

Two-Step Experiment of Perception to Household Gardens

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1. Introduction

The interest for gardening and flowering is expanding. It is a growing matter of concern to examine the common aspects and diversified aspects of perception to the gardens among different age classes or different cultures, and to characterize the distribution. In this paper, we propose with real data an experimental design and statistical procedure to examine the common aspects and diversified aspects of perception to the household gardens. It could offer a new tool of cross-cultural study, because the household gardens are expected to reflect the residents' daily life and characters. The possible application of the methodology is not limited to the study of gardens.

Our experiment is a two-step procedure. First, the subjects are asked to classify the pictures of randomly sampled households gardens, based on the similarity. Second, a week later, they answer to the questionnaire for each of the pictures. The items ask various aspects of the gardens such as the components, patterns, and sizes etc, and the preference for the gardens. The two experiments are assumed to be independent. The clustering based on the first impression is compared with the post-classification based on the answers to the evaluation.

There are accumulated works studying perception to landscapes. Zube (1981) studied cultural difference in preference for landscape, and Kaplan et al. (1987) analyzed racial difference in preference for city parks based on the ranks of pictures reported by the subjects. Kojima et al (1999) applied principal component analysis to the data of perception to urban landscapes, extracting keywords in the free answers of the subjects. Our work has an advantage to compare the first impression and evaluation based on the questionnaire. It is possible to examine the consistency between the first impression and questionnaire-based evaluation. Comparative analysis of people in different cultures will give us useful information on the commonality and difference in their perception.

2. Weighting and Rotation for Comparison of Multiple outputs

The data from the first experiment comprises a similarity matrix of the gardens. Each element of the similarity matrix is 0 or 1. If the i th and the j th pictures belong to the same group, the ij element is 1. Summing up the similarity matrices of the subjects, we get the similarity matrix as a whole. We drew the plots of the pictures by multi-dimensional scaling based on the similarity matrix (Hayashi 1952). This similarity matrix puts heavy weights on the large groups. When there are the small groups, the resultant figures are accompanied with outliers. The structure in the larger groups is more clearly observed by inflation of the variance of their components. For this purpose, we introduced the new weights on the pairs of the pictures taking account of group size. We assumed the pair of the pictures that belongs to relatively small group has the strong relation. Thus, each element of the modified similarity matrix of a subject is the probability that the pair of the pictures is selected from the group. In addition, we carried out the compensation between the subjects by making the total of the elements of the altered similarity matrices of the subjects equal. Summing up the altered similarity matrices of the subjects, the altered similarity matrix as a whole was also analyzed by multi-dimensional scaling and the plots of the pictures were obtained.

The data from the second experiment was analyzed by correspondence analysis (Hayashi 1956; Benzécri). The plot of the gardens is compared with the result from the first experiment. Outputs of multi-dimensional scaling (or correspondence analysis) are difficult to compare directly, because they have degree of freedom on rotation of axes when some of the eigen values take similar values. This is also a barrier when we compare the results between two different cultural groups (Japanese and English in this paper). To extract the commonality and difference between the multiple outputs directly, we propose a procedure that calculates the optimal orthogonal matrix by regressing factor loadings of one output on those of the other.

3. Result

In the result of multi-dimensional scaling applied to the original similarity matrix from the first experiment, because of the outliers of the large classical and Japanese style gardens, the rest are found in the periphery region.

The result from the weighted similarity matrix (Figure 1) is consistent with the correspondence analysis applied to the second experiment (Figure 2). In addition, when removing the outliers in the original similarity matrix from the first experiment, the result of multi-dimensional scaling is consistent with the result from the second experiment. Their distributions are mostly characterized with two aspects: axis of Japanese style vs. Western style and that of “tidy” vs. “messy”.

From comparative study between Japanese gardens and English gardens (subjects are Japanese), we detected the ability of the subjects to distinguish Japanese “Western style” or “English style” garden and actual English gardens. English gardens gave the subjects much different impression from Japanese “English style” gardens. That is to say, English gardens were characterized by their lawn and wide size, while Japanese “English style” gardens are characterized with the flowering herb.

It was also found from the international comparative study that the impression for the pictures of Japanese gardens is almost alike between Japanese and English. Especially, the responses to the items about “Western style”, “Japanese style”, and “flower” were similar between the two countries. On the other hand, some differences were found in the response to the items about “natural” and “man-made”. And although the perceptions to the pictures of the “familiar” gardens are almost alike, the perceptions to the “unfamiliar” gardens are completely different.

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RÉSUMÉ

Nous proposons une expérience en deux étapes pour l'étude comparative de la perception aux jardins de ménage: classification basée sur la premières impression et poteau-classification basées sur les réponses aux articles d'évaluation. Peser de la matrice de similitude et de la rotation des haches ont été développés pour rendre les sorties multiples comparables.

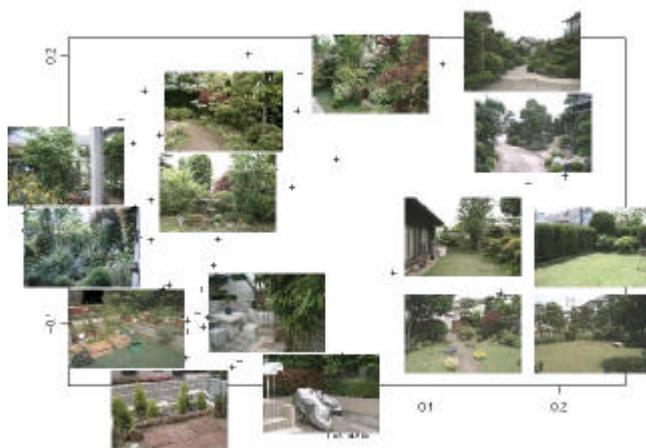


Figure 1 MDS applied to the weighted similarity matrix from the first experiment

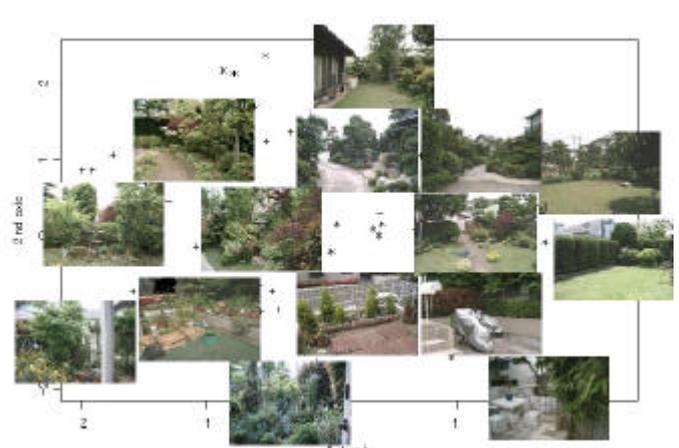


Figure 2 Correspondence analysis applied to the data from the second experiment