STUDY OF SENSE OF DEPTH IN THE VIEW OF ENTSU-JI TEMPLE GARDEN

Noritoshi Sugiura[1], Miyuki Ami[2]

[1] *Mukogawa Women's University, Japan*
[2] *Meiwa Pax Co., Ltd, Japan*

Keywords: Depth in the View, Entsu-ji Temple Garden, overlapping composition, garden scenery, elements of scenery

Introduction

This paper investigates the sense of depth in the traditional Japanese garden by focusing on Entsu-ji Temple, one of the most famous temples in Kyoto, Japan, which was built by Emperor Gomizunoo in the 17th century. The garden of Entsu-ji temple benefits from the view of Mt. Hiei (Fig. 1). To give a magnificent view of Mt. Hiei from inside the temple, various landscape techniques were applied there [1][2]. Overlapping composition is one of them. Depth of the garden is expressed by arranging the elements, which face the viewer, in parallel. Overlapping composition is a universal issue in the architectural field because it is seen in both Japanese traditional landscape drawings and spatial compositions in ASMT experiments [3]. As the first step in our analysis, we will model the scenery of Entsu-ji temple garden. Next, effects of the elements and composition of the scenery on sense of depth will be explored through some experiments.

Fig.1: View of the garden in Entsu-ji

Model of garden scenery in Entsu-ji temple

ELMENTS OF SCENERY

The typical view from Entsu-ji temple shown in Fig. 1 is composed of the following nine elements (Fig. 2): (1) Tatami floor, (2) Wooden verandah, (3) A row of columns, (4) Upper wall, (5) Moss-covered ground, (6) Hedge, (7) A row of trees, (8) Bamboo grove, (9) Mt. Hiei. Floor, verandah, column and upper wall are regarded as the elements that constitute the near view. The hedge, row of trees and bamboo grove are regarded as the elements that constitute the middle-distant view. Mt. Hiei is regarded as the sole element of the distant view. The ground is regarded as an element of both the

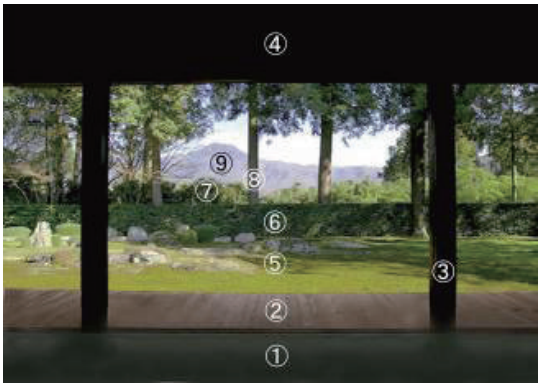


Fig. 2: Elements of the scenery

near and middle-distant view, which we call the near-middle view.

FORM OF ELEMENTS

We classified the elements into the following three types in terms of their form:
a) Vertical line: column and tree
b) Vertical plane facing the viewer: upper wall, hedge, bamboo grove and Mt. Hiei
c) Horizontal plane: floor, verandah and ground.

CHARACTERISTICS OF GARDEN SCENERY BASED ON THE MODEL

These elements are placed to overlap each other from the viewpoint to the distant side as “c (floor) – a (columns) and b (upper wall) – c (verandah) – c (ground) – b (hedge) – a (trees) – b (bamboo grove) – b (Mt. Hiei) (Fig. 3).” The view of the garden from Entsu-ji temple is composed of overlapping elements that have different direction, form and texture without monotonous repetition.

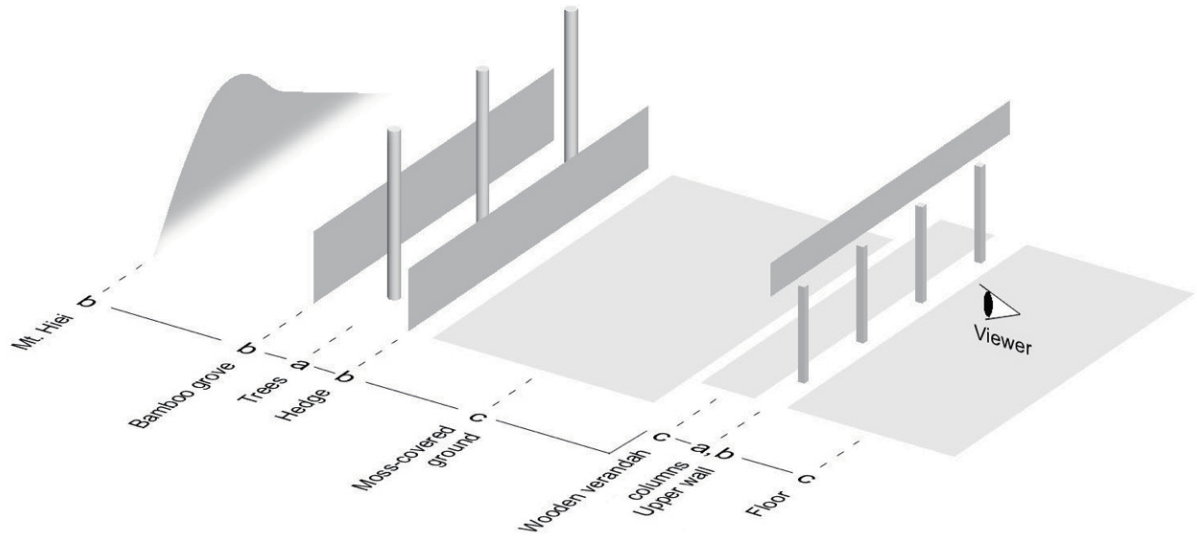


Fig. 3: Model of scenery of the Entsu-ji garden

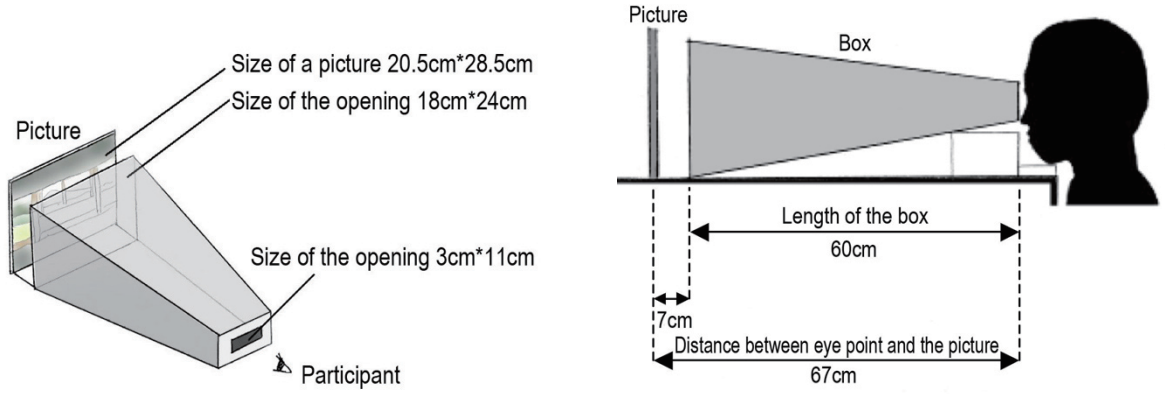
Experiments

PROCEDURE

To examine the influence of each element on sense of depth of the view, we conducted experiments as follows. The picture of the view of the garden shown in Fig. 1 is named the “original picture.” Fourteen pictures of the view were made by adding / deleting / transforming elements in the original picture. These pictures are called “retouched pictures.” Participants had no knowledge of Entsu-ji Temple. The original picture and a retouched picture were presented to each participant for five seconds each, and they judged which picture gave the greater sense of depth. They could also reply, “no difference.” These procedures were repeated 14 times for each participant with changing the retouched pictures. The number of participants was 37. They were chosen among university students who did not know the Entsu-ji garden so that advance knowledge did not influence the sense of depth that they felt.

EXPERIMENTAL DEVICE AND ENVIRONMENT

A participant looked at a picture through the box shown in Fig. 4 (a). The box was fixed on a stand, on which participants put their chins (Fig. 4 (b)). The inside of the box was painted black. Every experiment was conducted in the same room with the same lighting.



(a) (b)

Fig. 4: Experimental device and environment

RETOUCHED PICTURES

Figure 5 shows the retouched pictures used in the experiments. Differences between the original picture and the retouched pictures are as follows.

[1] Deleted elements

A) Deleted element for near view
A-1) Verandah, A-2) Row of columns, A-3) Verandah and row of columns

B) Deleted element for middle-distant view
B-1) Hedge, B-2) Bamboo grove, B-3) Row of cedar

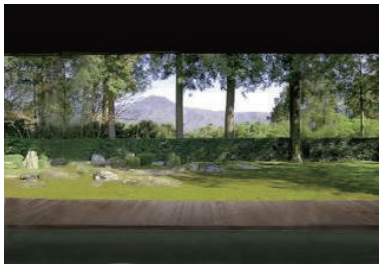
[2] Adding or transforming elements

C) Adding or transforming elements for near view
C-1) Adding fittings, C-2) Increasing depth of verandah, C-3) Shortening space between columns, C-4) Extending upper wall

D) Adding or transforming elements for middle view
D-1) Extending space between trees, D-2) Extending hedge

E) Adding elements for near-middle view
E-1) Adding trees on the ground, E-2) Adding shrubbery on the ground

A-1) Deleted verandah



A-2) Deleted row of columns

A-3) Deleted verandah and row of columns

B-1) Deleted hedge

B-2) Deleted bamboo grove

B-3) Deleted row of cedar

C-1) Added fitting

C-2) Increased depth of verandah

C-3) Shortened space between columns

C-4) Extended upper wall

D-1) Extended space between trees

D-2) Extended hedge

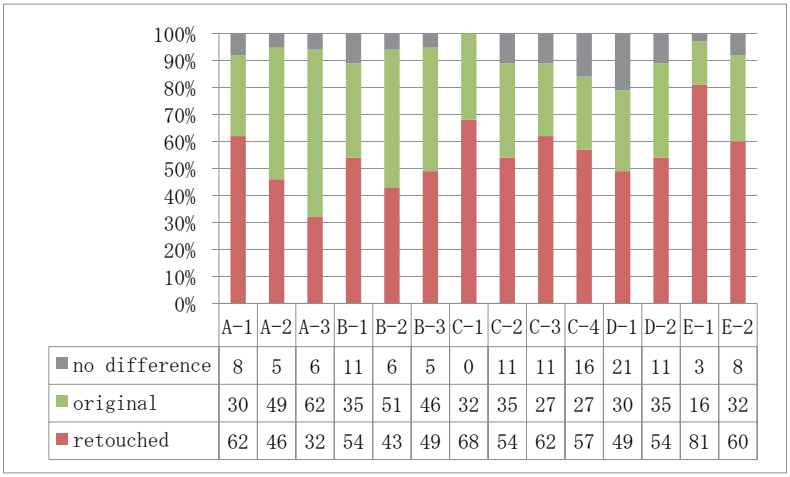
E-1) Added trees on ground

E-2) Added shrubbery on ground

Fig. 5: Retouched pictures used in experiments

Results of experiments

Figure 6 summarizes the results of the experiments. Percentages of the number of participants who made each choice out of the total number of participants are shown. Significant differences between numbers of participants who selected the original picture and those who selected a retouched picture were seen in the cases of A-1, A-3, C-1, C-3, C-4, E-1 and E-2 by t-test (significance level 5%). Retouched pictures A-1, C-1, C-3, C-4, E-1 and E-2 were rated higher for the sense of depth than the original picture. On the contrary, A-3 was rated lower than the original picture. In this paper, we focus on these cases.



	A-1	A-2	A-3	B-1	B-2	B-3	C-1	C-2	C-3	C-4	D-1	D-2	E-1	E-2
no difference	8	5	6	11	6	5	0	11	11	16	21	11	3	8
original	30	49	62	35	51	46	32	35	27	27	30	35	16	32
retouched	62	46	32	54	43	49	68	54	62	57	49	54	81	60

Fig. 6: Results of experiments (Figures are the percentages of the number of participants who made each choice out of the total number of participants.)

Discussion about factors that affect sense of depth

(1) Elements of near view

Five of the seven retouched pictures that have significant differences from the original picture, A-1, A-3, C-1, C-3 and C-4, had changed elements of the near view. Two of the seven retouched pictures, E-1 and E-2, had changed elements of the near-middle view. It is inferred that the composition of elements located near the viewer has a great influence on the sense of depth of the view.

(2) Vertical planes in the foreground that occlude viewer's eye

Both retouched pictures C-1 and C-4 have added or expanded vertical planes in the foreground. It is quite likely that screening the view directs the viewer's attention into the distance. All fittings that partition the indoors and the garden are removed there. If fittings are set as their former state and we see the garden through the open fittings, the sense of depth will be emphasized.

(3) Vertical line or plane in the near-middle area that constitute overlapping composition

On retouched pictures E-1 and E-2, a row of a vertical line and a vertical plane facing the viewer were added as elements of the near-middle view. It is considered that the increase of overlapping elements in the near-middle view intensified the sense of depth.

(4) Amount of information of the near view

Because of deletion of the wooden verandah and the row of columns in the foreground, the sense of depth of retouched picture A-3 was weakened. Conversely, it is inferred that the viewer can be more conscious of the space where she is as the number of elements of the near view are increased; in other words, as the information of the near view is increased. Therefore, the contrast between near and far becomes clear. As a result, the sense of depth will be emphasized. The same explanation can be applied to retouched picture C-1. This technique to direct the viewer's attention into the distance is also used in Japanese landscape drawings by Hiroshige Ando (Fig. 7). Retouched picture A-1, in which the verandah was deleted, was rated higher than the original picture. This result is contrary to the above, and we could not understand the reason.

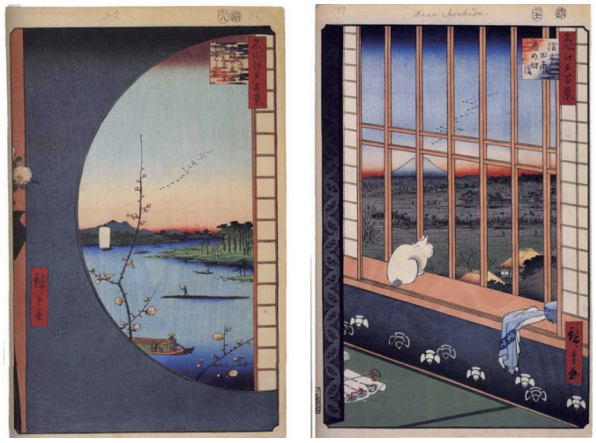


Fig. 7: Landscape drawings by Hiroshige Ando [4]

(5) Frame in the near view

In the original picture, two columns and the edge of the upper wall and verandah constitute a frame that includes Mt. Hiei. Retouched picture C-3, in which the space between the columns was shortened, was rated higher than the original picture. This change can be interpreted as the decrease in the width of the frame. It is considered that the sense of depth is intensified as the frame is narrowed down.

Conclusion

This paper addressed the relationship between the spatial composition of the scenery of a typical Japanese garden as seen at Entsu-ji Temple and the sense of depth that the viewer feels. In the experiments, 37 participants compared the original and retouched pictures of the view of the garden and selected one from which they felt a greater sense of depth. From the results, the following five factors affect the sense of depth: (1) Elements of the near view, (2) Vertical planes in the foreground that occlude the viewer's eye, (3) Vertical line or plane in the near-middle area that constitute overlapping composition, (4) Amount of information of the near view and (5) Frame in the near view. There are still many questions regarding the differences between the sense of depth on / in 2-D picture and 3-D space, the relationships between elements of scenery, and so on, which merit further research.

References

[1] Higuchi, T. The visual and the spatial structure of landscapes. The MIT Press, 1988

[2] Kitamura Y. The Garden of Entsu-ji Temple. Bulletin of Fukuyama University, vol. 7, pp. 131-134, 1985 (In Japanese)

[3] Noritoshi, S. & Shigeyuki, O. Relationship between Rules of Spatial Composition Process using Architectural Space Montage Technique and Typical Expressions of Japanese Architecture and Landscape. Archi-Cultural Translations Through the Silk Road, pp. 87-97, Bahcesehir University Press, 2011

[4] Asano, H. *Hiroshige Meisyo Edo Hyakkei*. shogakukan, pp. 45 & 115, 2007. (In Japanese)