CO-096

CULTURAL DIFFERENCES IN THE USE OF SPATIAL INFORMATION IN WAYFINDING BEHAVIOR

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BACKGROUND AND OBJECTIVES

The Japanese Government has launched a "Visit Japan" campaign to actively promote inbound tourism and is pursuing plans, such as setting up multilingual signs, to make tourism easier. However, it still takes time for foreign visitors to find their way around because of differences in spatial structure and differences in how spatial information is described. The purpose of our research is to investigate cultural differences in the use of spatial information during wayfinding.

In most cities in Japan, the address system is area-based, whereas the address systems used in most western countries are street-based (Davis et. al, 2003). Thus, in Japan, most of the streets don't have names. Suzuki and Wakabayashi (2005) examined Japanese and American guidebooks and found that Japanese guidebooks use more pictorial information and that the difference in address systems affects both the style of maps used and how much verbal information is provided. Tversky and Lee (1999) also compared pictorial and verbal description tools by examining the translatability between elements on route maps and those in route directions. Besides cultural differences, it has been pointed out that there are individual and gender differences in wayfinding behavior (Lawton et. al, 1996). However, how spatial information tools such as maps and directions are utilized, how they assist travelers during wayfinding in the real world, and cultural differences in the wayfinding process are not yet well understood.

APPROACH AND METHODS

We conducted a wayfinding experiment using maps and/or directions. There were 15 Japanese subjects and 15 visitors from North America ("American subjects"), ranging in age from their late teens to their early thirties. They travelled individually along three routes in Asakusa (Figure 1), a popular tourist destination in Tokyo, Japan, using a map (Figure 2), verbal directions (Figure 3) or both as spatial information tools. The streets in the area are a rather complex mixture of a regular grid and an irregular pattern, so the subjects needed to refer to the map and/or the directions during wayfinding. All were unfamiliar with the place. 5 Japanese and 5 American subjects followed one route with one set of spatial information tools. Each traversed three different routes and used three different sets of tools in rotation, though no one traveled along the same route twice or used the same set of spatial information tools twice.

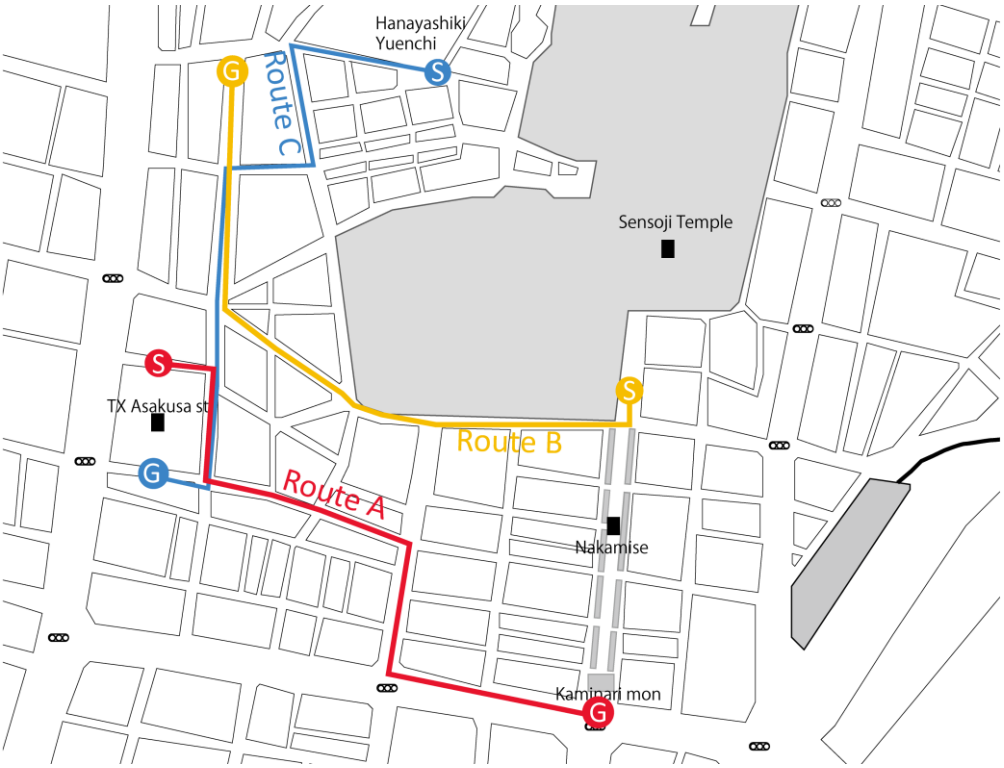

Figure 1 Three routes in Asakusa, Tokyo

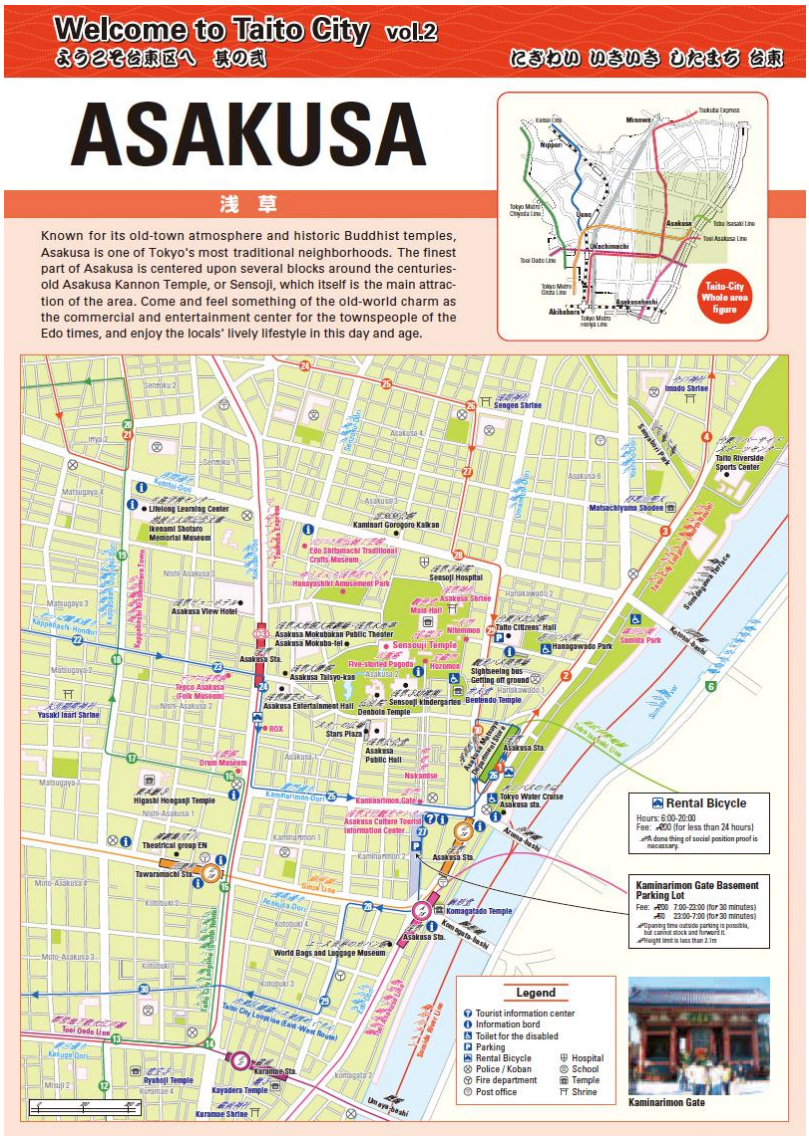

Figure 2 Map used for wayfinding

TX Asakusa sta. ⇒ Kaminari mon

1. After exiting Asakusa Station on the TX, turn right. Turn right again at the first traffic lights.
2. Go straight for one block, turn left at the traffic lights and head towards the Arcade on 新仲見世通り (Shin - Nakamise Ave)
3. Walk for 2 blocks on 新仲見世通り , then turn right at the traffic lights on オレンジ通り (Orange Ave). The road is slightly wider.
4. Turn left at 雷門通り , where there should be more traffic.
5. Keep walking until you see several willow trees. The kaminarimon should be near the willow trees

TX Asakusa sta. ⇒ Kaminari mon

1. TX 浅草駅を出たら右に曲がり、
   最初の交差点で右に曲がります。
2. さらに 1 ブロックまっすぐ進み、
   サッカー場の先の交差点を左に曲がって
   新仲見世通りのアーケードに向かいます。
3. 新仲見世通りを 2.ブロック歩いたら、
   少し道幅の広いオレンジ通りの交差点に突き当たるので右に曲がります。
4. 次にオレンジ通りから車がたくさん通る雷門通りまで向かい、交差点で左に曲がります。
5. アーケードを、柳の木が見えるまで
   歩いてください。柳の木のすぐそばに雷門があります。

Figure 3 Verbal directions used for wayfinding in English and Japanese

An observer walked along with each subject to record wayfinding actions on video and to ask about how certain the subject was about locations and his or her path. The observer asked questions about the degree of certainty when the subject referred to the map and/or directions, when the subject reached street crossings and when the subject's degree of certainty changed. The degree of certainty was measured on a 7-point Likert scale with scores ranging from -3 (uncertain) to 3 (certain).

RESULTS

(i) Changes in the Degree of Certainty

Changes in the degree of certainty through the wayfinding process are shown in Figure 4. Though in general, the degree of certainty increases as the subject nears the goal, Japanese subjects' degree of certainty tended to be higher at the start, then decreased in the middle of the routes, whereas American subjects' degree of certainty tended to be lower at the start and increased almost uniformly. American subjects were observed to have difficulty recognizing the location and identifying the proper path at the beginning, especially when using the map.

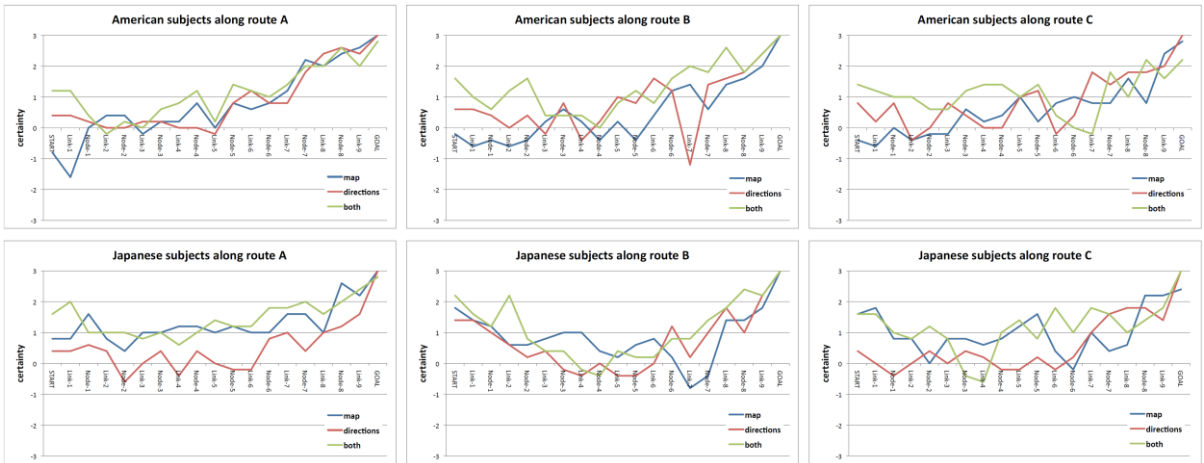

Figure 4 Changes in the degree of certainty

The average degrees of certainty over all the routes were: 1.08 for Japanese subjects using the map, 0.62 for Japanese subjects using directions, 1.27 for Japanese subjects who had both the map and the directions; 0.64 for American subjects using only the map, 0.87 for American subjects using directions, and 1.20 for American subjects who had both the map and the directions. Both groups were the most certain about their location and their way when they used both the map and the directions. Japanese subjects were more certain about their location and their way when they used only the map than when using only the directions. In contrast, American subjects were more certain about their location and their way when they used the directions than when using the map. It is obvious that the map was a more helpful spatial information tool for Japanese subjects' wayfinding and directions were a more helpful spatial information tool for American subjects.

Next, in order to investigate which spatial information elements on the map and the directions contributed to increasing subjects' degree of certainty in wayfinding, we carried out a multiple regression analysis (Table 1).

Table 1 Output of the multiple regression analyses

Dependent variable: Degree of certainty

	(1) ALL		*(2) American subjects*		*(3) Japanese subjects*		*(4) Male subjects*		*(5) Female subjects*	
Intercept	0.243 (0.132)	*	0.221 (0.170)		0.347 (0.178)	*	0.650 (0.178)	***	-0.015 (0.179)	
Map	0.377 (0.109)	***	0.147 (0.147)		0.655 (0.159)	***	0.110 (0.160)		0.595 (0.149)	***
Directions	0.953 (0.158)	***	1.389 (0.218)	***	0.586 (0.226)	***	0.587 (0.225)	***	1.326 (0.224)	***
Cultural origin (American 1, Japanese 0)	0.057 (0.077)						0.142 (0.111)		-0.017 (0.107)	
Gender (men 1, women 0)	0.112 (0.077)		0.185 (0.107)	*	0.015 (0.108)					
Street form [Directions]	0.286 (0.247)				0.029 (0.348)		0.414 (0.379)			
Turning point	-0.156 (0.082)	*	-0.208 (0.114)	*	-0.113 (0.117)		-0.097 (0.117)		-0.200 (0.115)	*
Distance [Directions]	-0.551 (0.119)	***	-0.730 (0.164)	***	-0.393 (0.169)	**	-0.584 (0.174)	***	-0.560 (0.163)	***
Street width [Directions]			0.540 (0.340)						0.233 (0.324)	
Street name [Map]	0.907 (0.154)	***	0.983 (0.211)	***	0.790 (0.221)	***	0.862 (0.220)	***	0.952 (0.215)	***
Street name [Directions]	-0.236 (0.118)	**	-0.261 (0.161)		-0.290 (0.171)	*	-0.095 (0.169)		-0.406 (0.164)	**
Building Name [Map]	0.038 (0.118)		0.260 (0.155)	*	-0.265 (0.186)		0.170 (0.172)		-0.026 (0.162)	
Building Name [Directions]	-0.619 (0.139)	***	-0.972 (0.192)	***	-0.244 (0.198)		-0.483 (0.198)	**	-0.750 (0.196)	***
Building type [Directions]	0.610 (0.171)	***	0.551 (0.236)	**	0.605 (0.244)	**	0.568 (0.240)	**	0.705 (0.243)	***
Building form [Map]	-0.094 (0.123)		-0.036 (0.161)		-0.051 (0.191)		-0.257 (0.181)		0.049 (0.168)	
Number of obs.	720		360		360		336		384	
Adjusted R2	0.133		0.182		0.129		0.086		0.178	

Note: Standard errors are in parentheses.

*** statistically significant at 1% level.

** statistically significant at 5% level.

* statistically significant at 10% level.

The output of the multiple regression analysis for all subjects (Table 1, (1)) shows that neither cultural nor gender differences in the degree of certainty are significant. However, when the multiple regression analyses are performed on each cultural group (Table 1, (2) and (3)), we find some differences in explanatory variables. In terms of spatial information tools, both the map and the directions significantly increased Japanese subjects' degree of certainty, whereas only the directions significantly increased American subjects' degree of certainty. The results agree with the cultural differences in average degrees of certainty described above. Descriptions of distance in the directions, such as "walk for 2 blocks" and "the second traffic light," significantly decreased the degree of certainty of both groups, and descriptions of building types in the directions, such as the terms "hall" and "soccer court," significantly increased the degree of certainty for both groups. Though the directions was a useful tool for American subjects, building names described in the directions significantly decreased American subjects' degree of certainty. We can guess that one reason is that finding, reading and matching Japanese building names in the real world is likely difficult for American travelers. We also performed multiple regression analyses on each gender group (Table 1, (4) and (5)), and found some differences between genders as well as between cultures. The directions significantly increased male subjects' degree of certainty, while both the map and the directions significantly increased female subjects' degree of certainty, though the directions showed a stronger association with the degree of certainty than the map. Description of street names on the directions significantly decreased the female subects' degree of certainty. As the male group had the lowest adjusted R-square value, the male subjects seem to have greater individual differences than the other groups.

(ii) Wayfinding Actions

The observed wayfinding actions can be categorized into four groups. Actions related to the real world searches were: looking around, gazing afar, looking at signs and looking back. Actions related to the

spatial information tool searches were: looking at a spatial information tool while walking and looking at a spatial information tool after stopping. Actions indicating hesitation were: stopping and turning back. An action indicating interest was: gazing at nearby features, showing that the subject was interested in other matters, such as when subjects engaged in window-shopping.

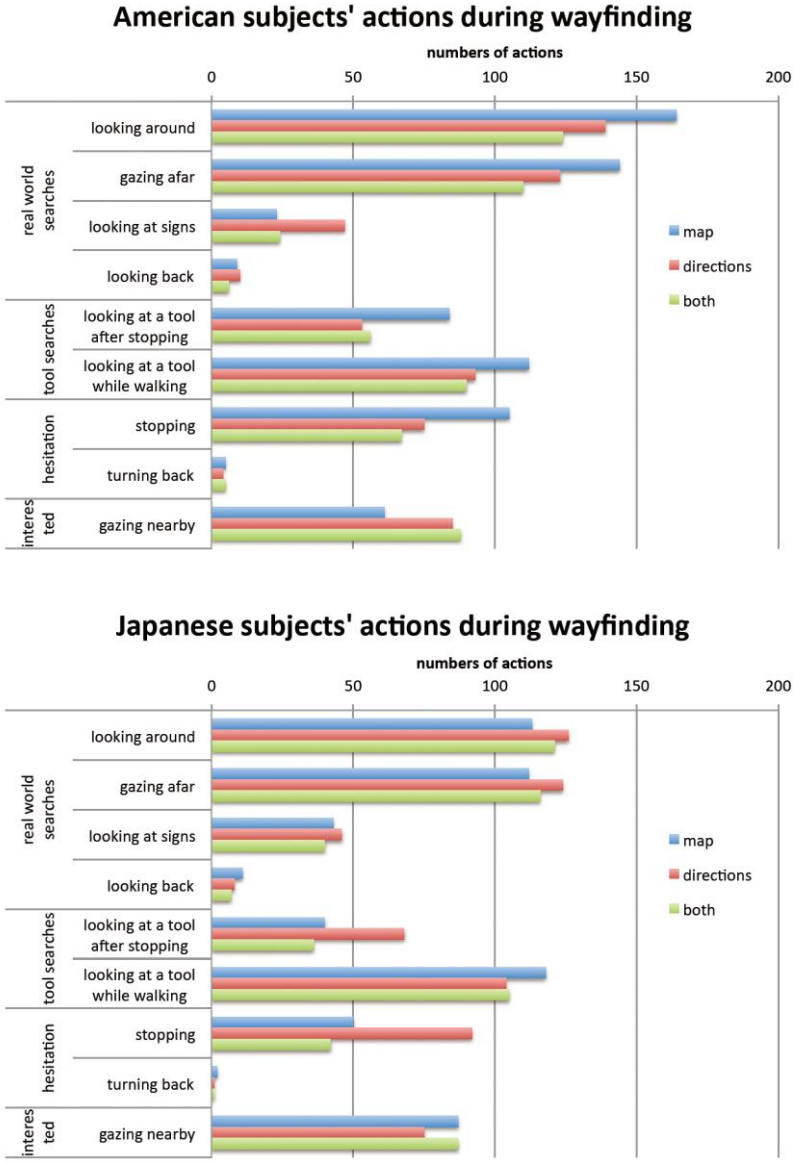

Figure 5 Numbers of actions during wayfinding

Figure 5 shows the number times these actions were observed. More real-world searches, tool searches and hesitation were observed when American subjects used the map only as compared to when they had the other sets of tools, though looking at signs is an exception. In contrast, we observed fewer instances of nearby gazing when they used the map only than when they had the other sets of tools. This indicates that American subjects need to match the spatial information with the real world frequently and are too busy to enjoy viewing things along the route when they use the map alone. More real world searches, tool searches and hesitation are observed when Japanese subjects used only the directions than when they had the other sets of tools, though looking at a spatial information tool while walking was an exception. They also gazed at nearby features less when using the directions than when using the other sets of tools. This contrasts with the American subjects' results, though the trend is not so clear as it was in the case of the American subjects. The results also agree with the analyses of degree of certainty described above.

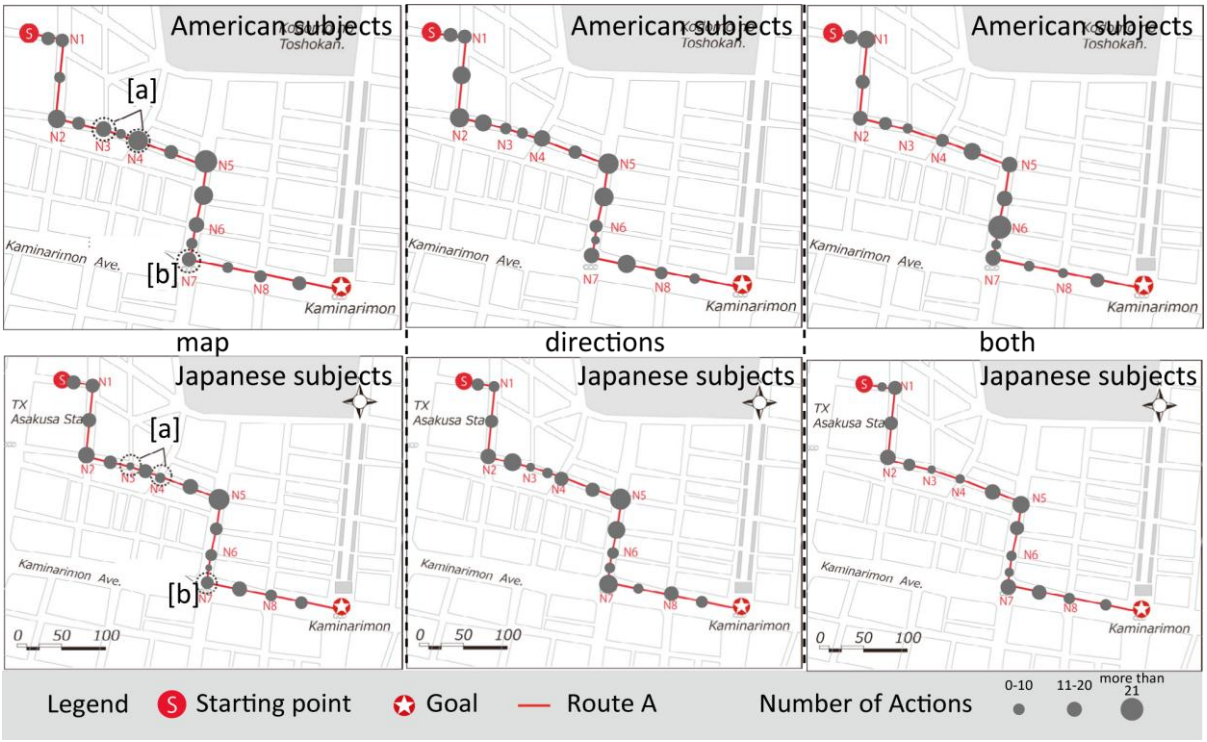

Figure 6 Number of actions along route A

In order to examine the timing of the subjects' actions, we plotted the number of actions that occurred at street crossings and on streets between two street crossings on the map. Figure 6 shows the observations plotted for route A. One notable feature is that, at the points labeled [a] on the map at the upper left of the figure (depicting American subjects using the map), about twice as many actions were observed than when the American subjects were using the other sets of tools, whereas at the same points on the map for Japanese subjects with the map, a rather small number of actions occurred. The points marked [a] are irregular street crossings, so subjects needed to judge the location by the angle of the crossings and the width of the streets. This situation may have caused American subjects relatively more difficulty in matching the spatial information with the real world. In contrast, at the point labeled [b], the number of actions observed for American subjects using the map only is in the same range as when they used the other sets of tools and also with Japanese subjects. There is a signboard with street name at point [b]. This implies that street names in the real world can help American subjects' wayfinding.

Especially when they used the map, American subjects' actions tended to occur at every street crossing, whereas Japanese subjects' actions were more concentrated at turning points and did not often occur at passing points. With the other sets of tools, the same tendency can be observed, though it is not very clear. To elucidate this tendency, we counted the number of actions by situation over all routes. Figure 7 shows the proportions of situations where each group, with each set of tools, took particular actions. Shown this way, the tendencies can be seen more clearly. Figure 8 shows the number of actions where subjects search the spatial information tools, divided by cultural origins in the case of traversing route A with the map. An interesting feature is that American subjects tended to read the map at street crossings, whereas Japanese subjects tended to read the map along streets before they reach the crossings.

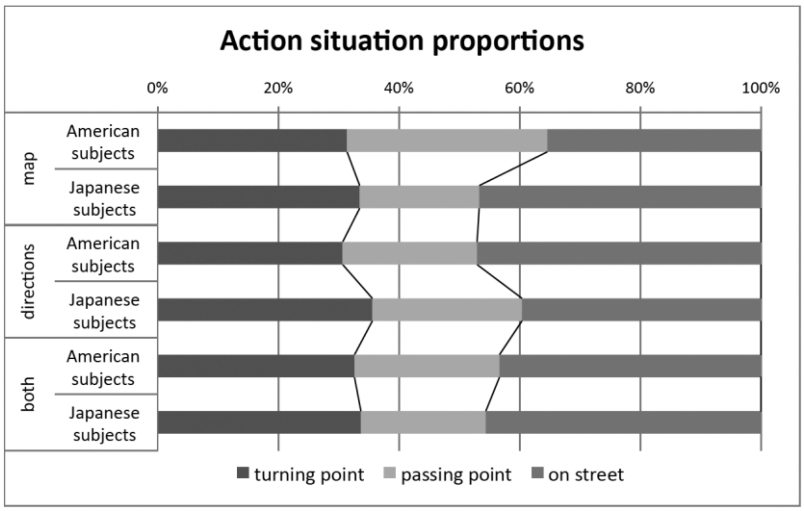

Figure 7 Action situation proportions

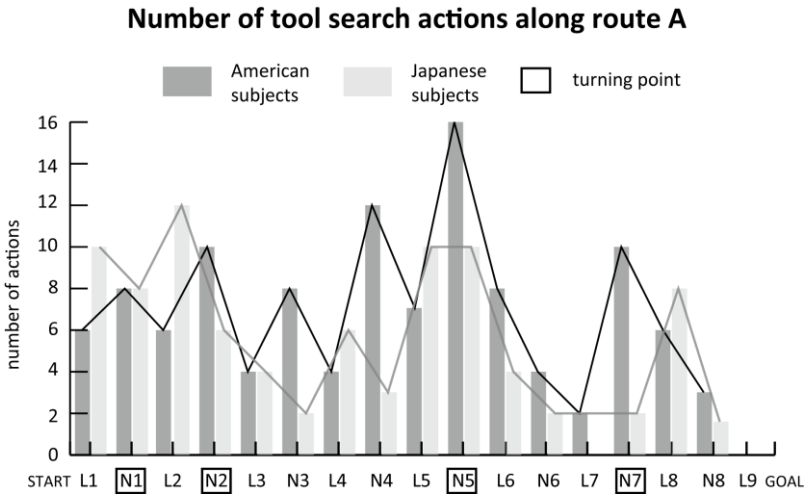

Figure 8 Numbers of tool search actions along route A

CONCLUSION AND FUTURE PLANS

We conducted this wayfinding experiment using maps and/or directions as spatial information tools for 15 Japanese and 15 American subjects, and examined the results by considering changes in subjects' degree of certainty and the location and frequency of wayfinding behaviors or actions.

We found differences between Japanese and American subjects in which spatial information tools are more helpful, which elements of the tools were used in wayfinding, and the timing of their wayfinding actions.

In future work, we will conduct wayfinding experiments and investigations under different conditions in order to clarify the relationship between the use of spatial information and the real world built environment and to gain knowledge about how to better offer spatial information to visitors.

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