The Effectiveness of design guideline regulations for improving streetscape

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Abstract

Municipal governments or developers make design guidelines to create a harmonious streetscape in a new town. The regulations, however, have often decided arbitrarily without any empirical research. The present study employed a visual simulation system to test the effects of such physical features of the buildings as color, height, flatness of the building façade and its recess from the street on pedestrians' impressions of the place. Thirty subjects were asked to rate their impressions of "order", "simple", and to evaluate the atmosphere after experienced the simulated scenes. The results revealed some relations between the physical features and the pedestrians' response.

Key-words

streetscape, pedestrian, simulation, perception, design guideline

1. Introduction

In recent years, many municipal governments in Japan have developed various design guidelines to regulate the physical features of buildings in order to maintain and/or create the aesthetic qualities of streetscape. There are two types of design guideline: one is called "preservation type" which aims to preserve existing historical and cultural landscapes, and the other is called "development type" which aims to create a harmonious streetscape in a newly developed town. The latter type of guideline has been developed by several municipal governments and developers prior to start large projects. They employed many architects and assigned each of them to design buildings in each block. By doing this, they attempted to give some different characteristics for each block. At the same time, they tried to maintain a harmonious streetscape by regulating such physical features of the building façade as color and height within a certain range. These regulations were, however, not decided based on any scientific and empirical researches.

The present study, therefore, examines how those design regulations can affect pedestrians' evaluation of the streetscape. A visual simulation system was employed to test how such physical features of the buildings as color and height effect the pedestrians' impressions of the street.

2. Experiment

2-1. Psychological scales and the controlled physical features

Based on a survey of existing design guidelines, items of subjects' response in the experiment were decided: "order vs. disorder", "simple vs. diverse", and "good atmosphere vs. bad atmosphere".

As for the physical features controlled in the experiment, the following aspects of building along the street were selected because they were often specified in the existing guidelines: 1) color, 2) height, 3) dimension of recess from the street, and 4) flatness of the façade.

2-2. Generation of the image of simulated streets

A scale model street that consists of seven blocks, each block has 34m in length, was created with the reference of Makuhari Bay Town near Tokyo, which was built under a design guideline (see Figure 1-a). In the experiment, a subject observed a sequence of scenes recorded by CCD camera moving through the model space. The visual angles of the camera were 112deg (horizontal) and 88 deg (vertical). With this movie, CG generated animations of pedestrians, cars and trees were overlaid on the scenes of scale-model street (see Figure 2).

2-3. Variation of the stimuli

The physical features of the buildings along the street were systematically changed as shown in Figure 3. A building that has a medium range of variation was defined as a "standard type" building: blown color, smooth surface façade, recessed 2m from the street, five story high. Other types of building were created by changing one of the four variables. Using these buildings, seven types of street were made as shown in Figure 4. A street that has some variations in building types was defined as "standard type" street (ST). A street in which all buildings are standard type building was defined as "monotonous type" street (MT). Each of the following four types of street was made by fixing one of the four features of the buildings: "color controlled" (CC), "recess controlled" (RC), "height controlled" (HC) and "flatness controlled (FC)" streets. In addition to these, a street in which neighboring buildings were quite different in physical features with each other had defined as "varied type" street (VT).

2-4 Procedures

Each of 30 subjects viewed a series of movies of the virtual street scenes projected on a wide screen (2040mm x 1500mm) (see Figure 5). After moving 140m in the model space with walking speed, the subject rated the impression of each street using the bi-polar adjective pair scales such as "order vs. disorder". Seven different types made by combination of buildings along the street and three different situations made by adding CG trees and CG movable elements as pedestrians and cars, totally 21 different virtual street scenes were rated by the subjects.

3. Results and discussions

3-1. Impressions of "order vs. disorder" and "simple vs. diverse"

As shown in Figure 6, it is clear that "monotonous type" street (MT) was rated as most ordered and "varied type" street (VT) was rated as most disorder in every

situation. However, the ratings by the scale of “simple vs. diverse” were different according to the situations as shown in Figure 7. Compared with the street scenes composed only with the buildings, the street scenes with people and cars were rated as more diverse, and the street scenes with trees were rated even more diverse. It was also noticed that the “varied type” street with trees was rated as same as the “standard street”. This indicates that trees in the street soften the impact of the streetscape caused by both too monotonous and too varied building design.

3-1. Evaluation of the controlled streetscape

Regarding those controlled streets, the following results were obtained in the situations without trees (see Figure 8 and Figure 9).

(1) The “color controlled” street (CC) was rated as simpler than the “standard type” street, but it was evaluated significantly lower on the scale of atmosphere preference.
(2) The “recess controlled” street (RC) was unexpectedly rated as more varied than the “standard type” street (ST). The reason for this result may be because other variables’ variations became more standout by aligning the buildings.
(3) The “height controlled” streets (HC) was rated almost same as the “standard type” street (ST). The range of variation of the height, from 14m to 21m, may not enough to evoke visual impact to the observer viewed from eye-level on the street.
(4) The “flatness’ controlled” streets (FC) were rated almost same as the “standard type” street (ST). The differences of configuration of the façade surface may not be noticed by the passenger who is walking by the building.

4. Conclusion

As an initial attempt to examine the design guideline for the streetscape, a simulation system was applied to test effectiveness of the control over the building features along the street. The results indicated that the impacts from the building design and their layout differ according to the existence of such movable elements as cars and pedestrians as well as trees in the street. It was also suggested that the impression of the streetscape is not independently affected by each component of building design but by combination of them. This implies that the regulation of building elements that arbitrary selected has no value as a design guideline.

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(a) Makuhari Bay Town (b) Seaside Momochi (c) Imai New Town

Figure 1　Some examples of projects developed under the design guidelines

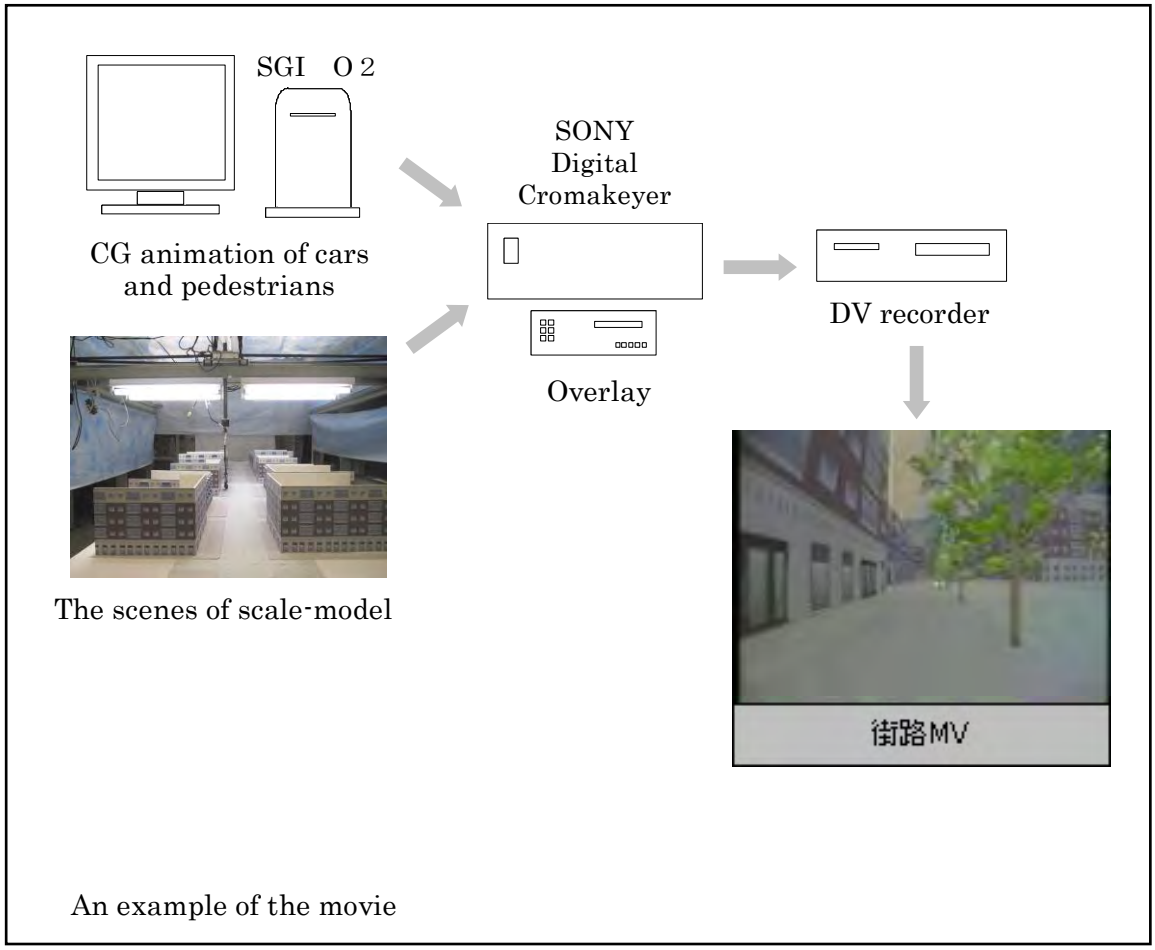

Figure 2　Generation of the image of the simulated street

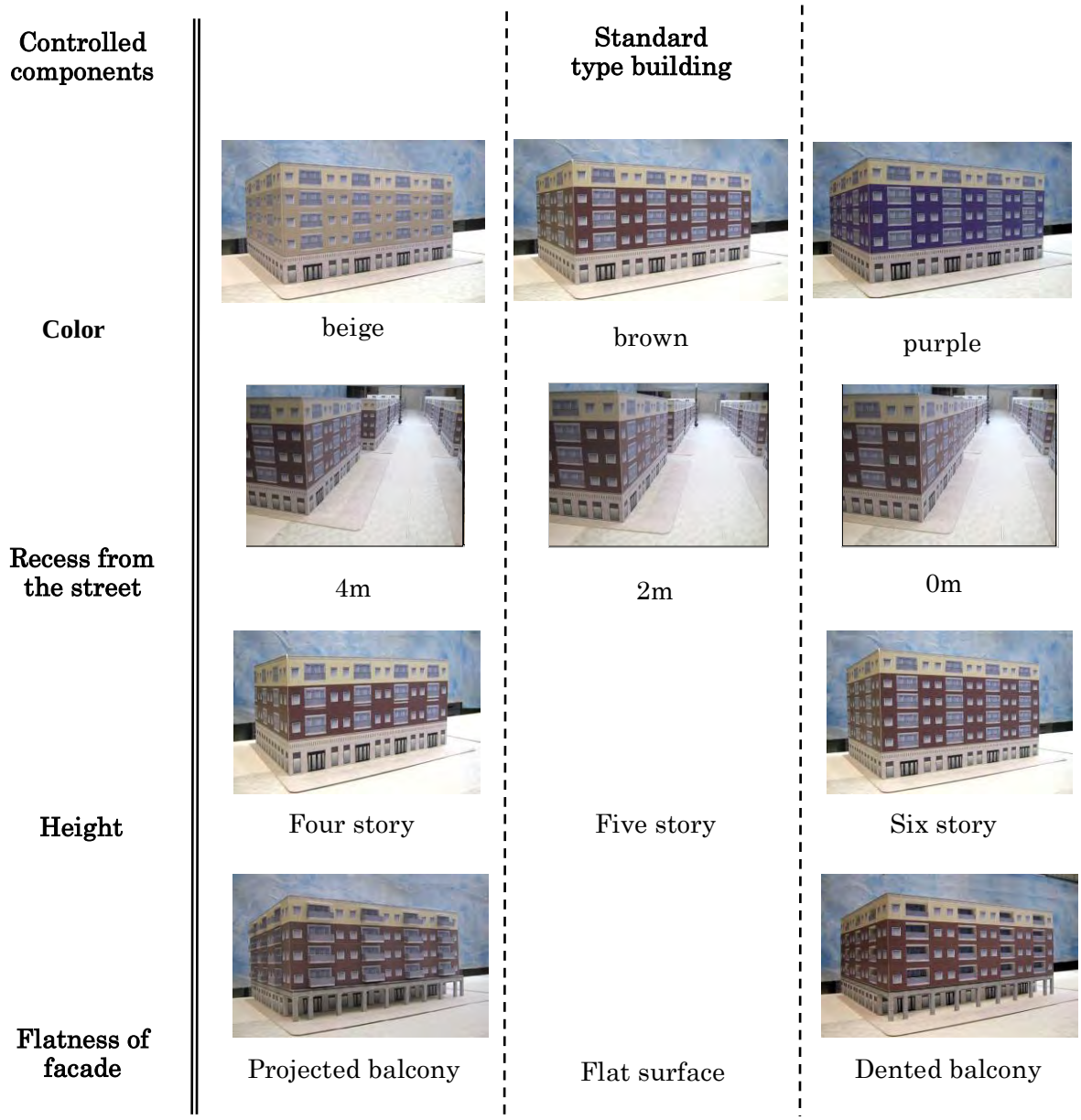

Figure 3 Variation of the model buildings

“standard type” street （ST）

“monotonous type” street （MT）

“varied type” street （VT）

“color controlled” street （CC）

“ recess controlled” streets （RC）

“height controlled” streets （HC）

“flatness controlled” streets （FC）

Figure 4　Variation of the streets

1. “order vs. disorder”

order disorder

13 11 9 7 5 3 1

2. “simple vs. diverse”

simple diverse

13 11 9 7 5 3 1

3. “good atmosphere vs.

good bad

13 11 9 7 5 3 1

Figure 5 Experimental setting and the psychological scales

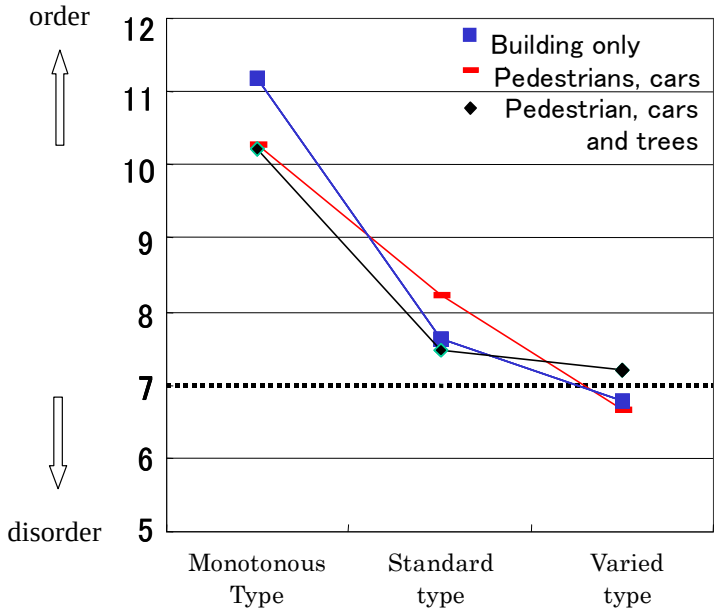

Figure 6　Impression of "order vs. disorder"

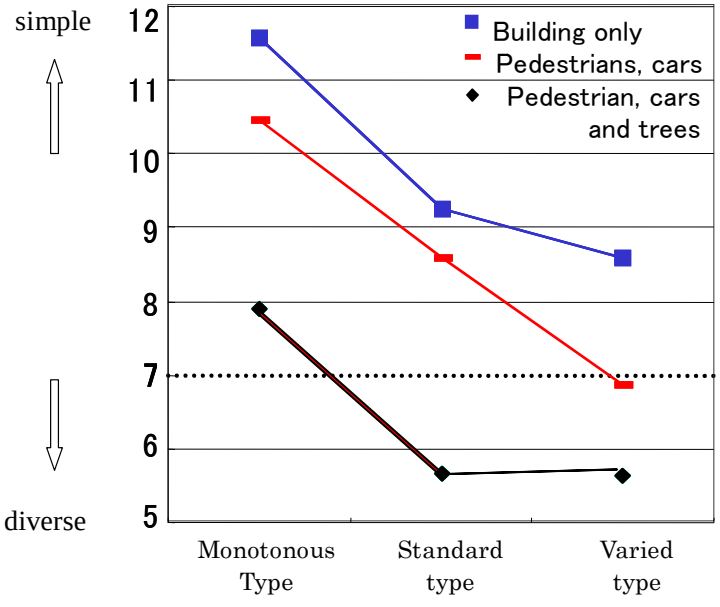

Figure 7　Impression of "simple vs. diverse"

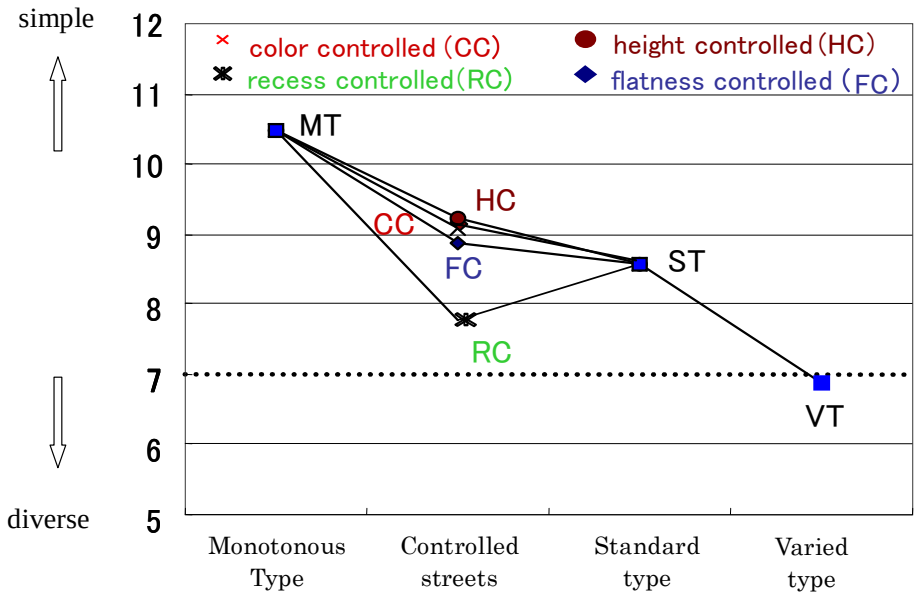

Figure 8　Impression of "simple vs. diverse"

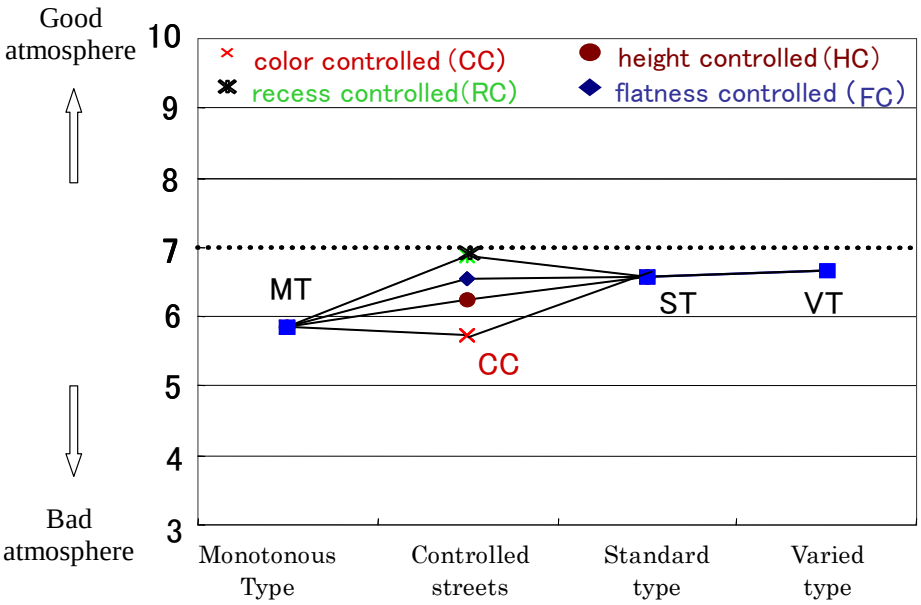

Figure 9　Impression of "good atmosphere vs. bad atmosphere"