The Effect of an Extra Object on the Apprehension of Projective Spatial Terms

Takatsugu Kojima (kojima@cpsy.mbox.media.kyoto-u.ac.jp)
Takashi Kusumi (kusumi@mbox.kudpc.kyoto-u.ac.jp)
Graduate school of Education, Kyoto University
Yoshida-honmachi, Sakyo-ku, Kyoto, 606-8501, JAPAN

Introduction

A sentence describing a spatial relationship includes at least two objects: a located object and a reference object. However, when we indicate a located object with respect to a reference object using a spatial term, the scene usually contains extra objects that may look like the located or reference object in some cases. What role do such extra objects play on the apprehension of spatial terms?

In this study, we examined whether the presence of an extra object like a located object changed the overall acceptability distribution of a projective spatial term in a given space. We conducted Experiment 1 with the acceptability-rating judgment similar to the task used in previous studies (Hayward & Tarr, 1995; Logan & Sadler, 1996). Then, Experiment 2 examined whether the presence of the extra object changed the acceptability distribution using the paired comparison method.

Method

In Experiment 1, the stimuli were constructed on a computer. They consisted of a black square (1° × 1° side), a black dot (0.12° × 0.12° diameter), and a white square (11° × 11° side). The black square was the reference object. The black dot was the located object. The white square was the background. The located object could appear in given 45 locations on the white square. The participants were required to judge how applicable the location of the dot was to *ue* (similar to *above* in English) in relation to the reference object, using a 9-point rating scale.

In Experiment 2, the display was composed of the same kinds of objects used in Experiment 1, but unlike Experiment 1, two black dots were presented. Therefore, in a pair, one was the located object and the other was the extra object, and vice versa. The participants were required to compare the locations of the two dots in relation to the reference object and choose the dot more applicable to *ue*.

Results and Discussion

From the result of Experiment 1, the mean acceptability rating of *ue* for each location is shown in Figure 1. The highest values were along the vertical axis of the reference object. The result shows that the region with the highest rating values (near 9) along the vertical axis (the good region) always seems to take priority over other parts of the space, and that the acceptability rating decreases the further the space is from the good region.

From the result of Experiment 2, the paired comparison data were processed and scaled using Thurstone's law of comparative judgment (case V). Each scale value of each location is shown in Figure 2.

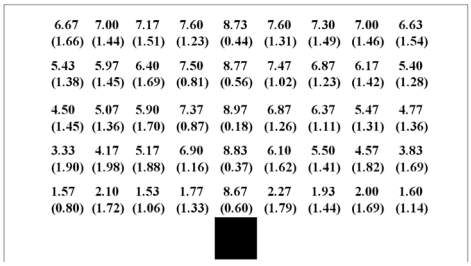

Figure1: Mean acceptability rating (*SD*) of *ue* for each location in Experiment 1.

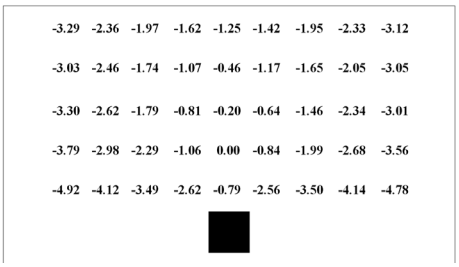

Figure 2: Scale values of ue for each location in Experiment 2. The location of the highest value is defined as zero.

To evaluate the difference between the distribution patterns quantitatively, the rating and scale data were normalized to convert the values ranging from 0.0 to 1.0. We paired a rating value with a scale value in each location. Then, Pearson's product-moment correlation, r, was calculated to determine the similarity of pattern between the distributions. There was no similarity, $r(45) = .14$, $p = .36$.

The distribution patterns in Experiments 1 and 2 differ completely from each other. This shows that judgment of the acceptability of a projective spatial term with regard to a given location will not be so simple when two or more objects are presented. That is, the presence of an extra object could have much effect on the acceptability of a located object to a projective spatial term.

References

Hayward, W., & Tarr, M. (1995). Spatial language and spatial representation. *Cognition*,55,39-84.

Logan, G. D., & Sadler, D. D. (1996). A computational analysis of the apprehension of spatial relations. In P. Bloom, M.A. Peterson, L. Nadel, & M. Garrett (Eds.), *Language and space* (pp.493-529). Cambridge, MA: MIT Press.