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## **APPENDICES**

## **Appendix A**

Test Form printed with offset printing

# Test Form

## การสร้างแบบจำลองค่ากระดํากระด้างของสิ่งพิมพ์ที่สัมพันธ์กับการรับรู้ของมนุษย์

โดย นายชำนาญ เจริญทรัพย์

นิสิตระดับบัณฑิตศึกษา สาขาเทคโนโลยีทางภาพ

ภาควิชาวิทยาศาสตร์ทางภาพถ่ายและเทคโนโลยีทางการพิมพ์

คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ค่าดัชนีนี้กระดํากระด้าง



ความส่องสว่าง (ลักซ์)	ระดับความยอมรับกระดํากระด้าง	
	ช่วงพิมพ์	ลูกคํา



**Appendix B**  
Results from Image Analyzer

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IMP (c) 1993, Pira International

MOTTLE ANALYSIS RESULTS

-----  
Test ID : 1 Date : 18/2/99  
Samples : 6 Fields : 5

Size units : mm  
Image size : 49.95 x 49.95  
Resolution : 0.11  
=====

SAMPLE	IMAGE	MEAN	SD	SP (/UNIT)
1	1	0.48	0.038	0.76
1	2	0.5	0.035	0.59
1	3	0.46	0.033	0.69
1	4	0.44	0.027	0.86
1	5	0.51	0.033	0.87
2	1	0.58	0.03	1.55
2	2	0.53	0.026	1.5
2	3	0.49	0.025	1.59
2	4	0.55	0.024	1.66
2	5	0.58	0.029	1.35
3	1	0.62	0.029	1.67
3	2	0.58	0.027	1.73
3	3	0.51	0.026	1.44
3	4	0.6	0.027	1.72
3	5	0.58	0.027	1.46
4	1	0.58	0.029	1.66
4	2	0.55	0.027	1.46
4	3	0.56	0.031	1.2
4	4	0.57	0.026	1.65
4	5	0.55	0.028	1.44
5	1	0.65	0.031	1.72
5	2	0.63	0.029	1.81
5	3	0.53	0.029	1.35
5	4	0.63	0.031	1.55
5	5	0.63	0.032	1.43
6	1	0.56	0.03	1.1
6	2	0.55	0.026	1.14
6	3	0.53	0.029	1.09
6	4	0.53	0.027	0.83
6	5	0.54	0.031	0.72

**Appendix B (continued)**

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IMP (c) 1993, Pira International

MOTTLE ANALYSIS RESULTS

-----

Test ID : 1    Date : 18/2/99  
 Samples : 6    Fields : 5

Size units : mm  
 Image size : 49.95 x 49.95  
 Resolution : 0.11

=====

SAMPLE	IMAGE	MEAN	SD	SP(/UNIT)
1	1	0.67	0.034	1.43
1	2	0.64	0.032	1.52
1	3	0.64	0.031	1.69
1	4	0.62	0.028	1.61
1	5	0.62	0.031	1.36
2	1	0.64	0.03	1.51
2	2	0.65	0.029	1.57
2	3	0.62	0.03	1.39
2	4	0.59	0.024	1.75
2	5	0.59	0.027	1.61
3	1	0.62	0.029	1.47
3	2	0.57	0.026	1.54
3	3	0.57	0.027	1.42
3	4	0.56	0.024	1.77
3	5	0.61	0.029	1.51
4	1	0.56	0.03	1.59
4	2	0.56	0.03	1.39
4	3	0.54	0.03	1.25
4	4	0.45	0.023	1.55
4	5	0.55	0.032	1.32
5	1	0.63	0.03	1.46
5	2	0.64	0.029	1.33
5	3	0.56	0.026	1.57
5	4	0.57	0.025	1.48
5	5	0.55	0.026	1.35
6	1	0.53	0.032	0.94
6	2	0.56	0.031	0.81
6	3	0.44	0.029	0.83
6	4	0.49	0.029	0.69
6	5	0.47	0.03	0.82

=====



**Appendix B (continued)**

=====  
 IMP (c) 1993, Pira International

MOTTLE ANALYSIS RESULTS

-----  
 Test ID : 1 Date : 18/2/99  
 Samples : 6 Fields : 5

Size units : mm  
 Image size : 49.95 x 49.95  
 Resolution : 0.11  
 =====

SAMPLE	IMAGE	MEAN	SD	SP (/UNIT)
1	1	0.47	0.037	0.72
1	2	0.43	0.029	0.94
1	3	0.38	0.03	0.79
1	4	0.48	0.03	0.83
1	5	0.43	0.031	1
2	1	0.58	0.028	0.93
2	2	0.55	0.026	1
2	3	0.49	0.027	1.05
2	4	0.53	0.026	1.09
2	5	0.5	0.026	1.18
3	1	0.58	0.031	1.52
3	2	0.52	0.027	1.68
3	3	0.52	0.027	1.5
3	4	0.53	0.026	1.48
3	5	0.53	0.029	1.34
4	1	0.59	0.031	1.44
4	2	0.58	0.028	1.54
4	3	0.56	0.027	1.61
4	4	0.53	0.024	1.5
4	5	0.56	0.029	1.44
5	1	0.61	0.028	1.59
5	2	0.52	0.028	1.22
5	3	0.52	0.029	1.33
5	4	0.56	0.027	1.46
5	5	0.55	0.028	1.39
6	1	0.6	0.042	1.55
6	2	0.58	0.041	1.66
6	3	0.58	0.05	1.59
6	4	0.5	0.038	1.85
6	5	0.53	0.035	1.5

**Appendix B (continued)**

=====  
 IMP (c) 1993, Pira International

MOTTLE ANALYSIS RESULTS

-----  
 Test ID : 1 Date : 18/2/99  
 Samples : 6 Fields : 5

Size units : mm  
 Image size : 49.95 x 49.95  
 Resolution : 0.11  
 =====

SAMPLE	IMAGE	MEAN	SD	SP (/UNIT)
1	1	0.51	0.034	0.97
1	2	0.47	0.03	1.09
1	3	0.5	0.032	1.13
1	4	0.51	0.03	1.01
1	5	0.49	0.033	0.97
2	1	0.57	0.028	1.07
2	2	0.51	0.027	1.13
2	3	0.53	0.028	0.92
2	4	0.51	0.023	1.3
2	5	0.54	0.027	1.13
3	1	0.47	0.036	0.96
3	2	0.48	0.033	0.96
3	3	0.41	0.032	0.85
3	4	0.42	0.029	0.85
3	5	0.46	0.035	0.83
4	1	0.57	0.034	1.21
4	2	0.53	0.029	1.38
4	3	0.49	0.028	1.19
4	4	0.6	0.029	1.47
4	5	0.53	0.03	1.32
5	1	0.57	0.031	1.16
5	2	0.56	0.029	1.02
5	3	0.55	0.03	0.98
5	4	0.52	0.029	0.72
5	5	0.54	0.033	0.75
6	1	0.46	0.034	0.99
6	2	0.46	0.035	0.82
6	3	0.35	0.03	0.65
6	4	0.48	0.034	0.66
6	5	0.44	0.036	0.81

**Appendix B (continued)**

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IMP (c) 1993, Pira International

MOTTLE ANALYSIS RESULTS

-----

Test ID : 1 Date : 18/2/99  
 Samples : 6 Fields : 5

Size units : mm  
 Image size : 49.95 x 49.95  
 Resolution : 0.11

=====

SAMPLE	IMAGE	MEAN	SD	SP(/UNIT)
1	1	0.49	0.033	0.96
1	2	0.49	0.034	0.79
1	3	0.37	0.029	0.75
1	4	0.42	0.029	0.69
1	5	0.48	0.035	0.76
2	1	0.47	0.035	0.95
2	2	0.45	0.033	0.88
2	3	0.36	0.028	0.92
2	4	0.4	0.026	0.91
2	5	0.36	0.027	1
3	1	0.46	0.036	0.92
3	2	0.48	0.035	0.78
3	3	0.37	0.031	0.69
3	4	0.41	0.025	1.06
3	5	0.43	0.032	0.86
4	1	0.46	0.036	1.01
4	2	0.43	0.033	0.65
4	3	0.42	0.032	0.85
4	4	0.4	0.028	0.79
4	5	0.44	0.035	0.82
5	1	0.45	0.036	0.95
5	2	0.43	0.035	0.75
5	3	0.36	0.031	0.7
5	4	0.47	0.035	0.97
5	5	0.48	0.038	0.74
6	1	0.45	0.036	0.93
6	2	0.42	0.033	0.79
6	3	0.43	0.035	0.68
6	4	0.47	0.034	0.73
6	5	0.48	0.041	0.76

**Appendix B (continued)**

=====  
 IMP (c) 1993, Pira International

MOTTLE ANALYSIS RESULTS

-----  
 Test ID : 1 Date : 18/2/99  
 Samples : 6 Fields : 5

Size units : mm  
 Image size : 49.95 x 49.95  
 Resolution : 0.11  
 =====

SAMPLE	IMAGE	MEAN	SD	SP(/UNIT)
1	1	0.61	0.031	1.53
1	2	0.61	0.028	1.68
1	3	0.61	0.028	1.7
1	4	0.59	0.026	1.94
1	5	0.58	0.028	1.42
2	1	0.57	0.031	1.42
2	2	0.51	0.028	1.48
2	3	0.54	0.032	1.38
2	4	0.5	0.026	1.42
2	5	0.57	0.032	1.27
3	1	0.63	0.032	1.52
3	2	0.63	0.029	1.57
3	3	0.64	0.031	1.59
3	4	0.58	0.027	1.58
3	5	0.56	0.028	1.18
4	1	0.56	0.033	1.43
4	2	0.56	0.031	1.35
4	3	0.52	0.031	1.49
4	4	0.57	0.029	1.43
4	5	0.59	0.035	1.02
5	1	0.56	0.026	1.33
5	2	0.47	0.026	0.99
5	3	0.57	0.032	0.88
5	4	0.56	0.027	1.05
5	5	0.48	0.027	0.92
6	1	0.45	0.035	0.89
6	2	0.42	0.032	0.94
6	3	0.47	0.036	0.88
6	4	0.37	0.023	1.11
6	5	0.43	0.032	0.87

**Appendix B (continued)**

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IMP (c) 1993, Pira International

MOTTLE ANALYSIS RESULTS

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Test ID : 1 Date : 18/2/99  
 Samples : 6 Fields : 5

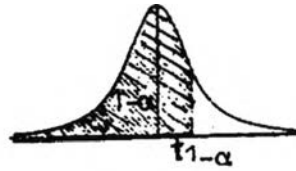
Size units : mm  
 Image size : 49.95 x 49.95  
 Resolution : 0.11

=====

SAMPLE	IMAGE	MEAN	SD	SP (/UNIT)
1	1	0.61	0.031	1.35
1	2	0.59	0.027	1.54
1	3	0.56	0.029	1.33
1	4	0.57	0.024	1.72
1	5	0.55	0.027	1.52
2	1	0.61	0.03	1.46
2	2	0.56	0.027	1.46
2	3	0.52	0.029	1.19
2	4	0.51	0.022	1.74
2	5	0.59	0.029	1.4
3	1	0.56	0.031	1.48
3	2	0.48	0.028	1.23
3	3	0.47	0.028	1.31
3	4	0.5	0.026	1.36
3	5	0.49	0.028	1.31
4	1	0.62	0.028	1.62
4	2	0.58	0.028	1.29
4	3	0.55	0.028	1.3
4	4	0.61	0.03	1.18
4	5	0.51	0.025	1.45

=====

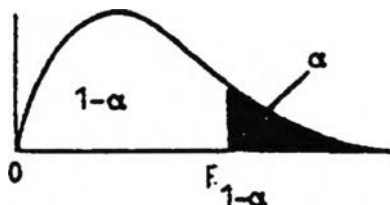
Appendix C  
t-table



ตัวเลขในตารางเป็นค่าของ  $t_{1-\alpha}$  ซึ่งทำให้  $P[T < t_{1-\alpha}] = 1 - \alpha$  ตามค่า  $\alpha$  ที่ระบุไว้

Degrees of Freedom	<i>t</i> .55	<i>t</i> .60	<i>t</i> .65	<i>t</i> .70	<i>t</i> .75	<i>t</i> .80	<i>t</i> .85	<i>t</i> .90	<i>t</i> .95	<i>t</i> .975	<i>t</i> .99	<i>t</i> .995	<i>t</i> .9995
1	.158	.325	.510	.727	1.00	1.38	1.96	3.08	6.31	12.7	31.8	63.7	637
2	.142	.289	.445	.617	.816	1.06	1.39	1.89	2.92	4.30	6.96	9.92	31.6
3	.137	.277	.424	.584	.765	.978	1.25	1.64	2.35	3.18	4.54	5.84	12.9
4	.134	.271	.414	.569	.741	.941	1.19	1.53	2.13	2.78	3.75	4.60	8.61
5	.132	.267	.408	.559	.727	.920	1.16	1.48	2.01	2.57	3.36	4.03	6.86
6	.131	.265	.404	.553	.718	.906	1.13	1.44	1.94	2.45	3.14	3.71	5.96
7	.130	.263	.402	.549	.711	.896	1.12	1.42	1.90	2.36	3.00	3.50	5.40
8	.130	.262	.399	.546	.706	.889	1.11	1.40	1.86	2.31	2.90	3.36	5.04
9	.129	.261	.398	.543	.703	.883	1.10	1.38	1.83	2.26	2.82	3.25	4.78
10	.129	.260	.397	.542	.700	.879	1.09	1.37	1.81	2.23	2.76	3.17	4.59
11	.129	.260	.396	.540	.697	.876	1.09	1.36	1.80	2.20	2.72	3.11	4.44
12	.128	.259	.395	.539	.695	.873	1.08	1.36	1.78	2.18	2.68	3.06	4.32
13	.128	.259	.394	.538	.694	.870	1.08	1.35	1.77	2.16	2.65	3.01	4.22
14	.128	.258	.393	.537	.692	.868	1.08	1.34	1.76	2.14	2.62	2.98	4.14
15	.128	.258	.393	.536	.691	.866	1.07	1.34	1.75	2.13	2.60	2.95	4.07
16	.128	.258	.392	.535	.690	.865	1.07	1.34	1.75	2.12	2.58	2.92	4.02
17	.128	.257	.392	.534	.689	.863	1.07	1.33	1.74	2.11	2.57	2.90	3.96
18	.127	.257	.392	.534	.688	.862	1.07	1.33	1.73	2.10	2.55	2.88	3.92
19	.127	.257	.391	.533	.688	.861	1.07	1.33	1.73	2.09	2.54	2.86	3.88
20	.127	.257	.391	.533	.687	.860	1.06	1.32	1.72	2.09	2.53	2.84	3.85
21	.127	.257	.391	.532	.686	.859	1.06	1.32	1.72	2.08	2.52	2.83	3.82
22	.127	.256	.390	.532	.686	.858	1.06	1.32	1.72	2.07	2.51	2.82	3.79
23	.127	.256	.390	.532	.685	.858	1.06	1.32	1.71	2.07	2.50	2.81	3.77
24	.127	.256	.390	.531	.685	.857	1.06	1.32	1.71	2.06	2.49	2.80	3.74
25	.127	.256	.390	.531	.684	.856	1.06	1.32	1.71	2.06	2.48	2.79	3.72
26	.127	.256	.390	.531	.684	.856	1.06	1.32	1.70	2.06	2.48	2.78	3.71
27	.127	.256	.389	.531	.684	.855	1.06	1.31	1.70	2.05	2.47	2.77	3.69
28	.127	.256	.389	.530	.683	.855	1.06	1.31	1.70	2.05	2.47	2.76	3.67
29	.127	.256	.389	.530	.683	.854	1.05	1.31	1.70	2.04	2.46	2.76	3.66
30	.127	.256	.389	.530	.683	.854	1.05	1.31	1.70	2.04	2.46	2.75	3.65
$\infty$	.126	.253	.385	.524	.674	.842	1.04	1.28	1.64	1.96	2.33	2.58	3.29

Appendix D  
F-table



$\alpha = .05$

$v_1 \backslash v_2$	1	2	3	4	5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96
$\infty$	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88

**Appendix D (Continued)**  
**t-table**

$\alpha = .05$

10	12	15	20	24	30	40	60	120	$\infty$	$v_1 \backslash v_2$
241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3	1
19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50	2
8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53	3
5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63	4
4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.37	5
4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67	6
3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23	7
3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93	8
3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71	9
2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54	10
2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40	11
2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30	12
2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21	13
2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13	14
2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07	15
2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01	16
2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96	17
2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92	18
2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88	19
2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84	20
2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81	21
2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78	22
2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76	23
2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73	24
2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71	25
2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69	26
2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67	27
2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65	28
2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64	29
2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62	30
2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51	40
1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39	60
1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25	120
1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00	$\infty$



## VITA

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