A METHOD OF CONTINUOUS RATING FOR PSYCHOLOGICAL IMPACT WHILE MOVING THROUGH EXTERIOR SPACE

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ABSTRACT

As a tool for environmental designers to assess the visual scenes in urban landscapes, this paper presents a method to analyze the sequential experience in a scientific manner. When we walk along a street, we unconsciously appreciate the changes in surrounding physical features that occur one after another. In this study we developed a method of recording the continuous changes in sensory impressions received from the environment. Using this nonverbal method, we conducted a series of experiments dealing with the senses of "oppression" and "release" experienced while moving through exterior space, and the validity of the method was discussed. In the experiment, sixteen subjects rated the sensory impressions along a route in a university campus, which has a variety of spaces. The result, a profile of changing sensory impressions, was examined by comparing changes in the ambient visual information of the surrounding scenes along the route. As a result, the changes of sensory impressions found to be well explained by such variables as the average distance between the observer and the surrounding surfaces, the relative spatial position of the surfaces to the observer, and the solid angle of the surrounding surfaces of buildings, ground and trees.

KEYWORDS

sequence, exterior space, sense of oppression, surfaces, ambient vision

1. INTRODUCTION

Urban landscapes in Japanese modern cities are notable for their poor visual scenes: they are often chaotic and sometimes too monotonous. Thiel (1997) emphasized the sequential nature of our experience in the environment by saying, “The basic fact of environmental experience is that it occurs as we move through space, over intervals of time.” Our sequential experience may be unconsciously affected by the change in surrounding physical features that occurs one after another. If we develop a method to analyze the sequential experience in a scientific manner, it would be a useful tool for environmental designers. In the previous researches dealing with sequential experience, subjects were asked to respond verbally after or halfway of experiencing a route (e.g., Takeuchi, Fujimoto and Mitsuhashi, 1995). However, the verbal judgments may involve a conscious and careful observation, which is not usual practice in the daily context. In this study we developed a nonverbal method of recording the continuous changes in sensory impressions received from the environment. Using this nonverbal method, we conducted a series of experiments dealing with the senses of "oppression" and "release" experienced in the exterior space, and the validity of the method was discussed.

2. AN EXPERIMENT OF CONTINUOUS RATING FOR SENSORY IMPRESSIONS

2.1 Development of an Experimental Instrument for Continuous Rating

An instrument was designed to record continuously the varying intensity of psychological impacts on a subject that move through an environment. Using this instrument, a subject was asked to externalize one's sensory impressions by an action, namely by rotating a dial in hand according to the intensity of psychological impact. The angle of rotation was transformed into electrical signal and recorded every 0.2 second in a notebook computer memory, which the subject carried by a knapsack (see Photo 1). The computer memory was also used to record the illuminance measured at the position of subject's overhead (see Figure 1). The experimenter walking behind the subject input a signal into the memory when the subject passed a position marker along the route.

2.2. Tested Psychological Impacts

The experimental instrument is usable for any kind psychological impacts as far as they have quantitative meaning. As an initial test of this method of measurement, the present study dealt with the most basic experience in the exterior space, namely the sense of "oppression" and "release" (e.g., Takei and Ohara, 1977).

2.3. Experimental Site

A route of 425 m in length in Nagatsuda campus of Tokyo Institute of Technology was chosen as experimental site because it has a variety of spatial configurations yet it has little variations both in building façade and in elemental features along the route (see Figure 2).

2.4. Procedure

Using the above-developed instrument, each of sixteen subjects was asked to rate one of the sensory impressions ("oppression" and "release") in a session while walking along the route. It was conducted in both directions (go and return). Therefore, the experiment consisted of four sessions. At the end of each session, the subject was interviewed about the places where he/she felt significant change in the sense of "oppression" (or "release") and the reasons for it. The experiments were conducted in the afternoon of cloudy days considering the stability of the light conditions.

2.5. Result of Experiment

The record of changing sensory impressions in the time scale, was translated into the profile in the distance scale. This calibration was made according to the position marker along the route recorded by the experimenter during the experiment. Since the variance of the ratings was different among subjects, the row data was standardized (mean value =0 and standard deviation =1).

Figure 3 shows an example of the results for the sense of "oppression", and Figure 4 for the sense of "release". The horizontal axis in these figures indicates the distance along the route from the start point, and the scale is indicated by number of steps (1 step = 0.5 m) from the start point. Comparing the Figures 3 with Figure 4, it can be noted that the senses of "oppression" and "release" are not necessary opposite meaning. The sense of "oppression" may explain about a continuous state of a certain length, whereas the sense of "release" may explain a change of state at a certain point.

In order to examine the reliability of the result, four subjects participated to do the same task twice. The profiles of the two data obtained by the same subject in separate days were generally similar, i.e.; the places where value increased and decreased were consistent although the amount of increase and decrease was not always same with each other.

Although most parts in the profile where rated value was significantly high were verbally indicated in the interview, there remained some significant changes that were not mentioned. This indicated that this method could extract the changing sensory impression that could not express verbally.

Figure 5 shows the results of experiment for the sense of "oppression" rated by all subjects. Those back and gray strips in the figure shows the places where subject

rated significantly high or low, i.e., the value was apart from the mean value more than 1.5 times as large as standard deviation. This result indicates that the places where the spatial impressions rated high and low are fairly common among the subjects except for some local places.

3. MEASUREMENT OF AMBIENT VISUAL INFORMATION

Regarding the physical features that are influential for the senses of "oppression" and "release", we assess the ambient visual information of the surrounding scenes. A previous study by one of authors has discussed the importance of ambient vision for the perception of atmosphere or ambience of a place (Ohno, 2000). Ambient vision deals with broad areas with scattered attention and provides a quick global impression of a place. A computer program was developed to measure and analyze the ambient visual information, and it was applied to some empirical studies (Ohno, 1991; Ohno and Kondo, 1994; Ohno, Hata, and Kondo, 1996). The program is designed to assess visual information from all directions around the perceiver and measures solid angle of visible surfaces of such components as pavement, grass, trees, building and sky. The program also measures the spatial volume around a perceiver, namely a mean length of visual lines between the surfaces and the station point.

The program was applied to a sequence of observation points along the route where the experiment was conducted. The results produced a set of changing profiles of the solid angle for each visible component and the spatial volume as one moves along the route. Figure 6 shows the result of measurement for the visible area of sky. Figure 7 shows a profile of average illuminance recorded at the position of subject's overhead in the experiment. The two profiles are well correspond to each other, therefore the measurement by the program well described the actual state of the surrounding physical features along the route.

4. RELATION BETWEEN SENSORY IMPRESSIONS AND AMBIENT VISUAL INFORMATION

For a detailed examination of the relation between the subjects' ratings and the result of measurement by the program, the measured data was divided into six parts according to the relative direction to the observer: front, back, right, left, top and bottom (see Figure 8 and Photo 2). An examination of the individual profile of subject's ratings for the sense of "oppression" and "release" revealed that influential physical features vary with the direction of individual's attention. However, the general tendencies of sensory impressions were found to be well explained by following

variables: 1) the average distance between the observer and the surrounding surfaces, 2) the relative spatial position of the surfaces to the observer, 3) the solid angle of the surrounding surfaces of buildings, ground and trees. Figure 9 shows an estimated profile of sense of "oppression" along the tested route using a formula composed of the above variables. This estimated profile is well represent the general tendency of the ratings shown in Figure 5.

5. CONCLUSION

Although more comprehensive study to test feasibility is necessary to construct a usable explanatory system, the measurement of ambient visual information is found to be useful for the prediction of the sequential experience. If the system were established, it would be a useful tool for environmental designers and planners in order to assess unbuilt environment. For example, if the designer were interested in the sequential experience of people as they move through the proposed spaces he/she would input the environmental data into a computer and consult the program to know the perceptual impact of the changes. Since computer aided drafting has become quite popular among the environmental designers, the data is obtained without extra effort. Thus the program can be easily and interactively used in the design process.

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Photo 1 The experimental situation

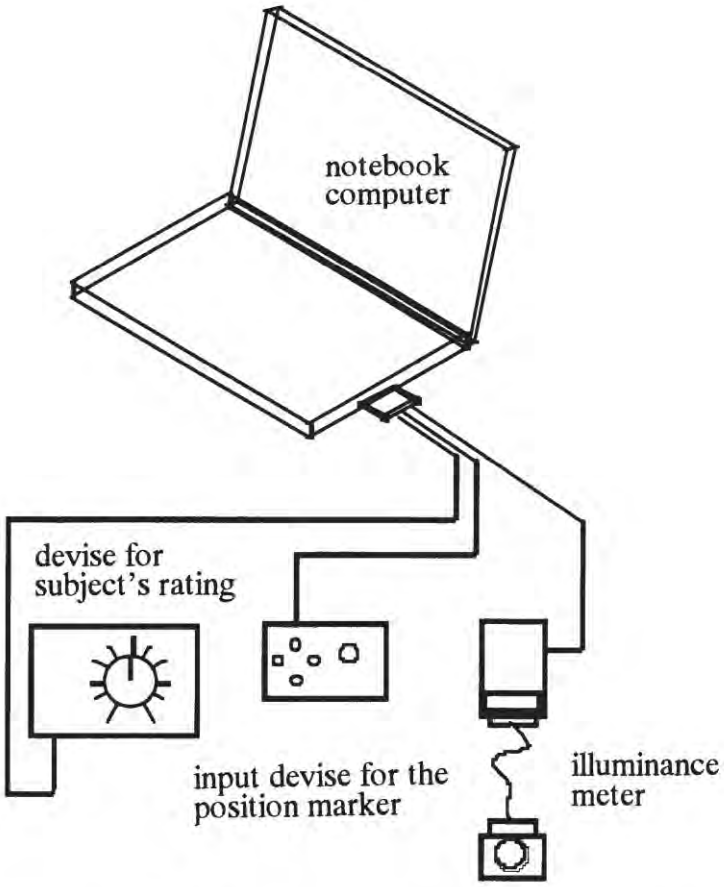


Figure 1 Experimental instrument for continuous rating

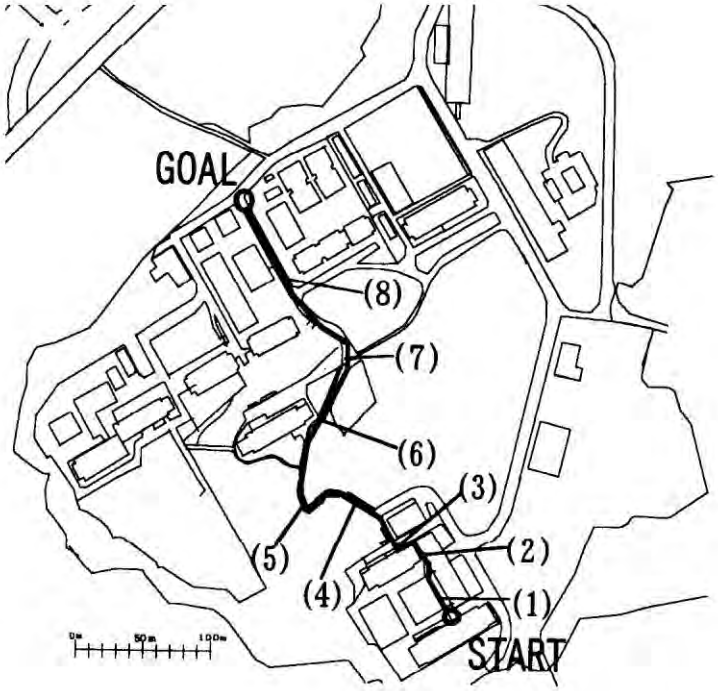


Figure 2 The experimental site: Nagatsuda campus of Tokyo Institute of Technology

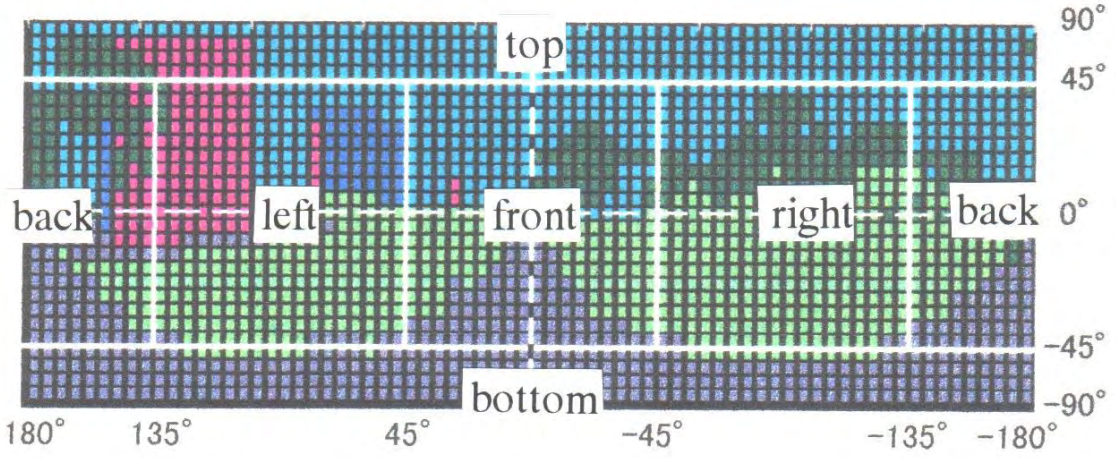


Photo 2 An example of the measurement outcom by the program

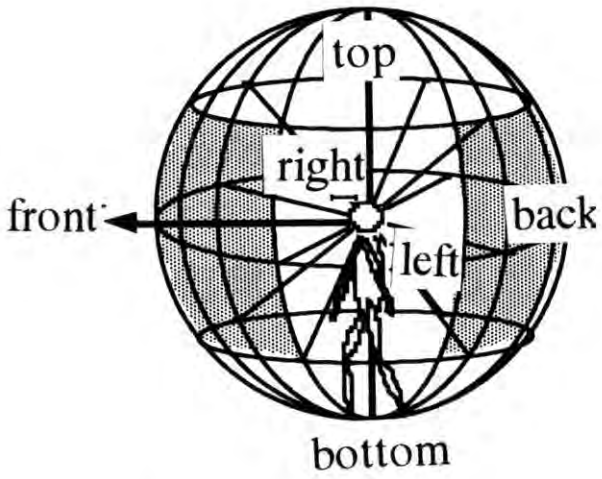


Figure 8 The six relative directions to the observer

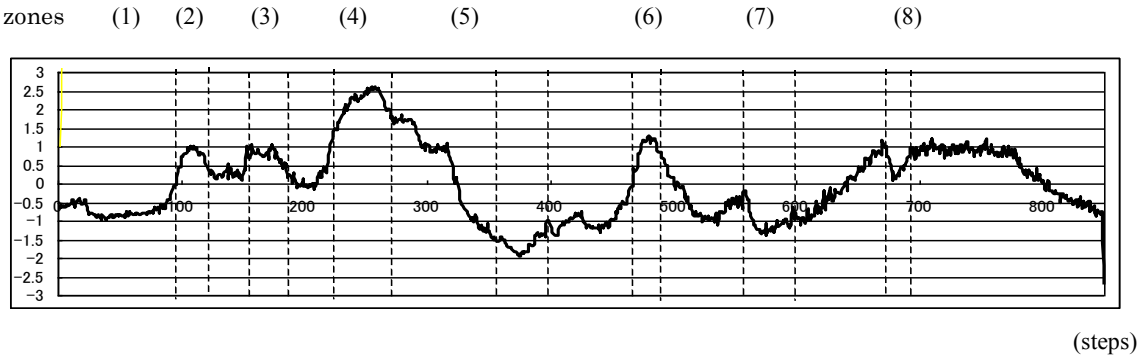


Figure 3　An example of the rating results for the sense of "oppression"

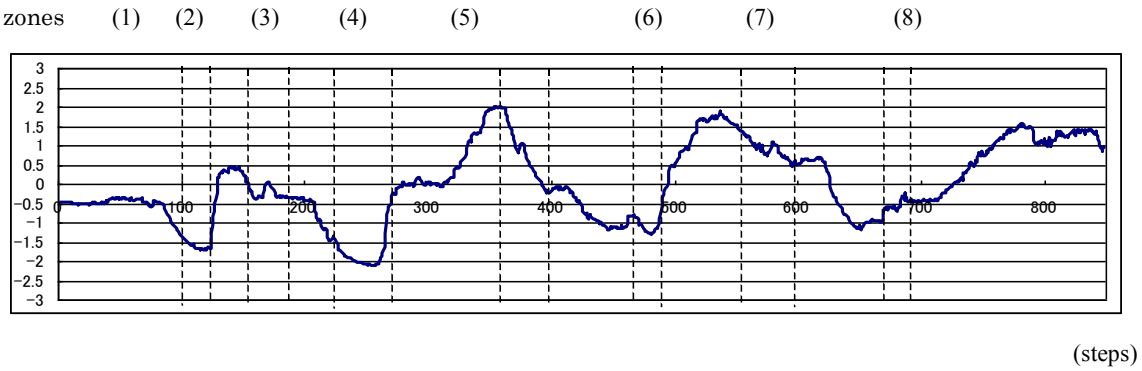


Figure 4　An example of the rating results for the sense of "release"

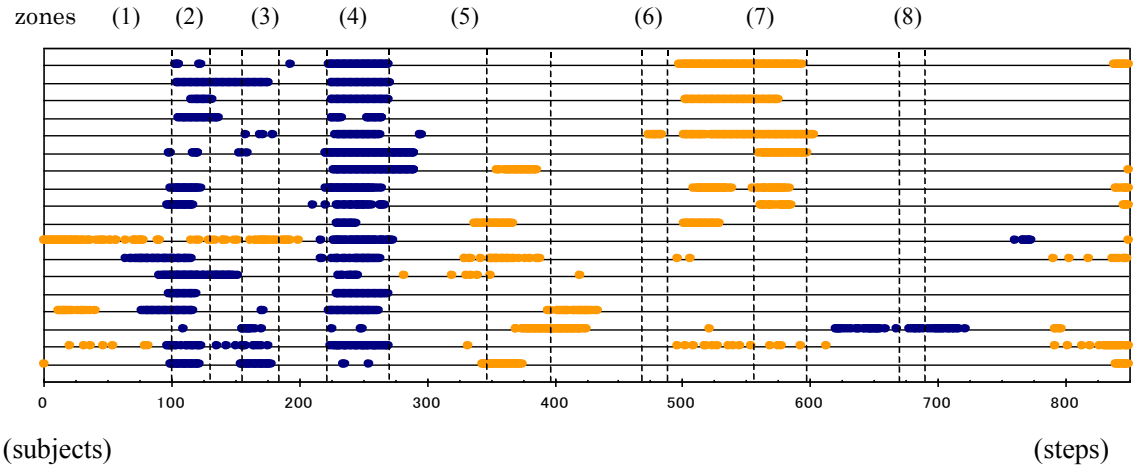
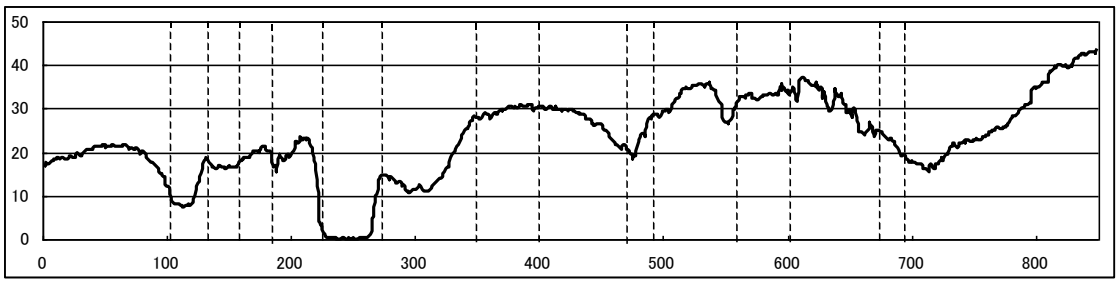


Figure 5　The sense of "oppression" rated by all subjects

(significantly high (+1.5>)　significantly low (-1.5<))

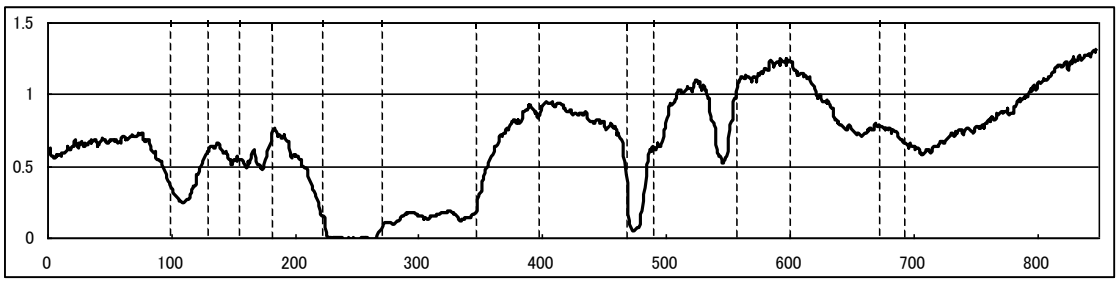
(%)



(steps)

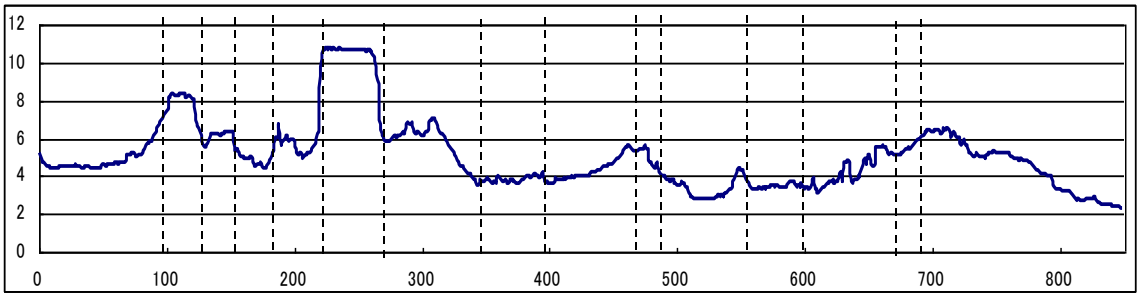
Figure 6 The result of measurement for the visible area of sky

(x 1000 lx)



(steps)

Figure 7 The profile of average illuminance along the route



(steps)

Figure 9 An estimated profile of sense of "oppression" along the tested route