Analysis of the Visual Preference of Patterns in Pedestrian Roads

Kang, Eun Sung, Song, Hyeong Wook, and Kim, Hong Kyu

Abstract—The purpose of this study is to analyze the visual preference of patterns in pedestrian roads. In this study, animation was applied for the estimation of dynamic streetscape. Six patterns of pedestrian were selected in order to analyze the visual preference. The shapes are straight, s-curve, and zigzag. The ratio of building's height and road's width are 2:1 and 1:1. Twelve adjective pairs used in the field investigation were selected from adjectives which are used usually in the estimation of streetscape. They are interesting-boring, simple-complex, calm-noisy, open-enclosed, active-inactive, lightly-depressing, regular-irregular, unique-usual, rhythmic-not rhythmic, united-not united, stable-unstable, tidy-untidy.

Dynamic streetscape must be considered important in pedestrian shopping mall and park because it will be an attraction. So, s-curve pedestrian road, which is the most beautiful as a result of this study, should be designed in this area. Also, the ratio of building's height and road's width along pedestrian road should be reduced.

Keywords—Visual preference, streetscape, animation, simulation, pedestrian.

I. INTRODUCTION

THE purpose of this study is to analyze the visual preference of patterns in pedestrian roads. In this study, animation was applied for the estimation of dynamic streetscape.

In this study, the scope of the study was set up following. Six patterns of pedestrian were selected in order to analyze the visual preference. The shapes are straight, s-curve, and zigzag. The ratio of building's height and road's width are 2:1 and 1:1. Twelve adjective pairs used in the field investigation were selected from adjectives which are used usually in the estimation of streetscape. They are interesting-boring, simple-complex, calm-noisy, open-enclosed, active-inactive, lightly-depressing, regular-irregular, unique-usual, rhythmic-not rhythmic, united-not united, stable-unstable, tidy-untidy.

II. BUILD OF DATA AND BASIC STATISTICS

A. Build of Data

Type of pedestrian roads are stratight, s-curve, and zigzag. The ratio of building's height and road's width are 2:1 and 1:1.

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TABLE I Animation Number						
Animation's No	Shape of Pedestrian Roads	The Ratio of building's height and road's width				
#1	Straight	2:1				
#2	s-curve	2:1				
#3	zigzag	2:1				
#4	Straight	1:1				
#5	s-curve	1:1				
#6	zigzag	1:1				

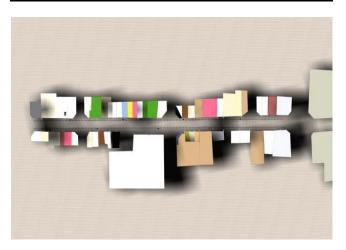


Fig. 2 (a) straight type's road

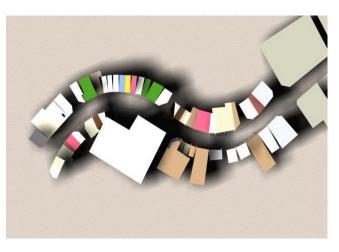


Fig. 2 (b) s-curve type's road

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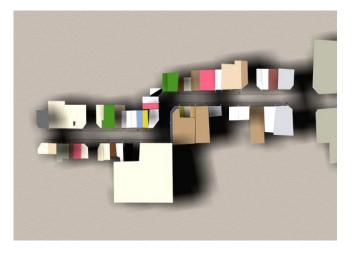


Fig. 2 (c) zigzag type's road



Fig. 2 (d) building's height and road's width(2:1)



Fig. 2 (e) building's height and road's width(1:1)

TABLE II
THOLOGICAL SENCE OF CHANGE ABOUT BUILDING HEIGHT AND WIDTH

PSYCHOLOGICAL SENCE OF CHANGE ABOUT BUILDING HEIGHT AND WIDTH					
Building's height(H) / Road's width(W)	Psychological sense of change				
$H/W \ge 1$	Psychological pressure occurs. Complete wound closure. For the height of the building cannot be recognized.				
$1/2 \leq H/W \leq 1$	You can feel the balance and stability. Vanishing Point and the distance can be recognized.				
H/W = 1/3	Emphasize the symbolism of the pedestrian roads. Can feel a sense of closure in the lowest rate.				
$H/W \le 1/4$ Recognize the sense of emptiness a exposure. Building as a boundary exists.					

B. Survey for the Evaluation of Landscape

Items asking the feel of a landscape are interesting-boring, simple-complex, calm-noisy, open-enclosed, active-inactive, lightly-depressing, regular-irregular, unique-usual, rhythmic-not rhythmic, united-not united, stable-unstable, tidy-untidy.

TABLE III
PSYCHOLOGICAL SENSE OF CHANGE ABOUT BUILDING HEIGHT AND WIDTH

Survey Object		Survey Paper numbers	Recovery Survey Paper
Student	Major	50	40
Student	Non-major	50	47
ordinary person		50	43
Total		150	130

III. BASIC STATISTICS ANALYSIS

TABLE IV

GENDER RATIO OF INTERVIEWEE							
		Man		Won	Total		
		Intervie wee (people)	wee Rate wee		Rate (%)	Interview ee (people)	
Stu-	Major	21	16.2	19	14.6	40	
dent	Non- major	30	23.1	17	13.1	47	
ordina	ry person	27	20.7	16	12.3	43	
Т	otal	78	60.0	52	40.0	130	

TABLE V

OCCUPATION RATIO OF INTERVIEWEE					
	interviewee(people) Rate(%)				
Student	Major	40	30.8		
Student	Non-major	47	36.2		
	Office Worker	21	16.1		
	Self-employed	12	9.2		
Ordinary	Professional	3	2.3		
Person	Official	2	1.5		
	Housewife	4	3.1		
	Unemployed	1	0.8		
Total		130	100.0		

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TABLE VI							
COMPARISON OF AVERAGE LANDSCAPE EVALUATION							
Animation No.	#1	#2	#3	#4	#5	#6	
Shape	Straig	s-curv	Zigza	Straig	s-curv	Zigza	
Height : Width	ht	e	g	ht	e	g	
	2:1	2:1	2:1	1:1	1:1	1:1	
Landscape Beautifulness	5.5	6.3	4.3	6.6	7.3	5.5	
interesting- boring	4.4	2.7	3.7	3.6	2.8	3.6	
simple-co mplex	3.1	4.5	4.2	2.9	4.3	4.1	
calm-noisy	3.0	4.0	3.6	2.8	3.5	4.0	
open-enclo sed	4.6	4.2	5.4	2.4	2.4	4.2	
active-inac tive	5.0	2.6	3.9	4.1	2.4	3.7	
lightly-dep ressing	4.4	2.9	4.6	3.3	2.4	4.3	
regular-irre gular	2.7	4.1	3.7	2.9	3.8	4.0	
unique-usu al	5.4	3.4	3.9	4.3	2.8	3.8	
rhythmic-n ot rhythmic	5.4	2.7	4.5	4.3	2.6	4.3	
united-not united	2.7	3.9	4.0	2.7	3.4	4.2	
stable-unst able	2.9	3.8	4.4	2.5	3.2	4.2	
tidy-untidy	3.0	3.7	4.1	2.3	3.2	4.2	

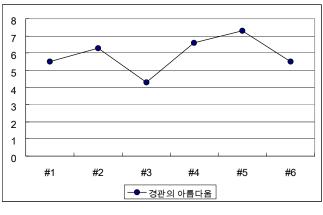


Fig. 3 (a) Comparison of Average Landscape Evaluation

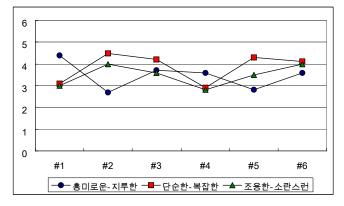


Fig. 3 (b) Comparing the Landscape Feelings of each Animation I (interesting-boring, simple-complex, calm-noisy)

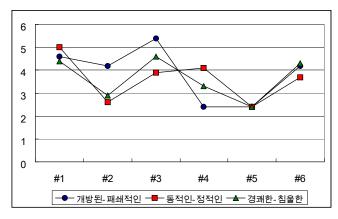


Fig. 3 (c) Comparing the Landscape Feelings of each Animation II (open-enclosed, active-inactive, lightly-depressing)

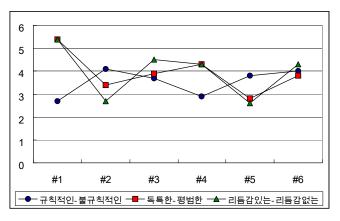


Fig. 3 (d) Comparing the Landscape Feelings of each Animation III (regular-irregular, unique-usual, rhythmic-not rhythmic)

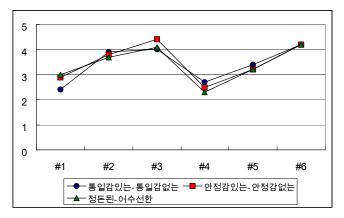


Fig. 3 (e) Comparing the Landscape Feelings of each Animation IV (united-not united, stable-unstable, tidy-untidy)

IV. LANDSCAPE PREFERENCE ANALYSIS

The SBE(Scenic Beauty Estimation) method uses standard value(Z-score) to correct differences of estimation from personnel distictions(Daniel & Boster, 1976). SBE is a equally-spaced values that can only compare relative values but cannot express absolute values of landscapes(S.B. Lim, Landscape analysis, 1996). The reliability and validity of the SBE method has been proved by several follow-up studies(Im,

1986). This study used the SBE method to estimate landscape beautifulness of each 6 animations.[1], [2].

	TABLE VII						
	SCENIC BEA	AUTY ESTIN	MATION VA	LUE OF EAC	'H ANIMAT	ION	
Animat ion No.	#1	#2	#3	#4	#5	#6	
Shape Height : Width	Straight 2:1	s-curv e 2:1	Zigzag 2:1	Straight 1:1	s-curv e 1:1	Zigzag 1:1	
SBE	71.65	111.94	0.00	128.45	156.67	71.60	

SOURCE Variance the degree of freedom Average variance F Beautifulness 699.19 5 139.83 51.19 Residual 2114.20 774 2.73 1 Total 2813.39 779 1 28.85 Residual 1456.83 774 1.88 1 Total 1728.43 779 1 34.34 Residual 1287.88 774 1.66 1 Total 1573.60 779 1 1 calm-noisy 162.02 5 32.40 18.51 Residual 1354.97 774 1.75 102.77 Total 1516.99 779 102.77 102.77 Residual 1470.12 774 1.78 102.77 Residual 1470.12 774 1.78 102.58 67.79 Residual 1378.89 774 1.78 102.58 67.79 Residual 1171.24 774 1	TABLE VIII Variance Analysis of Each Animation's Landscape Estimation						
Beautifulness 699.19 5 139.83 51.19 Residual 2114.20 774 2.73	SOURCE	Variance	-		F		
Total 2813.39 779	Beautifulness	699.19	5	139.83	51.19		
interesting-boring 271.59 5 54.31 28.85 Residual 1456.83 774 1.88	Residual	2114.20	774	2.73			
Residual 1456.83 774 1.88 Total 1728.43 779	Total	2813.39	779				
Total 1728.43 779 simple-complex 285.71 5 57.14 34.34 Residual 1287.88 774 1.66 Total 1573.60 779	interesting-boring	271.59	5	54.31	28.85		
simple-complex 285.71 5 57.14 34.34 Residual 1287.88 774 1.66 Total 1573.60 779	Residual	1456.83	774	1.88			
Residual 1287.88 774 1.66 Total 1573.60 779	Total	1728.43	779				
Total 1573.60 779 18.51 calm-noisy 162.02 5 32.40 18.51 Residual 1354.97 774 1.75 175 Total 1516.99 779 100 100.77 Residual 1470.12 774 1.89 102.77 active-inactive 634.77 5 126.95 71.26 Residual 1378.89 774 1.78 102.58 67.79 Ightly-depressing 512.93 5 102.58 67.79 174 Total 1684.17 779 1.78 25.36 183.70 774 1.78 Total 1684.17 779 1.78 25.36 89.46 1.72 <t< td=""><td>simple-complex</td><td>285.71</td><td>5</td><td>57.14</td><td>34.34</td></t<>	simple-complex	285.71	5	57.14	34.34		
calm-noisy 162.02 5 32.40 18.51 Residual 1354.97 774 1.75 1.75 Total 1516.99 779 1.75 open-enclosed 976.02 5 195.20 102.77 Residual 1470.12 774 1.89 1 Total 2446.14 779 1 1.78 active-inactive 634.77 5 126.95 71.26 Residual 1378.89 774 1.78 1.78 Total 2013.67 779 1 1.51 Total 1684.17 779 1 1.51 Total 1684.17 779 1 1.78 regular-irregular 226.73 5 45.34 25.36 Residual 1383.70 774 1.78 1 Total 1610.43 779 1 1 unique-usual 499.29 5 99.85 57.73 Residual 1386.02 <td>Residual</td> <td>1287.88</td> <td>774</td> <td>1.66</td> <td></td>	Residual	1287.88	774	1.66			
Residual 1354.97 774 1.75 Total 1516.99 779	Total	1573.60	779				
Total1516.99779102.77open-enclosed976.025195.20102.77Residual1470.127741.89102.77Total2446.147791.89102.77active-inactive 634.77 5126.9571.26Residual1378.897741.781.78Total2013.67779102.5867.79Residual1171.247741.51102.58Total1684.177791.51Total1684.177791.78regular-irregular226.73545.3425.36Residual1383.707741.78Total1610.43779100unique-usual499.29599.8557.73Residual1338.627741.72Total1837.92779160.2089.46Residual1386.027741.79Total2187.05779100united-not united270.871554.1732.50Residual1290.127741.66Total1560.99779100stable-unstable381.80576.3642.85Residual1379.137741.78Total1760.93779100tidy-untidy347.46569.4936.46Residual1474.927741.90	calm-noisy	162.02	5	32.40	18.51		
open-enclosed 976.02 5 195.20 102.77 Residual 1470.12 774 1.89	Residual	1354.97	774	1.75			
Residual 1470.12 774 1.89 Total 2446.14 779	Total	1516.99	779				
Total 2446.14 779 active-inactive 634.77 5 126.95 71.26 Residual 1378.89 774 1.78 1.78 Total 2013.67 779 1.79 1.78 Iightly-depressing 512.93 5 102.58 67.79 Residual 1171.24 774 1.51 1.51 Total 1684.17 779 1.78 1.78 regular-irregular 226.73 5 45.34 25.36 Residual 1383.70 774 1.78 1.78 Total 1610.43 779 1.72 1.73 unique-usual 499.29 5 99.85 57.73 Residual 1338.62 774 1.72 1.72 Total 1837.92 779 1.79 1.73 Residual 1386.02 774 1.79 1.79 Total 2187.05 779 1.66 1.79 United-not united <	open-enclosed	976.02	5	195.20	102.77		
active-inactive 634.77 5 126.95 71.26 Residual 1378.89 774 1.78 1.78 Total 2013.67 779 1.78 1.78 Iightly-depressing 512.93 5 102.58 67.79 Residual 1171.24 774 1.51 1.51 Total 1684.17 779 1.78 1.78 regular-irregular 226.73 5 45.34 25.36 Residual 1383.70 774 1.78 1.78 Total 1610.43 779 1.78 1.72 unique-usual 499.29 5 99.85 57.73 Residual 1338.62 774 1.72 1.72 Total 1837.92 779 1.60.20 89.46 Residual 1386.02 774 1.79 1.79 Total 2187.05 779 1.60 1.79 united-not united 270.871 5 54.17 32.50	Residual	1470.12	774	1.89			
Residual 1378.89 774 1.78 Total 2013.67 779 1 lightly-depressing 512.93 5 102.58 67.79 Residual 1171.24 774 1.51 1 Total 1684.17 779 1 1 regular-irregular 226.73 5 45.34 25.36 Residual 1383.70 774 1.78 1 Total 1610.43 779 1 1 unique-usual 499.29 5 99.85 57.73 Residual 1338.62 774 1.72 1 Total 1837.92 779 1 1 rhythmic-not rhythmic 801.02 5 160.20 89.46 Residual 1386.02 774 1.79<	Total	2446.14	779				
Total 2013.67 779 lightly-depressing 512.93 5 102.58 67.79 Residual 1171.24 774 1.51 102.58 67.79 Residual 1171.24 774 1.51 102.58 67.79 Residual 1184.17 779 1.51 102.58 67.79 regular-irregular 226.73 5 45.34 25.36 Residual 1383.70 774 1.78 170 Total 1610.43 779 1000 1000 1000 unique-usual 499.29 5 99.85 57.73 1.72 Total 1337.92 779 1.72 1.72 Total 1837.92 779 160.20 89.46 Residual 1386.02 774 1.79 1000 Total 2187.05 779 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 </td <td>active-inactive</td> <td>634.77</td> <td>5</td> <td>126.95</td> <td>71.26</td>	active-inactive	634.77	5	126.95	71.26		
lightly-depressing 512.93 5 102.58 67.79 Residual 1171.24 774 1.51 151 Total 1684.17 779 1.51 1684.17 179 regular-irregular 226.73 5 45.34 25.36 Residual 1383.70 774 1.78 178 Total 1610.43 779 1.78 172 unique-usual 499.29 5 99.85 57.73 Residual 1338.62 774 1.72 170 Total 1837.92 779 160.20 89.46 Residual 1386.02 774 1.79 179 Total 12187.05 779 160.20 89.46 Residual 1386.02 774 1.79 179 United-not united 270.871 5 54.17 32.50 Residual 1290.12 774 1.66 160.20 42.85 Total 1560.99 779	Residual	1378.89	774	1.78			
Residual 1171.24 774 1.51 Total 1684.17 779 1.51 regular-irregular 226.73 5 45.34 25.36 Residual 1383.70 774 1.78 1.78 Total 1610.43 779 1.78 1.72 unique-usual 499.29 5 99.85 57.73 Residual 1338.62 774 1.72 1.72 Total 1837.92 779 160.20 89.46 Residual 1386.02 774 1.79 1.79 Total 1837.92 779 1 1.79 Total 1386.02 774 1.79 1 Total 1386.02 774 1.79 1 Total 1287.05 779 1 1 united-not united 270.871 5 54.17 32.50 Residual 1290.12 774 1.66 1 Total 1560.99 779	Total	2013.67	779				
Total 1684.17 779 regular-irregular 226.73 5 45.34 25.36 Residual 1383.70 774 1.78 1.78 Total 1610.43 779 1.78 1.78 unique-usual 499.29 5 99.85 57.73 Residual 1338.62 774 1.72 1.72 Total 1837.92 779 1.79 1.72 Total 1386.02 774 1.79 1.79 Total 2187.05 779 1.79 1.79 United-not united 270.871 5 54.17 32.50 Residual 1290.12 774 1.66 1.70 Total 1560.99 779 1.66 1.71 Stable-unstable 381.80	lightly-depressing	512.93	5	102.58	67.79		
regular-irregular 226.73 5 45.34 25.36 Residual 1383.70 774 1.78 1.78 Total 1610.43 779 1.78 1.78 unique-usual 499.29 5 99.85 57.73 Residual 1338.62 774 1.72 1.72 Total 1837.92 779 1.72 Total 1837.92 779 1.72 Total 1837.92 779 1.72 Total 1837.92 779 1.79 rhythmic-not rhythmic 801.02 5 160.20 89.46 Residual 1386.02 774 1.79 1.79 Total 2187.05 779 1.79 1.79 united-not united 270.871 5 54.17 32.50 Residual 1290.12 774 1.66 1.7 Total 1560.99 779 1.25 1.25 Residual 1379.13 774 1.7	Residual	1171.24	774	1.51			
Residual 1383.70 774 1.78 Total 1610.43 779	Total	1684.17	779				
Total 1610.43 779 99.85 57.73 unique-usual 499.29 5 99.85 57.73 Residual 1338.62 774 1.72 Total 1837.92 779 1 rhythmic-not rhythmic 801.02 5 160.20 89.46 Residual 1386.02 774 1.79 1 Total 1386.02 774 1.79 1 Total 2187.05 779 1 1 united-not united 270.871 5 54.17 32.50 Residual 1290.12 774 1.66 1 Total 1560.99 779 1 1 stable-unstable 381.80 5 76.36 42.85 Residual 1379.13 774 1.78 1 Total 1760.93 779 1 1 tidy-untidy 347.46 5 69.49 36.46 Residual 1474.92 774 <td>regular-irregular</td> <td>226.73</td> <td>5</td> <td>45.34</td> <td>25.36</td>	regular-irregular	226.73	5	45.34	25.36		
unique-usual 499.29 5 99.85 57.73 Residual 1338.62 774 1.72 Total 1837.92 779 rhythmic-not rhythmic 801.02 5 160.20 89.46 Residual 1386.02 774 1.79 Total 2187.05 779 united-not united 270.871 5 54.17 32.50 Residual 1290.12 774 1.66 Total 1560.99 779 stable-unstable 381.80 5 76.36 42.85 Residual 1379.13 774 1.78 Total 1760.93 779 tidy-untidy 347.46 5 69.49 36.46 Residual 1474.92 774 1.90	Residual	1383.70	774	1.78			
Residual 1338.62 774 1.72 Total 1837.92 779 1 rhythmic-not rhythmic 801.02 5 160.20 89.46 Residual 1386.02 774 1.79 1.79 Total 2187.05 779 1.79 united-not united 270.871 5 54.17 32.50 Residual 1290.12 774 1.66 1.66 Total 1560.99 779 1.66 1.72 stable-unstable 381.80 5 76.36 42.85 Residual 1379.13 774 1.78 1.78 Total 1760.93 779 1.78 1.78 Total 1760.93 779 1.90 36.46 Residual 1474.92 774 1.90 1.90	Total	1610.43	779				
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rhythmic-not rhythmic 801.02 5 160.20 89.46 Residual 1386.02 774 1.79 1.79 Total 2187.05 779 1.79 united-not united 270.871 5 54.17 32.50 Residual 1290.12 774 1.66 1 Total 1560.99 779 1 1 stable-unstable 381.80 5 76.36 42.85 Residual 1379.13 774 1.78 1 Total 1760.93 779 1 1 Kesidual 1379.13 774 1.78 1 Total 1760.93 779 1 1 Kesidual 1474.92 774 1.90 1	Residual	1338.62	774	1.72			
rhythmic 801.02 5 160.20 89.46 Residual 1386.02 774 1.79 Total 2187.05 779 united-not united 270.871 5 54.17 32.50 Residual 1290.12 774 1.66 Total 1560.99 779 stable-unstable 381.80 5 76.36 42.85 Residual 1379.13 774 1.78 Total 1760.93 779 tidy-untidy 347.46 5 69.49 36.46 Residual 1474.92 774 1.90	Total	1837.92	779				
Total 2187.05 779 united-not united 270.871 5 54.17 32.50 Residual 1290.12 774 1.66 Total 1560.99 779 stable-unstable 381.80 5 76.36 42.85 Residual 1379.13 774 1.78 Total 1760.93 779 tidy-untidy 347.46 5 69.49 36.46 Residual 1474.92 774 1.90		801.02	5	160.20	89.46		
united-not united 270.871 5 54.17 32.50 Residual 1290.12 774 1.66 1.66 Total 1560.99 779 1.66 1.66 stable-unstable 381.80 5 76.36 42.85 Residual 1379.13 774 1.78 1.78 Total 1760.93 779 1.79 1.66 Eidy-untidy 347.46 5 69.49 36.46 Residual 1474.92 774 1.90 1.90	Residual	1386.02	774	1.79			
Residual 1290.12 774 1.66 Total 1560.99 779 stable-unstable 381.80 5 76.36 42.85 Residual 1379.13 774 1.78 Total 1760.93 779 tidy-untidy 347.46 5 69.49 36.46 Residual 1474.92 774 1.90	Total	2187.05	779				
Total 1560.99 779 stable-unstable 381.80 5 76.36 42.85 Residual 1379.13 774 1.78 Total 1760.93 779 tidy-untidy 347.46 5 69.49 36.46 Residual 1474.92 774 1.90	united-not united	270.871	5	54.17	32.50		
stable-unstable 381.80 5 76.36 42.85 Residual 1379.13 774 1.78 Total 1760.93 779 tidy-untidy 347.46 5 69.49 36.46 Residual 1474.92 774 1.90	Residual	1290.12	774	1.66			
Residual 1379.13 774 1.78 Total 1760.93 779 1 tidy-untidy 347.46 5 69.49 36.46 Residual 1474.92 774 1.90 1	Total	1560.99	779				
Total 1760.93 779 tidy-untidy 347.46 5 69.49 36.46 Residual 1474.92 774 1.90	stable-unstable	381.80	5	76.36	42.85		
tidy-untidy 347.46 5 69.49 36.46 Residual 1474.92 774 1.90 1	Residual	1379.13	774	1.78			
Residual 1474.92 774 1.90	Total	1760.93	779				
Residual 1474.92 774 1.90	tidy-untidy	347.46	5	69.49	36.46		
	Total	1822.38	779				

autifulness of each 6 animations.[1], [2].

V. CONCLUSION

The pedestrian road, which is s-curve and 1:1 ratio of building's height and road's width, is the most beautiful of the six patterns pedestrian road as a result of analysis with SBE(scenic beauty estimation) method. Twelve adjectives pairs were divided into two groups as a result of the factor analysis. One of them was called $\lceil tidy \rfloor$, and the other was called $\lceil rhythmic \rfloor$. The tidiest pedestrian road is of straight and 1:1 ratio of building's height and road's width. The most rhythmic pedestrian is of s-curve and 1:1 ratio of building's height and road's width. In regard of dynamic streetscape, \lceil rhythmic \rfloor is more important than $\lceil tidy \rfloor$.

Dynamic streetscape must be considered important in pedestrian shopping mall and park because it will be an attraction. So, s-curve pedestrian road, which is the most beautiful as a result of this study, should be designed in this area. Also, the ratio of building's height and road's width along pedestrian road should be reduced.

REFERENCES

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