

Relations between Scenic Desirability and Landscape Component of the Copse in the City Park

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ABSTRACT

Civic participation in managing the work of a park is a natural experience, and urban culture has a role in forming and communicating ideas. However, when it comes to managing a copse, there is no clear scenic image. In this study, my intention was to determine a desirable scene involving a copse and suggest a target image for managing work from a scenic perspective.

I selected 12 photographs and listed 10 pairs of adjectives that were judged to reflect the effect produced by the copse scene using the repertory grid development technique. In addition, I performed a scenic evaluation using the semantic differential(SD) method with each pair of adjectives. Factor analysis was performed based on questionnaire survey results, such that the scenic structure of the copse had a clear definition. In addition, the physical characteristics of the photographs were analyzed using Adobe Photoshop 6.0 and the correlations between the results of the questionnaire survey were understood using multiple regression analysis. A desirable scenic image of the copse became clear through this process and I was able to suggest various options of scenic images. Taking the aspects of urban culture into consideration, park improvement projects(including their planning stages) should be implemented by involving residents, which will lead to further development of park planning and maintenance theories and projects giving due consideration to residents' opinions.

Key Words: City Park, Copse, Scenic Image, Scenic Evaluations, Multiple Regression Analysis

I. Introduction

Although residents in cities and suburbs are actively involved in various activities of conserving landscape^{1,3)}, encouraging various organizations to promote conservation of greenery and open spaces is equally important. Park maintenance by different organizations contributes to providing a new form of park usage and establishing a local community by means of accumulation and transmission of human and material information⁴⁾. Meanwhile, there are a few cases where park improvement projects, including their planning stages, are implemented by involving residents, and in most cases, the latter participate only in park maintenance^{3,6)}. Furthermore, a possible problem lies in the lack of any clear vision of landscape on the part of residents. In this study, a

scenic evaluation of city parks was performed to develop a desirable scenic image of a copse within a park and subsequently propose the goal of park maintenance involving residents within the purview of scenic conservation.

II. Method

1. Selection of Target Sites and Subjects

To provide stimulating images, 300 photographs were taken in one national park and four city parks on clear days between September 1st and October 30, and 12 images were selected taking into consideration both luminance as well as whether there was a path in the wooded area. In addition, since the objective of this study was to determine a scenic

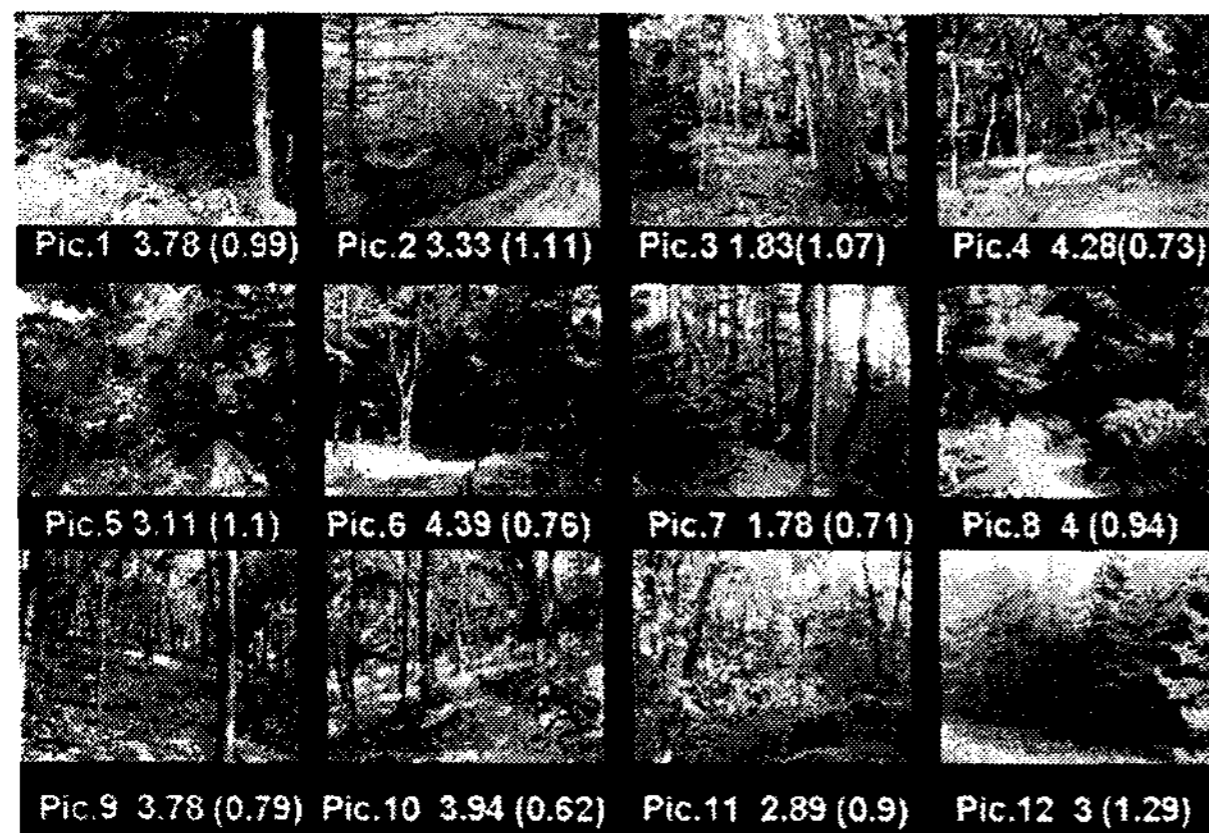


Figure 1. 12 target sites, Evaluation score by repertory grid development technique(Standard deviation)
(3072×2304 pixel each)

image for purposes of park maintenance, the selected photographs were of near and middle distance subjects. To determine the physical properties of the landscape components in the images, the luminance and the ratio of green stratification were calculated using Photoshop 6.0. Luminance is an indicator of how bright the surface will appear and is used in the video industry to characterize the brightness of displays. Luminance was decided using the weighted average of RGB values in Photoshop 6.0. The ratio of luminance and green stratification was examined across the entire image, including green upper(GU: tree) and green lower(GL: ground cover, shrub).

2. Scenic Evaluation by Repertory Grid Development Technique

Applying the repertory grid development technique to the 12 selected images of the copse, pairs of adjectives that were considered to be descriptive of the scene were determined. Kelly developed the repertory grid development technique within the field of clinical psychology during the first half of the 1950s; this is a method for drawing up a personal system using the interview form test^{2,8,9)}.

Participants were asked to compare the 12 stimulating images and to classify them into five groups according to preference. The number of stimuli in each group was determined arbitrarily²⁾. Participants were also asked to freely explain the criteria and reasons for their comparisons, evaluations, and judgments. Then, the laddering technique was employed together with the evaluation factors to establish

three evaluation structures: overall impressions, psychological values(ladder up), and physical properties(ladder down)^{2,8,10)}. A personal network diagram was drawn up by connecting these three structures using lines to show their correlation. Then, an overall network diagram was constructed by integrating the personal diagrams. The repertory grid development technique was used to compare multiple landscape photographs and evaluate them in words. The participants were 18 undergraduate and graduate students as well as professors from the Faculty of Agriculture, Meiji University, since these people were considered to have a deeper knowledge of greenery and open spaces.

3. Scenic Evaluations by SD Method and Magnitude Estimation Method

The SD and magnitude estimation methods were employed to explore the views of the public, and results were obtained via the website <http://research.ann-kate.jp>(number of subjects: 100). Using the 10 pairs of adjectives determined by the repertory grid development technique, a seven-scaled SD method was applied to establish what are agreeable landscapes within the wooded area of the park. Factor analysis was conducted based on the results of the SD method to classify and summarize the evaluating words with similar characteristics. A multiple regression analysis was conducted to demonstrate a correlation between the results of the psychological evaluation experiment using the SD method and the landscape components. Based on the results, the physical properties of the landscape components were changed using Photoshop 6.0 and evaluated using the magnitude estimation method. Consequently, I inspected how a change in the scene(luminance) affected the evaluation of the adjective pair.

III. Results

1. Grasp of the Landscape Component

The landscape components of the stimulating images were classified into three types—the entire image, GU and GL—and their physical properties were determined. The luminance(IRE: Institute of Radio Engineers) and the ratio of green stratification were calculated using Photoshop 6.0 as was the percentage of a path, if any, in an image.

Table 1. Luminance of Pictures

(IRE)	Entire			Green Upper			Green lower		
	Average	Standard Deviation	Middle Value	Average	Standard Deviation	Middle Value	Average	Standard Deviation	Middle Value
Pic1	116.22	71.45	95	89.63	59.02	69	158.68	69.02	161
Pic2	119.34	42.00	114	123.98	42.98	118	107.63	38.89	100
Pic3	119.24	46.94	112	121.81	50.22	112	112.98	37.02	113
Pic4	123.00	55.02	114	104.44	50.85	91	148.96	49.88	147
Pic5	118.01	56.76	107	120.39	60.52	106	115.44	52.28	108
Pic6	94.27	62.50	74	83.23	56.84	64	119.85	67.32	106
Pic7	111.27	58.98	96	137.40	66.08	123	82.63	30.61	78
Pic8	104.63	66.00	85	88.99	56.65	70	126.91	71.74	115
Pic9	120.93	53.93	111	115.87	56.11	103	126.70	50.71	119
Pic10	116.01	48.28	108	112.95	49.89	102	119.54	46.12	115
Pic11	128.89	54.89	115	156.04	58.64	144	105.01	37.69	100
Pic12	122.60	60.12	111	138.87	59.63	130	89.53	45.84	75

2. Desirable Image of the Copse

The results of the evaluation using the repertory grid development technique were summarized into an overall network diagram, and the 10 most frequently used pairs of adjectives were selected.

For the results of the evaluation using the SD method based on the selected pairs of adjectives, a factor analysis (varimax rotation) was conducted to establish the principal evaluation items that specify the scenic impression. As a result, the contribution rate of Factors 1-3 was 96.25% (Factor 1: 89.57%; Factor 2: 4.33%; Factor 3: 2.36%), whereas that of the other factors was considerably lower. Accordingly, Factors 1 - 3 were considered to be the evaluation items. Factor

1 had the highest factor loadings for 'bright', 'lively' and 'relief' and was termed the 'refreshing' axis. Factor 2 had the highest factor loadings for 'thick' and was termed the 'heavy' axis. Factor 3 had the highest factor loadings for 'maintained', 'feeling good' and 'stroll' and was termed the 'well-proportioned' axis. Then, the factor scores were calculated and the 12 images were arranged on a two-dimensional space.

Consequently, the evaluation was as follows: The copse in images 4 and 6 was refreshing, well proportioned, and not heavy; that in images 1 and 8 was badly proportioned and heavy, yet refreshing; that in images 3 and 7 was dark, thin, and badly proportioned. Images 9 and 10 were taken in the same park but the results were contrary.

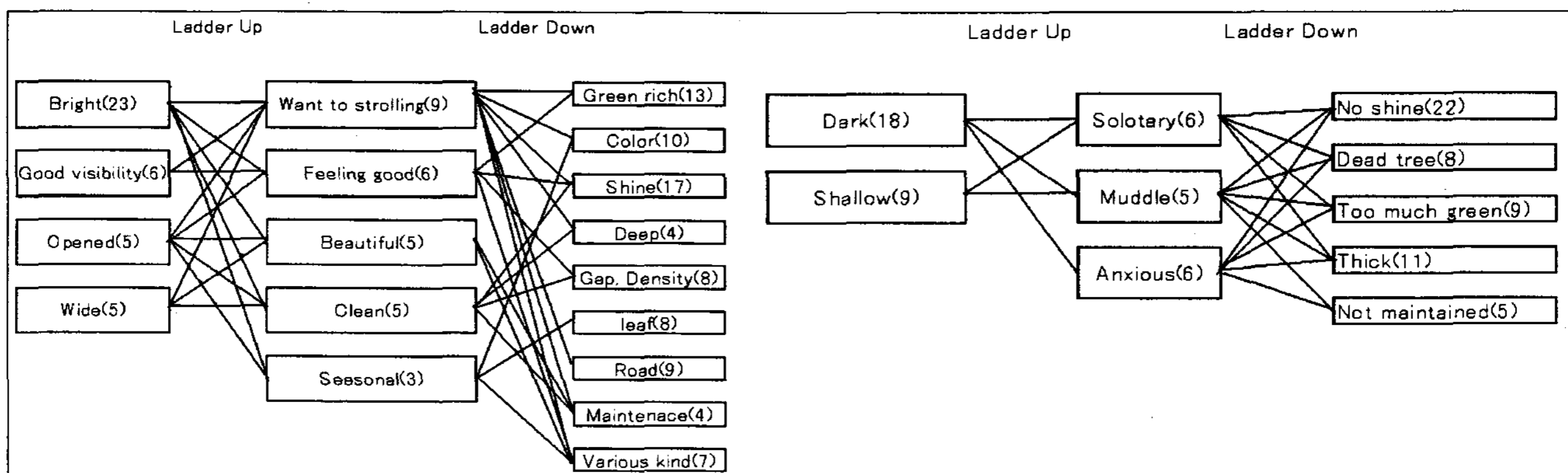


Figure 2. Network of Pleasant(left) and Not pleasant(right)

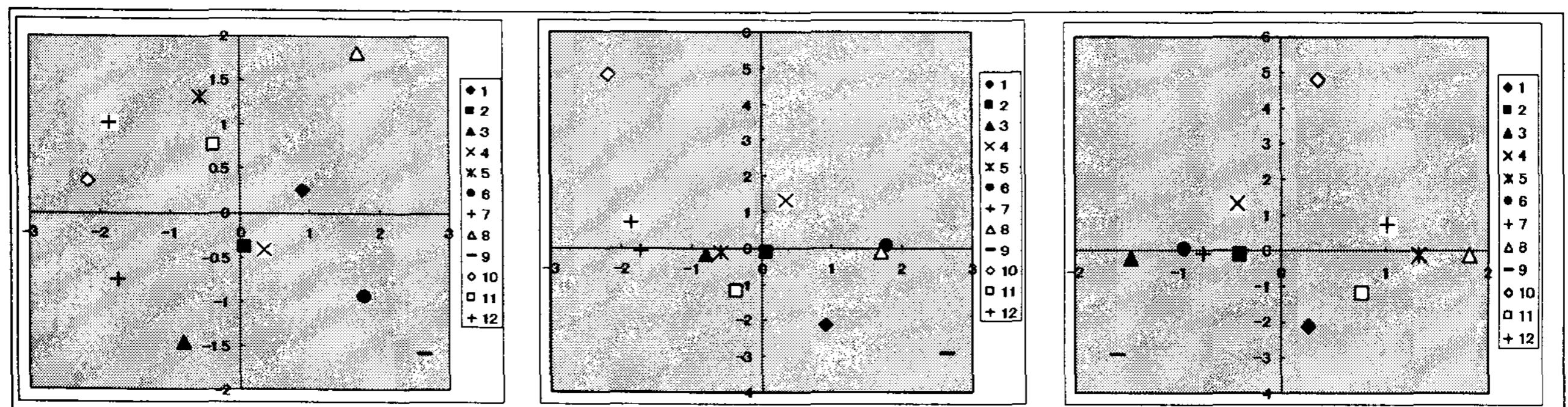


Figure 3. Scene arrangements on the factor axis(left:1, 2, middle: 2, 3, right: 1, 3)

Table 2. 10 Adjective pair

Bright	Dark
Good visibility	Bad visibility
Thick	Not thick
Relief	Anxious
Maintained	Not maintained
Feeling good	Feeling bad
Want to stroll	Don't want to stroll
Opened	Closed
Clean	Muddle
Lively	Solitary

Table 3. Factor load

Factor load After varimax rotation	Factor №1	Factor №2	Factor №3
Bright	0.815	-0.466	0.252
Good visibility	0.539	-0.694	0.454
Thick	-0.277	0.820	-0.299
Relief	0.721	-0.489	0.478
Maintained	0.408	-0.475	0.760
Feeling good	0.595	-0.484	0.632
Stroll	0.651	-0.447	0.605
Opened	0.593	-0.542	0.583
Clean	0.493	-0.637	0.581
Lively	0.796	-0.221	0.512

As a result of multiple regression analysis (purpose variable: average of the repertory grid development technique; explanatory variable: factor score), Factors 1 and 3 had a relevance at the 1% significance level. The results of the evaluation using the repertory grid development technique showed that the most suitable pair of adjectives for the copse scene is bright-dark. Since factor analysis of the questionnaire responses also indicated that 'bright' was closely related to Factor 1, a multiple regression analysis was conducted to determine the landscape components that constitute a 'bright' impression. The results of the analysis of the questionnaire responses using the SD method (average) were used as the objective variable, and the luminance (average) and the ratio

of green stratification were used as explanatory variables. As a result, there was no correlation between 'bright' on the one hand and luminance and the ratio of green stratification on the other, that is, there was no correlation between a 'bright' impression and high luminance in the image. Since there was a significant correlation of 5% in the constant term 'bright', this demonstrated that 'bright' is related to other factors. On the other hand, the four adjectives 'relief', 'maintained', 'feeling good', and 'stroll' had a significant correlation of 5% with GU (purpose variable: average of results of the SD method; explanatory variable: average luminance). It was therefore demonstrated that the higher the luminance of GU, the higher the evaluation of the above four adjectives.

Since there was a correlation between luminance and the above four pairs of adjectives, and no correlation between luminance and the ratio of green stratification, the effect of luminance change on the evaluation of the pairs of adjectives was examined using the magnitude estimation method. I decided to increase luminance (10%) to improve the evaluation of Factors 1 and 3, for which there was meaningful relevance in the multiple regression analysis. This means that brightness improves through managing works such as pruning by involving the local inhabitants. The images used for this evaluation were 6, 9 and 10. Images 9 and 10 were contrary to each other along Factor axes 1, 2 and 3; and image 6 was almost in the middle, between images 9 and 10. In addition to the SD method, an evaluation was also conducted via the website <http://research.ann-kate.jp> (number of subjects: 100). Consequently, images with greater luminance than the original ones were evaluated highly overall, yet the evaluation of 'heavy' was lower for these. For image 6 in particular, the higher the luminance, the higher the evaluation of 'bright' and 'good visibility'.

Table 4. Results of multiple regression coefficients

		R	R ²	P.R.C.	S-P.R.C.	F-value	T-value	P-value	Judgment
Bright	Constant term	0.7181	0.5156	55.96797		5.7419	2.3962	0.0434	*
Relief	G.U.	0.7433	0.5525	-0.7918	-1.7489	5.3738	2.3182	0.0491	*
Maintained	G.U.	0.4734	0.6881	-1.271	-2.0455	6.2475	2.4995	0.0370	*
Feeling good	G.U.	0.4805	0.6932	-0.8739	-1.9170	5.5629	2.3586	0.0461	*
Stroll	G.U.	0.5407	0.7353	-1.03273	-1.9166	6.2888	2.5078	0.0365	*



Figure 4. Original(upper), CG(lower)(3072×2304 pixel)

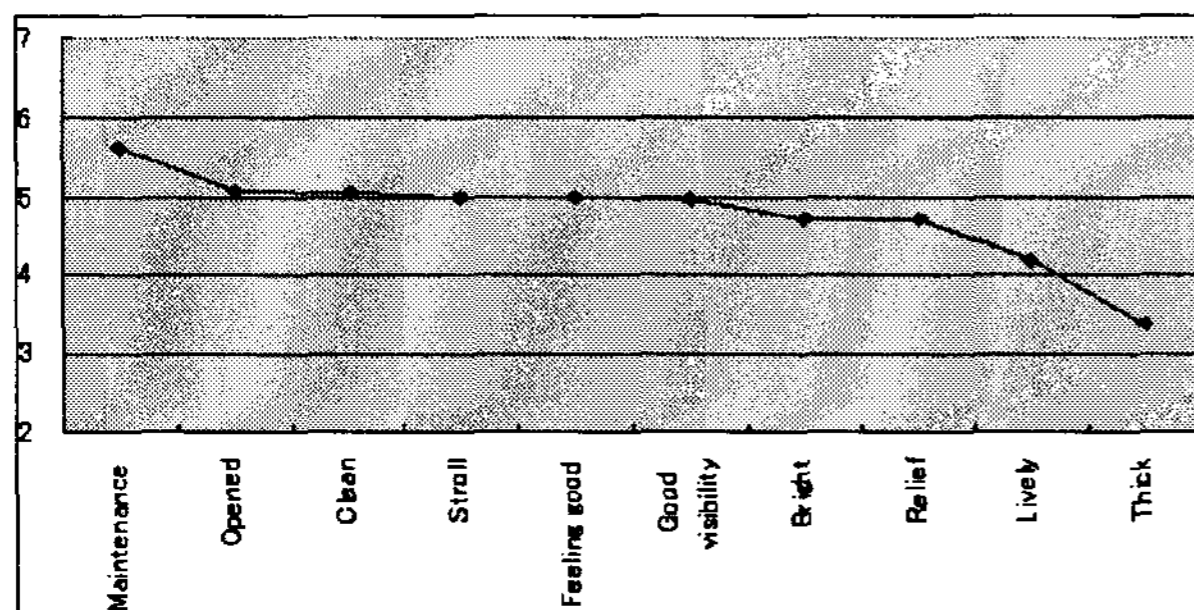


Figure 5. SD(Upper)

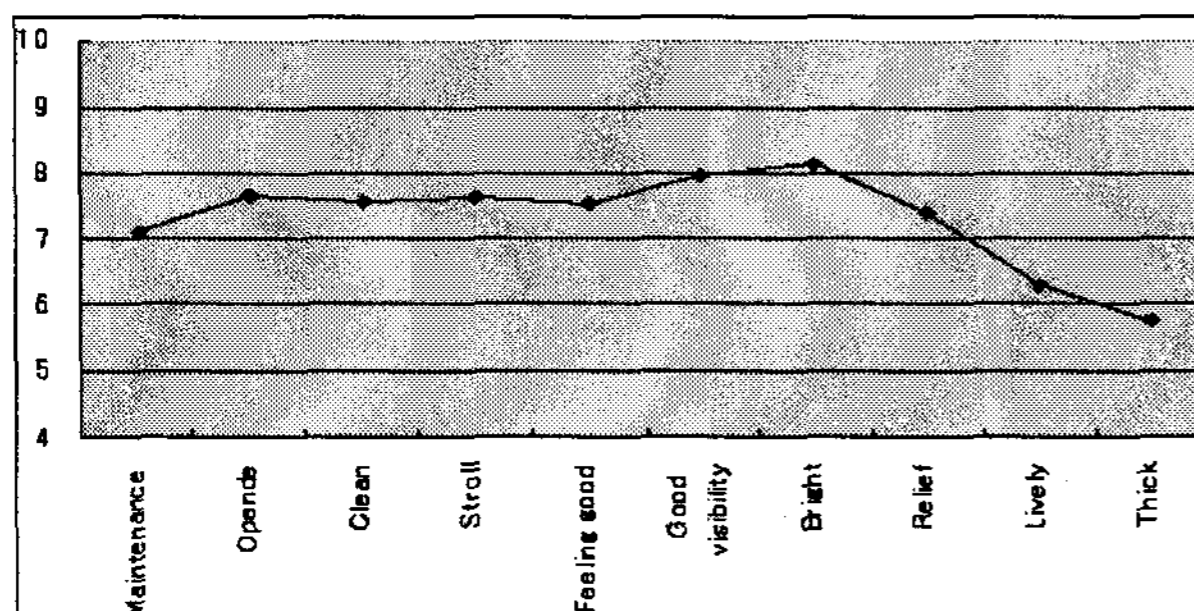


Figure 6. Magnitude(Lower)

IV. Discussions

The objectives of this study were to develop a desirable scenic image of a copse within a city park and to propose ideas about an ideal copse. The evaluation was conducted

using the repertory grid development technique, SD method, and magnitude estimation method, and the structure of the copse was determined using the laddering technique, factor analysis, and multiple regression analysis. From the psychological evaluation, many opinions were expressed concerning 'bright', and this affected scenic evaluation. However, as a result of the multiple regression analysis, the evaluation of 'bright' had no correlation with the physical characteristics of the image (luminance, ratio of green stratification, etc.), this was considered to be influenced by psychological factors such as atmosphere. Ideas concerning what city park the users need or prefer may vary from place to place and time to time. In addition to the 10 pairs of adjectives and the three factor axes, which are the outcomes of this study, the park users characteristics and behavioral patterns should be comprehensively analyzed in order to satisfy the various needs of the users in terms of appropriate park planning and maintenance. Typically, parks and their landscapes have been managed by park authorities. Taking the aspects of urban culture into consideration, park improvement projects (including their planning stages) should be implemented by involving residents, which will lead to further development of park planning and maintenance theories and projects giving due consideration to residents' opinions.

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