.00	66.67	60.00	86.67
5BG1	-5.89	1.26	74.69	6.02	167.9	80.00	50.00	-76.67	20.00	-73.33	-53.33	-70.00	-46.67	-60.00	-63.33	-86.67	-66.67
5BG2	-12.03	4.7	84.93	12.91	158.7	90.00	90.00	-86.67	76.67	-83.33	-3.33	-90.00	43.33	-76.67	-30.00	-73.33	-63.33
5BG3	-7.32	-1.9	63.53	7.57	194.5	-76.67	-13.33	-80.00	-86.67	83.33	-50.00	66.67	-93.33	70.00	-80.00	-100.00	6.67
5BG4	-23.56	-1.58	68.89	23.62	183.8	90.00	73.33	-53.33	36.67	36.67	50.00	-20.00	80.00	10.00	26.67	-10.00	46.67
5BG6	-10.84	-4.18	41.67	11.61	201.1	-93.33	-53.33	-53.33	-96.67	93.33	-20.00	93.33	-96.67	90.00	-73.33	-83.33	53.33
5BG7	-34.5	-5.47	55.69	34.93	189	76.67	30.00	-43.33	-3.33	86.67	80.00	40.00	60.00	66.67	56.67	33.33	76.67
5BG9	-7.36	-2.57	24.64	7.79	199.3	-100.00	-80.00	-26.67	-96.67	100.00	23.33	100.00	-86.67	96.67	-80.00	-83.33	80.00

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values												
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS	
5BG10	-31.99	-6.4	38.19	32.63	191.3	-6.67	-30.00	-53.33	-70.00	90.00	50.00	83.33	13.33	86.67	0.00	3.33	93.33	
5BG11	-28.65	-5.61	44.52	29.19	191.1	0.00	6.67	-70.00	-53.33	80.00	16.67	73.33	-30.00	50.00	-10.00	-50.00	43.33	
10BG1	-3.17	0.88	78.64	3.29	164.6	83.33	73.33	-56.67	36.67	-66.67	-60.00	-83.33	-46.67	-46.67	-60.00	-83.33	-80.00	
10BG2	-18.67	-4.23	81.94	19.15	192.8	100.00	96.67	-53.33	86.67	-26.67	73.33	-76.67	93.33	-50.00	40.00	16.67	30.00	
10BG3	-4.43	-2.08	60.59	4.89	205.2	-70.00	-20.00	-56.67	-76.67	76.67	-46.67	76.67	-86.67	80.00	-80.00	-80.00	3.33	
10BG4	-22.74	-5.44	73.67	23.38	193.5	86.67	76.67	-46.67	66.67	6.67	63.33	-43.33	83.33	-26.67	36.67	-10.00	40.00	
10BG6	-8.62	-4.18	44.81	9.58	205.9	-100.00	-66.67	-53.33	-100.00	100.00	-46.67	93.33	-96.67	100.00	-83.33	-80.00	40.00	
10BG7	-29.29	-13.7	52.69	32.34	205.1	70.00	26.67	-36.67	-26.67	70.00	66.67	46.67	50.00	63.33	46.67	13.33	83.33	
10BG9	-7.88	-5.21	27.51	9.45	213.5	-90.00	-90.00	-16.67	-100.00	100.00	23.33	96.67	-80.00	100.00	-70.00	-80.00	76.67	
10BG10	-27.21	-12.17	39.94	29.81	204.1	-13.33	-3.33	-40.00	-56.67	93.33	40.00	90.00	-6.67	76.67	23.33	-13.33	73.33	
5B1	-4.43	-0.65	82.49	4.47	188.3	90.00	90.00	-70.00	56.67	-93.33	-43.33	-90.00	-13.33	-66.67	-33.33	-90.00	-76.67	
5B2	-12.3	-4.46	86.73	13.08	199.9	96.67	100.00	-63.33	96.67	-63.33	46.67	-83.33	73.33	-53.33	13.33	-40.00	-13.33	
5B3	-3.32	-2.58	60.44	4.2	217.8	-63.33	-20.00	-63.33	-73.33	60.00	-43.33	56.67	-90.00	73.33	-70.00	-93.33	3.33	
5B4	-15.01	-10.86	72.27	18.52	215.9	83.33	86.67	-63.33	30.00	-13.33	36.67	-40.00	53.33	-26.67	26.67	-26.67	20.00	
5B6	-6.95	-6.07	46.74	9.23	221.2	-76.67	-13.33	-80.00	-93.33	93.33	-53.33	86.67	-80.00	76.67	-86.67	-90.00	3.33	
5B7	-18.78	-20.82	53.14	28.04	227.9	60.00	50.00	-66.67	10.00	53.33	46.67	26.67	36.67	13.33	20.00	-3.33	70.00	

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
5B9	-8.89	-10.53	27.17	3.78	229.8	-100.00	-73.33	-66.67	-96.67	93.33	-13.33	100.00	-70.00	93.33	-80.00	-80.00	56.67
5B10	-12.63	-16.83	32	21.04	233.1	-80.00	-40.00	-76.67	-90.00	93.33	13.33	100.00	-70.00	93.33	-56.67	-63.33	70.00
10B1	-2.06	1.11	83.55	2.34	151.7	90.00	63.33	-63.33	63.33	-73.33	-46.67	-73.33	-23.33	-36.67	-50.00	-73.33	-53.33
10B2	-7.21	-9.25	79.82	11.73	232.1	90.00	86.67	-80.00	86.67	-66.67	13.33	-83.33	40.00	-53.33	-16.67	-76.67	-36.67
10B3	-2.07	-3.14	67.68	3.77	236.6	-23.33	-6.67	-86.67	-46.67	43.33	-63.33	13.33	-83.33	46.67	-76.67	-90.00	-46.67
10B4	-12.41	-18.88	67.25	22.59	236.7	80.00	76.67	-66.67	40.00	13.33	43.33	-16.67	30.00	0.00	20.00	-23.33	30.00
10B5	-15.67	-22.2	71.83	27.17	234.8	100.00	86.67	-76.67	83.33	3.33	90.00	-46.67	90.00	-10.00	53.33	26.67	70.00
10B6	-4.69	-8.91	44.58	10.07	242.3	-86.67	-43.33	-76.67	-96.67	90.00	-26.67	86.67	-76.67	86.67	-83.33	-90.00	23.33
10B7	-12.61	-21.61	55.01	25.02	239.7	16.67	20.00	-73.33	-36.67	86.67	6.67	43.33	-20.00	36.67	-8.47	-43.33	18.64
10B8	-16.13	-34.79	56.13	38.48	245.2	83.33	43.33	-46.67	50.00	80.00	90.00	26.67	86.67	63.33	80.00	83.33	90.00
10B9	-2.92	-9.7	24.06	10.13	253.2	-90.00	-70.00	-50.00	-90.00	93.33	16.67	86.67	-70.00	90.00	-80.00	-66.67	70.00
10B10	-6.19	-25.81	32.63	26.55	256.5	-73.33	-63.33	-70.00	-86.67	96.67	13.33	93.33	-46.67	90.00	-40.00	-66.67	63.33
5PB1	-0.54	-0.08	81.98	0.55	188	80.00	68.97	-60.00	63.33	-73.33	-26.67	-80.00	-23.33	-56.67	-33.33	-90.00	-56.67
5PB2	-2.56	-6.18	81.9	6.69	247.5	96.67	89.83	-86.67	76.67	-66.67	-30.00	-83.33	6.67	-56.67	-36.67	-83.33	-53.33
5PB3	-0.97	-3.96	64.23	4.07	256.2	-70.00	-13.33	-86.67	-76.67	53.33	-60.00	73.33	-66.67	43.33	-83.33	-79.66	-25.42
5PB4	-1.39	-13.09	62.83	13.17	264	-6.67	26.67	-83.33	-53.33	56.67	-36.67	56.67	-50.00	35.59	-38.98	-93.33	-10.00

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
5PB5	-0.83	-27.34	65.63	27.35	268.3	83.33	76.67	-46.67	70.00	23.33	70.00	-28.81	80.00	6.67	66.10	36.67	70.00
5PB6	-1.04	-5.77	41.27	5.87	259.8	-93.33	-73.33	-63.33	-90.00	83.33	-43.33	86.67	-90.00	83.33	-80.00	-90.00	20.00
5PB7	2.33	-30.13	45.72	30.22	274.4	-16.67	30.00	-93.33	-46.67	86.67	16.67	50.00	-13.33	66.67	-26.67	-56.67	46.67
5PB8	0.76	-44.63	50.46	44.64	271	83.33	56.67	-53.33	43.33	66.67	93.33	6.67	90.00	63.33	52.54	53.33	86.67
5PB9	1.73	-11.23	21.3	11.36	278.8	-86.67	-63.33	-53.33	-90.00	100.00	43.33	96.67	-76.67	100.00	-83.33	-76.67	76.67
5PB10	1.11	-27.62	27.5	27.7	272.3	-80.00	-60.00	-73.33	-83.33	100.00	33.33	96.67	-70.00	83.33	-53.33	-60.00	76.67
5PB11	6.61	-36.62	29.68	37.21	280.2	3.33	-20.00	-70.00	-56.67	96.67	73.33	76.67	10.00	96.67	-20.00	-23.33	96.67
5PB12	3.67	-48.98	38.57	49.12	274.3	66.67	13.33	-30.00	26.67	83.33	86.67	30.00	86.67	60.00	60.00	70.00	93.33
10PB1	0.24	0.27	78.27	0.36	48.68	73.33	70.00	-66.67	20.00	-76.67	-66.67	-86.67	-66.67	-66.67	-60.00	-93.33	-76.67
10PB2	3.61	-7.16	82.16	8.02	296.8	83.33	60.00	-60.00	40.00	-56.67	-13.33	-73.33	16.67	-33.33	-26.67	-60.00	-36.67
10PB3	0.73	-2.54	66.61	2.65	286	-26.67	20.00	-90.00	-60.00	36.67	-50.00	36.67	-83.33	23.33	-76.67	-93.33	-26.67
10PB4	4.69	-14.31	69.32	15.06	288.1	70.00	73.33	-60.00	10.00	-13.33	-26.67	-26.67	-3.33	-30.00	-30.00	-73.33	-30.00
10PB5	11.43	-29.95	65.86	32.06	290.9	90.00	73.33	-43.33	66.67	20.00	50.00	-36.67	73.33	13.33	43.33	43.33	50.00
10PB6	3.11	-5.83	39.09	6.6	298.1	-80.00	-60.00	-63.33	-76.67	93.33	-16.67	93.33	-80.00	73.33	-70.00	-80.00	46.67
10PB7	12.46	-27.62	36.98	30.31	294.3	-60.00	-30.00	-60.00	-63.33	96.67	26.67	96.67	-60.00	90.00	-10.00	-40.00	76.67
10PB8	25.41	-43.31	46.58	50.22	300.4	86.67	30.00	-3.33	43.33	76.67	86.67	33.33	86.67	56.67	66.67	76.67	93.33

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
10PB9	5.59	-10.98	23.13	12.32	297	-93.33	-73.33	-70.00	-90.00	100.00	50.00	96.67	-80.00	100.00	-80.00	-83.33	73.33
10PB10	12.52	-24.44	26.29	27.46	297.1	-81.67	-65.00	-68.33	-85.00	95.00	51.67	91.67	-71.67	95.00	-58.33	-58.33	91.67
10PB11	24.16	-37.79	31	44.85	302.6	3.33	-30.00	-50.00	-36.67	96.67	70.00	86.67	3.33	90.00	23.33	26.67	93.33
10PB12	30.97	-48.81	31.16	57.81	302.4	46.67	-20.00	-26.67	-6.67	90.00	86.67	70.00	50.00	66.67	60.00	66.67	95.00
5P1	5.59	-2.36	73.8	3.5	317.6	50.00	60.00	-66.67	-20.00	-16.67	-80.00	-40.00	-63.33	-23.33	-76.67	-93.33	-80.00
5P2	5.22	-3.91	81.28	6.52	323.2	90.00	66.67	-50.00	53.33	-50.00	-30.00	-70.00	16.67	-23.33	-18.33	-63.33	-46.67
5P3	1.82	-2.36	60.81	2.98	307.6	-76.67	-23.33	-60.00	-93.33	80.00	-63.33	83.33	-90.00	73.33	-86.67	-93.33	13.33
5P4	10.87	-11.87	58.62	16.1	312.5	13.33	33.33	-30.00	-26.67	63.33	-6.67	53.33	-26.67	30.00	-11.86	-26.67	20.00
5P5	30.81	-29.12	61.75	42.39	316.6	86.67	60.00	16.67	78.33	40.00	73.33	13.33	76.67	31.67	66.67	66.67	76.67
5P6	5.35	-5.33	38.39	7.55	315.1	-100.00	-66.67	-43.33	-100.00	100.00	-43.33	96.67	-96.67	90.00	-90.00	-93.33	26.67
5P7	21.31	-22.95	39.02	31.32	312.9	-23.33	-26.67	-13.33	-73.33	90.00	6.67	93.33	-30.00	73.33	-16.67	23.33	83.33
5P8	40.42	-37.98	47.8	55.47	316.8	93.33	33.33	13.33	50.00	70.00	96.67	46.67	93.33	73.33	86.67	96.67	100.00
5P9	5.82	-6.88	22.11	9.01	310.9	-86.67	-80.00	-6.67	-93.33	100.00	26.67	90.00	-80.00	96.67	-80.00	-70.00	76.67
5P10	20.66	-19.65	25.87	28.51	316.4	-90.00	-63.33	-36.67	-96.67	100.00	23.33	96.67	-66.67	96.67	-56.67	-20.00	83.33
5P11	33.91	-34.95	28.91	48.37	314.5	-6.67	-53.33	0.00	-63.33	96.67	70.00	90.00	26.67	86.67	0.00	46.67	93.33
5P12	45.78	-41.74	30.34	61.95	317.6	40.00	-26.67	16.67	-13.33	90.00	86.67	80.00	63.33	93.33	66.67	83.33	100.00

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
10P1	2.26	1.46	81.04	2.69	32.75	86.67	83.33	-72.88	66.67	-90.00	-56.67	-96.67	-20.00	-63.33	-73.33	-93.33	-86.67
10P2	7.32	-0.56	83.36	7.34	355.7	93.33	90.00	-50.00	70.00	-80.00	-30.00	-80.00	13.33	-60.00	-40.00	-80.00	-66.67
10P3	2.21	-1.09	59.69	2.46	333.8	-70.00	-26.67	-73.33	-83.33	73.33	-63.33	76.67	-86.67	60.00	-93.33	-93.33	0.00
10P4	13.3	-5.53	68.79	14.4	337.4	66.67	66.67	-40.00	-3.33	13.33	-36.67	-10.00	-13.33	-10.00	-6.67	-36.67	3.33
10P5	27.56	-10.62	72.76	29.53	338.9	93.33	83.33	30.00	80.00	23.33	73.33	-23.33	86.67	-33.33	73.33	60.00	73.33
10P6	3.48	-1.96	40.79	3.99	330.6	-83.33	-63.33	-53.33	-86.67	86.67	-36.67	96.67	-93.33	80.00	-76.67	-93.33	33.33
10P7	23.87	-15.49	39.42	28.48	327.1	-50.00	-50.00	-10.00	-93.33	96.67	16.67	93.33	-46.67	86.67	-6.67	0.00	80.00
10P8	43.16	-23.31	49.62	49.05	331.6	90.00	46.67	20.00	43.33	60.00	93.33	23.33	86.67	56.67	83.33	83.33	86.67
10P9	8.54	-5.37	27.41	10.09	327.8	-100.00	-52.54	-49.15	-96.61	96.61	5.08	62.71	-86.44	96.61	-72.88	-76.27	42.37
10P10	22.89	-12.5	27.03	26.08	331.4	-42.37	-28.81	11.86	-52.54	93.22	45.76	76.27	-25.42	89.83	-15.25	5.08	66.10
10P11	36.86	-22.76	26.71	43.32	328.3	32.20	-32.20	15.25	-18.64	93.22	86.44	86.44	55.93	86.44	52.54	66.10	96.61
10P12	57.19	-33.5	32.65	66.28	329.6	66.10	25.42	28.81	42.37	66.10	93.22	62.71	89.83	72.88	89.83	93.22	100.00
5RP1	3.66	3.79	82.55	5.27	46.01	93.22	62.71	-76.27	49.15	-86.44	-59.32	-89.83	-32.20	-72.88	-69.49	-96.61	-86.44
5RP2	9.01	3.07	86.48	9.52	18.78	93.22	75.86	-45.76	86.21	-89.83	17.24	-96.61	44.83	-86.21	-6.90	-82.76	-55.17
5RP3	3.92	1.7	58.12	4.27	23.38	-72.88	1.69	-76.27	-89.83	69.49	-55.93	69.49	-69.49	66.10	-76.27	-89.83	1.69
5RP4	15.56	-0.12	61.81	15.56	359.5	18.64	38.98	-15.25	-59.32	38.98	-35.59	35.59	-62.71	11.86	-22.03	-59.32	-8.47

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
5RP5	35.21	-0.2	72.11	35.21	359.7	96.61	83.05	55.93	100.00	45.76	86.21	-25.42	93.22	-1.69	93.22	86.44	89.83
5RP6	12.05	-3.23	33.02	12.47	345	-86.44	-69.49	-18.64	-100.00	100.00	-11.86	96.61	-93.22	100.00	-83.05	-83.05	52.54
5RP7	30.7	-4.29	40.25	31	352	-1.69	-42.37	42.37	-49.15	89.83	11.86	93.22	-1.69	83.05	32.20	25.42	72.88
5RP8	55.26	-2.68	57.36	55.33	357.2	96.61	49.15	62.71	72.88	76.27	96.61	18.64	96.61	-18.64	93.22	86.44	100.00
5RP9	9.86	-2.38	26.14	10.14	346.4	-89.83	-83.05	-42.37	-96.61	93.22	-5.08	96.61	-69.49	100.00	-79.66	-69.49	49.15
5RP10	29.51	-7.24	30.59	30.38	346.8	-38.98	-52.54	42.37	-79.66	93.22	28.81	96.61	-28.81	89.83	-8.47	-11.86	72.88
5RP11	42.03	-12	30.09	43.71	344.1	11.86	-38.98	52.54	-52.54	96.61	59.32	79.66	28.81	83.05	49.15	55.93	93.22
5RP12	56.38	-8.21	36.79	56.78	351.7	79.66	5.08	62.71	18.64	86.44	89.83	76.27	76.27	72.88	79.66	79.66	86.44
10RP1	3.67	3.72	85.01	5.23	45.37	93.22	86.44	-59.32	59.32	-100.00	-28.81	-93.22	-11.86	-74.58	-52.54	-96.61	-79.66
10RP2	10.75	5.25	86.98	11.96	26.05	100.00	83.05	-45.76	79.66	-96.61	-1.69	-93.22	38.98	-86.44	-18.64	-72.88	-42.37
10RP3	5.93	1.14	68.77	6.04	10.92	-38.98	22.03	-83.05	-52.54	25.42	-76.27	55.93	-79.66	35.59	-55.93	-93.22	-59.32
10RP4	17.22	3.44	68.74	17.56	11.3	34.48	62.07	0.00	-13.79	27.59	-44.83	10.34	-37.93	-6.90	13.79	-58.62	3.45
10RP5	32.37	8.53	66.28	38.34	12.86	90.00	90.00	6.67	25.42	30.00	53.33	-30.00	66.67	-26.67	50.00	26.67	66.67
10RP6	8.64	1.08	47.13	8.71	7.14	-93.33	-36.67	-72.88	-93.33	86.67	-43.33	93.33	-93.33	73.33	-70.00	-96.67	3.33
10RP7	25.71	2.64	48.55	25.84	5.87	-30.00	-3.33	10.00	-72.88	96.67	-23.33	83.33	-60.00	46.67	-23.33	-53.33	36.67
10RP8	49.3	12.65	56.47	50.9	14.39	83.33	53.33	66.67	53.33	80.00	76.67	30.00	86.67	33.33	86.67	83.33	86.67

Table A-1 Colorimetric values of the color samples and visual assessment values from Thai observers (cont.)

Color Sample	Colorimetric Values					Visual Assessment Values											
	a*	b*	L*	C*	h	LD	SH	WC	TT	DP	DV	HL	VS	SW	DYP	GP	SS
10RP9	18.69	-0.87	22.15	18.71	357.3	-86.67	-86.67	-11.86	-100.00	100.00	20.00	100.00	-66.67	100.00	-66.10	-52.54	70.00
10RP10	26.82	1.74	32.25	26.88	3.71	-66.67	-66.67	43.33	-93.33	93.33	13.33	93.33	-56.67	100.00	-20.00	-10.00	76.67
10RP11	44.07	3.51	35.76	44.21	4.56	-13.33	-30.00	63.33	-76.67	96.67	53.33	86.67	6.67	90.00	20.00	53.33	83.33
10RP12	62.97	7.46	41.36	63.41	6.76	86.67	26.67	80.00	40.00	90.00	86.67	56.67	93.33	70.00	93.33	96.67	90.00
N1	-0.04	-0.54	17.11	0.55	266.1	-89.83	-83.05	-35.59	-93.33	90.00	43.33	96.67	-56.67	100.00	-93.22	-72.88	81.36
N-2	0.11	-2.41	20.79	2.41	272.5	-93.33	-80.00	-45.76	-86.67	96.67	33.33	100.00	-66.67	100.00	-86.67	-72.88	53.33
N-4	0.27	0.13	40.42	0.3	25.3	-60.00	-23.33	-73.33	-85.44	53.33	-20.00	46.67	-93.33	62.71	-76.67	-93.33	-11.86
N-6	-0.65	-1.38	60.98	1.52	244.7	13.33	33.33	-83.05	-20.00	-10.00	-13.33	-20.00	-66.67	13.33	-53.33	-86.67	-36.67
N-8	-1.32	4.94	82.31	5.11	105	76.67	60.00	-66.10	66.67	-76.67	-30.00	-70.00	3.33	-46.67	-50.00	-68.33	-70.00
N95	-0.56	4.02	93.39	4.06	97.88	96.67	90.00	-59.32	86.67	-93.22	30.00	-93.33	49.15	-55.93	-56.67	-93.33	-26.67

สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

APPENDIX B

QUESTIONNAIRE IN THE VISUAL EXPERIMENT



สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

VITA

Miss Daungrat Ngampatipatpong was born on February 21, 1972 in Bangkok, Thailand. She received her B.Sc. degree in Science from the Faculty of Science, Chulalongkorn University in 1995, and she has been a graduate student in the Imaging Technology Program, Graduate school, Chulalongkorn University since 1997.



สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย