International Cartographic Association
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Investigation of Sequential Order of Sketch Map Drawing After Walking in the City

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Keywords: Sketch map, Sequential order of drawing, Smartphone, Real urban environment

Abstract:

The experience of walking in the city has changed since the diffusion of smartphones. In our previous work (Ito et al., 2019), we conducted an experiment in which participating students walk alone freely with their smartphone, classified them by sketch map types, and showed their senses of direction and use of map application varied by sketch map type. In another work of ours (Ito et al., 2021), we conducted a similar experiment, and investigated the difference among decision-making with smartphones and those with other sources such as accidental passer-by and their memory of the past experiences.

In this manuscript, we focused on a sequential order of sketch map drawing. We organized an experiment similar to previous ones. A summary of the experiment is shown in Table 1. Participating students were asked to walk alone from a given starting point to a final destination. The participants were told that they did not need to follow the direct route to the final destination and could visit any places in the neighbourhood as long as they travelled on foot and arrived at the final destination within about three hours from departure. Each participant walked with their own smartphone and used it as usual. Their use of smartphones was recorded within their permissions in order to record what application they used and how they used it. Additionally, participants drew sketch maps of their travel following the experiment.

A sequential order of sketch map drawing was recorded, and path elements (streets) and point elements (stops, passing points, landmarks, etc.) were extracted from a drawing process. Stops were categorized into drop-in stops, which were seen on the street and decided to stop by, or planned stops, which were decided to visit based on other information such as smartphone searches and his/her former experience, based on the interviews. The former could be more flexible decision-making based on their experience of the real urban environment. Drop-in ratio, i.e. a ratio of drop-in stops to total stops was calculated. The maximum value of drop-in ratios was 0.875 and the minimum value was 0.

Figure 1 shows the level of progress in drawing path elements and point elements in the sketch map. The horizontal axis indicates the sequential order of drawing, with 0 at the beginning and 1 at the completion. The graph shows the levels of progress in drawing paths (yellow) and points (grey) respectively, with 0 at the beginning and 1 at the completion of drawing. The processes of drawing sketch map were classified into five types of sequential order of drawing shown in table 2: path first, path earlier, concurrently, point earlier, and point first.

To investigate whether the drop-in ratio differs depending on the types of sequential order of sketch map drawing, we tested the difference among the mean values for five groups using ANOVA, and found that the p-value was 0.0019, indicating that one or more of the groups was significantly different from others. Subsequently, the Tukey-Kramer method was used to adjust for multiple comparisons. As shown in figure 2, the pairs of [path first - point earlier], [path first - point first], [path earlier - point earlier], and [path earlier - point first] were significantly different. In addition, we conducted t-test to compare two groups: path type that is combining path first and path earlier and point type that is combining point first and point earlier. The results showed that the drop-in ratio of the path type was significantly higher than that of the point type, with a p-value of 5.8E-06. The students who drew the sketch map from the streets tended to

Dates	December 9-29, 2022
Starting point	*Omotesando* subway station (Tokyo)
Final destination	*Kitasando* subway station (Tokyo)
Participating subjects	22 students whose age are 19-24 18 males and 4 females

Table 1 A summary of the experiment

type	Subjects ID
path first	5, 10, 13, 21
path earlier	1, 18, 20
concurrently	4, 6, 8, 9, 11, 19, 22
point earlier	12, 15, 17
point first	2, 3, 7, 14, 16

Table 2 Types of sequential order of drawing

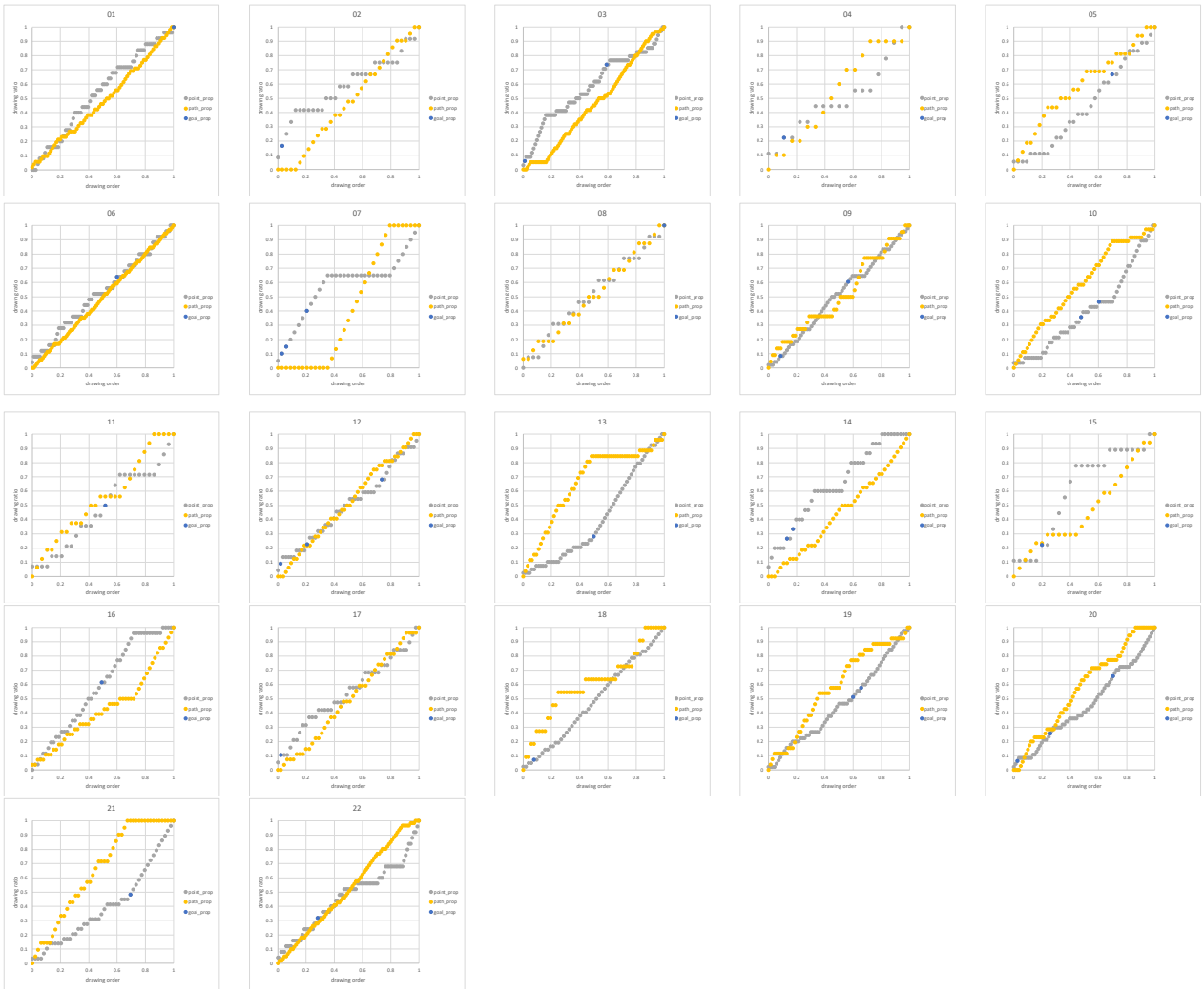

Figure 1 Level of progress in drawing path elements and point elements in the sketch maps

obtain information from the real urban environment and made decision to visit some points, while the students who drew the sketch map from point elements, such as landmarks and stops, tended to stop as they had planned.

The use of smartphones and the spread of images on SNS may lead people to make decisions based on other information than the real urban environment when walking in the city. As a result, people may come to see streets not as streets themselves, but as links that connect POIs scattered throughout the city.

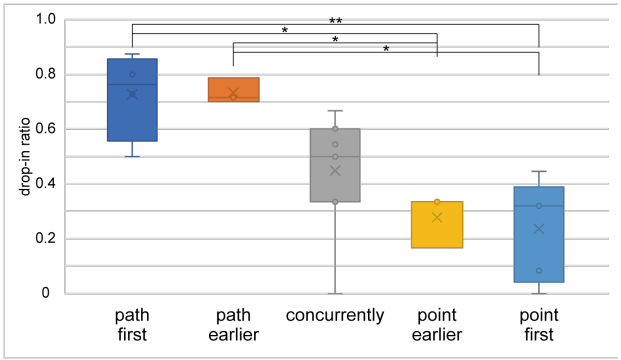

Figure 2 Box chart with multiple comparison results

Acknowledgements

The study was supported by JSPS KAKENHI Grant Number JP22H00764.

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