A Comparative Study of the Spatial Descriptions
in Tourist Guidebooks

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Abstract: This study makes comparison of spatial descriptions for navigation between Japan and America from cross-cultural and geographic perspectives, based on 24 tourist guidebooks of four cities in Japan (Kyoto, Tokyo) and the U.S (Boston, New York City). The contents of maps and linguistic information in the guides were quantified and then analyzed. The results indicate that Japanese guidebooks use predominately visual information such as maps, while American guides mainly use linguistic information. Therefore, we can insist that there is a complementary relationship between these modes of spatial information vehicle, language and imagery. The results also demonstrate that a relative frame of reference with landmarks is the most fundamental sentence construction for giving directions. In principle, linguistic information can be used to complement the lack of visual information in describing a given geographic environment, so its use rate increased in relatively unfamiliar environments. However, the contents varied with the environmental characteristics such as the regularity of street pattern. Difference in address systems between two countries also affected the way of sorting the sites, style of maps, and the use frequency rate of linguistic information.

Key words: tourist guidebooks, wayfinding, spatial information transmission, cross-cultural comparison, Japan and USA

Introduction

Communication and mapping abilities

The sources of spatial cognition are divided into direct contact with the physical environment (e.g., travel behavior) and indirect one (e.g., map). The latter source contains language and visual information. Concerning the relationship between language and spatial cognition, researchers in linguistics and related fields have argued about the reliability of the Sapir-Whorf hypothesis. According to this hypothesis, spatial cognition is affected by the structure of the language used (Imai 2000). Likewise for spatial cognition research, to discuss spatial ability it is important to verify whether there is a cultural difference in cartographic communication mediated by maps. This question has been argued mainly about mapping abilities.

Downs and Liben (1991) reported that even university students could not grasp Euclidean relationship or shadow projections, which are considered fundamental mapping abilities, and they pointed out the importance of educating students in the use of maps. But their argument based on constructivist view of Jean Piaget was criticized by nativists, James Blaut, who substituted the ontogenesis level of human development for the phylogenesis one.[1]

The focus of the argument about mapping abilities has remained at the ontogenesis level (Blaut 1997; Downs and Liben 1997). However, the map and language are both important means of spatial information transmission, and they cannot be adequately produced by an individual who is isolated from the social context. Therefore, we should consider the difference in opinions to be a difference of the level in question, ontogeny versus phylogeny, not a difference of their academic standpoints.

Suzuki (2000) argued that there are several stages in mapping abilities. At lower stages, mapping ability is endowed more by natural factors, whereas higher levels of ability require more socio-cultural influences. Mapping ability is a type of spatial ability including spatial visualization, spatial orientation, and spatial relations (Golledge and Stimson 1997: 157–158). The ability referred to by Blaut et al. (1970) is to grasp the orientation in an environment, which

corresponds to the spatial orientation. On the other hand, the ability referred to by Downs and Liben (1991) corresponds to spatial visualization, which is an ability to learn how to use maps or language in a social or cultural context. Therefore spatial visualization is more likely to be affected by characteristics of culture and society.

In this paper, I will examine previous studies that have dealt with the ecological, or sociocultural aspect of mapping abilities.

Cultural and social factors affecting spatial description with maps

Previous research on the cultural and social variations in mapping styles can be divided roughly into two types. One type includes cultural anthropological case studies that mainly noticed the spatial information transmission process, which is observed only in the limited environment. For example, Hisatake (1978) investigated sand and rock pictorial maps used by native Americans. Also Gladwin (1970) researched stick-charts for which sticks and shells as materials by the inhabitants of the Marshall Islands. As for the Inuit navigation system, Irwin (1984), and Lewis and George (1991) pointed out that their navigation is carried out using deer footprints, winds and constellations as landmarks in bare winter snowfields. Omura (1995) reviewed such case studies and asserted that their orientation is based on a two coordinate–four directions system, which consist of right-left direction and directions of seasonal winds.

The other type of research tried to explain the importance of cultural differences in the development of spatial cognition by comparing children's developmental changes in map-drawing styles with their age, and by comparing different countries. For example, Blades et al. (1998) examined the mapping abilities in young children aged 4 from five countries using a vertical aerial-photograph interpretation task and a map-using task, and found that the children could fairly achieve the tasks. Also, Yamano (1985) compared sketch maps between children in Sri Lanka and Japan, but he found that Sri Lankan children tended to stagnate in style of drawing the maps pictorially compared

to Japanese children. Most of this kind of cross-cultural research makes children the participants, assuming that the development in style of map-drawing ability follows the developmental sequence scheme proposed by Piaget. However, there are few studies that investigate adults in the same way. Most empirical studies for adults were conducted at a microgenesis level, that is, they focused only on individual or gender (sex) differences related to the preference in style of sketch maps (Blades 1990), on characteristics of the environment (Rovine and Weisman 1989; Brown and Broadway 1981; Milgram and Jodelet 1976), or on degree of familiarity to the environment (Appleyard 1970; Pocock 1976).

Downs and Liben (1993) claimed, referring to the Vygotzkian viewpoint, that the studies on development of cognitive maps consist of both social and individual levels. The former refers to "historical changes in representational techniques that are specific to a given cultural context" (p. 157) and the latter refers to "the relation between developmental changes in the child and the ability to create and assimilate" (p. 157). But as I reviewed above, most of the previous studies focused on the individual level. Except for those empirical studies that use children as the test subject, or case studies for a social group in a particular environment, research focusing on social level of spatial cognition has been rarely conducted.

Spatial description by language

Though most of the spatial information transmission geographical studies have focused on map-like media (Blaut et al. 1970; Blades et al. 1998), language is another means of communicating spatial information. There are many studies emphasizing the usage of locative prepositions in spatial language structure. Sowden and Blades (1996) compared the usage of two locative prepositions in both children and adults to investigate age-related changes in cognitive spatial proximity. Freundschuh and Blades (1998) tested children's usage of 15 locative prepositions and proved that older children link cognitive spatial proximity to actual proximity more adequately than younger children. Also, Mark and Egenhofer (1994) tested adults'

ability to choose proper locative prepositions for explaining topological relationships involving a line and a polygon.

However, the purpose of this paper is not to explain its role to fulfill the relations of the space,[2] nor to analyze the langue-aspect of language—in other words, to grasp the structure and system of a language and then compare it cross-culturally. Instead, the parole-aspect of spatial description by language, in turn, the usage of environmental features or frames of reference in a given environmental context, is the concern of the current study.

Although the studies of spatial description by language have been abundant, the ones focusing on the role of language in actual transmission of spatial information in a specific environment have been rare. But because of recent increase in research using an ecological approach, some case studies have become available.

First, we will consider studies that treated spatial description by language as a problem of the difference in spatial ability. Ward et al. (1986) and Allen (2000) focused on sex-related differences in use of frames of reference. Vanetti and Allen (1988) examined the relationship between abilities in spatial description and direction giving. Kovach Jr. et al. (1988) investigated the relationship between spatial information complexity and wayfinding performance.

Secondly, we will consider studies dedicated to the strategies employed in spatial description. For example, Allen (2000) focused on the order of exhibition of spatial information, Taylor and Tversky (1996) investigated the relationships of scales of space and referent types, and Dennis et al. (1999) paid attention to the usage of critical points to consider the effective navigational expression.

However, these articles considered differences at an individual level, as reviewed above. Therefore, they did not consider whether spatial description is influenced by physical characteristics of the environment and by sociocultural context of their subjects. Also they made little attempt to exemplify how much the spatial information vehicles, which they referred to as good description, were used in ac-

tual navigational settings. Studies by Taylor and Tversky (1996) and Dennis et al. (1999) are directly related to this issue. But they carried their studies only in one study area for each. Consequently they failed to clarify what was the effective factor in forming a given spatial-information vehicle. Moreover, except for Kovach Jr. et al. (1988), most researchers were interested in verbal description of spatial information vehicles and failed to consider the simultaneous usage of spatial descriptions.

The purpose of this paper

How are variations in spatial descriptions influenced by social and cultural factors? To examine this problem, it is necessary to divide the levels in question into (1) social-individual factors, and (2) the variations and usages of spatial information vehicles.

As for the first problem, previous research on spatial cognition dealt with it in a person independent from a given context. However, as Stea et al. (1996) pointed out, people also acquire spatial information even from linguistic and map media devices. There is an issue that these devices are produced and operated beyond the individual level. Therefore, the rules of producing the most typical formats for communicating spatial information in a given socio-cultural group are credited with being presented in those devices. In consequence, it is regarded as being meaningful to clarify the ecological effects on spatial cognition through those information vehicles.

Suzuki (2001) tried to verify spatial cognition from the viewpoint of cross-cultural comparison of maps in guidebooks for Japanese and American tourists. As a result, he found that frequency of maps in Japanese guides was significantly higher (up to about 4.5 times) than that in American guides. As for the Japanese guidebooks, when they were compared with American ones in terms of such factors as map coloration and levels of map abstraction, the relation between maps and texts is stronger, and the map expression was also more colorful and pictorial. Furthermore, the schema in Japanese guidebooks that every object was arranged by spatial proximity, contrasting with the schema in category of business in American

Table 1. Analytical framework of this study

publishing country	types of information		cities described			
			American cities (Street pattern regularity)		Japanese cities (Street pattern regularity)	
			New York (regular)	Boston (irregular)	Kyoto (regular)	Tokyo (irregular)
America	visual information	photo	American cities described by American		Japanese cities described by American	
		map				
	linguistic information	frame of reference				
		referent				
Japan	visual information	photo	American cities described by Japanese		Japanese cities described by Japanese	
		map				
	linguistic information	frame of reference				
		referent				

tourist guides. After considering these differences, Suzuki claimed that there was a strong tendency for Japanese guidebooks to depend more on pictorial or visual devices for the purpose of spatial information transmission, while American guides were more likely to rely on linguistic expressions. He inquired whether these disparities reflect the differences in address systems between countries.

Suzuki intended to demonstrate cultural diversity in the transmission of spatial information from a cross-cultural viewpoint, by use of tourist guidebooks as a media in daily use. However he gave an account of the diversity only for visual information. In other words, he did not study the other type of information vehicles–language. An additional problem lies in the limited number of guidebooks sampled, only four for each city. This is too small to generalize the result of the analysis.

As for the second problem, the research examples focusing on linguistic navigational expression with geographic perspective are not sufficient, and there is little information about how people actually use such an expression in a large-scale environment. Therefore, it is ever-fruitful to analyze the linguistic information in guidebooks, because they encompass not only visual information but also linguistic information.

The present study will further examine

Suzuki's investigation by analyzing both visual and linguistic information in the guides. The number of guidebooks expanded into six for each city, and the spatial description contained there is analyzed. As for the map expression as visual information, a statistical test is done, using Analysis of Variance (ANOVA). Next, spatial description by the language used in the guides is analyzed both quantitatively and qualitatively for each city. This study aims to clarify how characteristics of geographic environment and address systems influence human spatial description through depictions in information vehicles.

The Framework of the Research and Method

Framework of this study

Tourist guidebooks are one of the most widely used media for traveling anywhere outside our familiar place, and contain multiple representational styles such as maps, photo pictures and verbal descriptions; moreover, anyone can purchase and carry them casually. Furthermore, they are not biased for a specific audience, but are intended for general readers. Therefore, the guidebook can be thought to reflect the general figure of the spatial description of the readers to a considerable extent.

As mentioned in the previous section on eco-logical aspects of spatial description, socio-cultural, environmental, and individual factors in the observed differences should be distin-guished. Therefore, the difference in address systems between the countries were selected as a measure of a socio-cultural one; Japan has a typical example of address systems based on blocks, and America has a typical street-based address system. As shown in Table 1, I selected cities, which had regularity of street patterns varied in pairs for each country, because previ-ous research has shown the effects of regularity on spatial cognition (Brown and Broadway 1981).

Kyoto and Tokyo were selected as the target cities in Japan. Kyoto is a city whose street pattern is highly regular, designed at a time in history when urban planning was based on an-cient Chinese urban form. Tokyo is a city whose street pattern is less regular because the city is located on undulating plains and the urban ambit has spread gradually (Jinnai 1985). As for the target cities in America, New York City and Boston were selected. The street pat-tern in New York City (more precisely, Manhat-tan Island) is designed in a highly regular form. In contrast, since the central area of Boston has spread gradually during reclamation of the wa-terfront, its street pattern is less regular. Then, six publishers were selected using the criterion that each should publish the guidebooks for these cities in the same series.[3]

Analysis of visual information

Visual information in this study includes spa-tial descriptions other than linguistic informa-tion, which is divided broadly into the maps and the photographs. For the maps, coloration, types of legends, map grids, site arrangement, and use frequency were set up as measures. For the photographs, frequency in use was assessed.

"Coloration" indicates the level of abundance of color given to the map. It can be divided approximately into three types as full-color, two-color and monochrome printings (not counting the ground-color "white"). Because a guidebook may use together among those, two more categories should be added giving five categories in total. Consequently, I employed

the scoring method of 1 for monochrome, 3 for two-color printing, 5 for full-color printing, and two intermediate expressions among those were scored as 2 and 4.

"Legend" means the number of signs in an explanatory note for the maps of a guide. But, because American guides may add explanatory notes in every map, in this case, the largest one in a guide was counted.

"Map grid" means the device to make an ob-ject-site search easier, by marking two axes on the four corners of a map. Also, to add the number for each site indicating the page includ-ing corresponding map is the other device of "grid." Thus, guides which included both de-vices for all maps were scored as A, guides which adopted one of the two methods were scored as C, and guides with no coordinates on maps were scored as E. Again, guides with intermediate expressions were scored as B or D.

When each site was enumerated in its con-text, "site arrangement" displays what the order was based on and how it was being done. Guides adopting the editorial line that all sites are ordered on the basis of their spatial proxim-ity and are enumerated were classified into "spatial." Guides employing the editorial line that arranges the sites in context on the basis of their category of business were named "busi-ness."

"Maps use" indicates the rate of map use per tourist guide, which was calculated by division of pages carrying maps by the total pages. As for photographs, "photos used" were counted up. Incidentally, photographs of cuisine, inte-rior, or facial expression should not be catego-rized as spatial description for navigation, so all those photographs were excluded.

Analysis of linguistic expression

Linguistic description of space in large-scale environment employs a variety of spatial ex-pressions. To deal with them quantitatively, we must classify the elements contained in the linguistic expression. Past studies have used a variety of classification schemes for analyzing linguistic expression, and a clear standard for classification for directional terms has not yet been established. But there is some common ground among such studies.

Table 2. Typology of the elements in spatial description by language

	types	definition	examples
frame of reference	intrinsic	An explanation of routes made from the observer's point of view.	Walk..., Go..., Turn..., Pass..., Down...
	relative	An explanation in relation to a position in the environment.	is located/sited...
	absolute	Conceptual frame of reference which is not concerned with any environmental features.	is north, south, east, west of...
referent	landmark/node (intersection)	Environmental features typically seen from many angles and distances and can be detected singularly. (Names of an intersection itself as a node of streets)	the red brick building, the park, the station (Hyakumanben, Saiin)
	path (traffic)	Channels along which the observer walks. (Names with route numbers of public transportations)	street, dori, avenue, road (city bus No. 205, metro, tramline line A)
	district	Names or alias to identify a given two dimensional extent which are recognizable as having some common, identifying character.	SoHo, Higashiyama, Beacon Hill, Sibuya, names of wards
	edge	Boundaries between two phases, linear breaks in continuity.	river, railway tracks, walls

First I will consider classification based on the referential system and referent. Vanetti and Allen (1988) divided the sentence of the spatial directional terms into (1) environmental features and (2) spatial relational constructs. The former indicates referents like landmarks or choice points, and the latter is indicative of spatial relational terms like direction and distance. Such a method of classification was also used by Allen (2000), although with modifications.

Second, many of the previous studies intended to classify sentences based on verb functions. Allen (2000) classified verbs into verbs of movement and state-of-being verbs. Similar classifications were devised by Taylor and Tversky (1996), who classified verbs into static verbs used for route description, and active verbs used for survey description. Taylor and Tversky further sorted the terms into three categories of intrinsic, relative and eclectic expressions on the basis of the agent's observing point. In the previous studies, to classify the directional terms, at least the distinction between frame of reference and referent (for frame of reference, distinction of verbs which correspond to actor's view point), is necessary. Consequently, the current study reflects past classification schemata in these two points

(Table 2).

According to Levinson (1996), frame of reference in linguistic description can be grouped into three categories: intrinsic, relative and absolute. This corresponds to Hart's (1981) classification of frames of reference: egocentric, fixed and abstract. This study adopts the Levinson's categories.

Because previous studies of linguistic direction-giving were mainly interested in the language structure of the sentence, the taxonomy of referent has not yet been established. But since Lynch's (1960) investigation, cognitive mapping research has addressed the question of what referent can be used as a cue. Also, some studies have reported that the way of using referents changed in connection with the characteristics of physical environments or with subjects' familiarity with the environment (Appleyard 1970; Pocock 1976; Evans et al. 1981). In this study, referents of environmental features were classified into six types (landmark/node, intersection, path, traffic, district and edge) and then compiled.

The "landmark/node" referent operates as a cue to find a way to the destination, which is probably the same one as Lynch's (1960). However, during preliminary analysis I observed another usage, in which the destination itself

serves as a landmark. For example, in the case that a site is located in a distinctive building, the building takes on the function of landmark although a guidebook user can enter it. Also, when a guidebook user refers to a station as a cue and passes through it, the station takes on a hybrid function. In this study, therefore, both landmark and node were counted as in the same category.

The subcategory "intersection" referent appeared predominantly in Japanese cities where most intersections are given their own names. Hence, there are many cases where an intersection name is written in the guidebook using the icon of the signal in Japanese maps. When a guidebook described only "the intersection of street A and avenue B," it was considered to be describing two roads, rather than a specific intersection name. As with landmark/node, the term "node" as used by Lynch (1960) does not include all words in this definition, although the intersection name functions as a kind of node.

"District" as used in this study corresponds closely to Lynch's definition, indicating a given area name which is recognizable as having some common, identifying character. In America, place names such as "Villages," "SoHo," and "Midtown" for areas of New York City, and "Beacon Hill" or "Back Bay" for areas of Boston correspond to this category. In Japan, this category includes places such as "Shibuya" and "Asakusa" in Tokyo, and "Gion" or "Arashiyama" in Kyoto.

The "edge" referent almost always refers to a railroad or river. These can be distinguished in their function of blocking a path.

"Traffic" gives the description of a way by providing the lines of public transportation. In a functional sense, this type can be included in the "path" category.

Using the categorization framework indicated above, for example, the sentence "my house is next to your house" can be fractionated into one relative frame of reference ("is next to") and two referents ("my house" and "your house"). All 8,698 sites, except those sites that appeared in the form of box columns, all the tourist guidebooks selected for this study were quantitatively fractionated into reference frames and referents, and then counted.

Table 3. Results of the analysis of visual information in guidebooks

city	guide books	color-ation	map grid	site arrange-ment*	map use (%)	photo use (%)
Kyoto	JTB-K	5	A	S	28.0	46.9
	Sho.-K	5	A	S	6.0	123.7
	Jit.-K	5	B	S	26.4	77.4
	Fod.-K	1	E	B	7.7	0
	Fro.-K	2	C	B	9.0	0
	Lon.-K	3	C	B	6.1	5.5
Tokyo	JTB-T	5	A	S	16.8	84.0
	Sho.-T	5	A	S	12.1	69.4
	Jit.-T	5	A	S	26.3	119.8
	Fod.-T	1	E	B	9.2	0
	Fro.-T	2	E	B	6.2	0
	Lon.-T	3	C	B	6.9	12.2
New York	JTB-N	5	A	B/S	9.9	86.1
	Sho.-N	5	E	S	11.1	80.2
	Jit.-N	5	A	S	12.4	54.2
	Fod.-N	1	E	B	5.8	0
	Fro.-N	2	E	B	9.0	0
	Lon.-N	3	E	B	4.1	14.8
Boston	JTB-B	5	A	S	7.1	133.3
	Sho.-B	5	E	S	9.1	205.3
	Jit.-B	5	A	S	13.6	95.7
	Fod.-B	1	E	B	7.1	0
	Fro.-B	2	E	B	7.4	4.4
	Lon.-B	3	C	B	6.7	19.1

* Types of arrangement display as follows:
S: ordered on the basis of their spatial proximity.
B: ordered on the basis of their category of business.

Comparison between Two Countries, Four Cities

Analysis of visual information

Result of the analysis of the visual information is shown in Table 3. Let us examine the maps first. All maps in the selected Japanese tourist guides were printed in full color without exception. On the contrary, in the American guidebooks, the variation of coloration was much larger than in Japanese guidebooks, and the regularity was not apparent.

Thus, the preciseness of the map expression is examined thereby. The Japanese maps

Figure 1a. A typical Japanese layout of spatial description in the guidebooks (the case of 'Tatsukichi,' Boston).
    Source: JTB 2001, p. 135. original size 18.1×11.5 cm.

tended to show the environmental features in accurate outlines and were distinguished by colors in accordance with feature category (Figures 1a and 2a). On the other hand, American guides drew most environmental features in geometric format with numbers (Figures 1b and 2b). Thus users cannot identify a certain site without referring to the listing, which is printed separately and sites are sometimes arranged in alphabetical order (see the site listings of Figures 1b and 2b). In other words, Japanese maps were found to be more pictorial (MacEachren 1995) than maps of American tourist guides, which call on more advanced skill for acquiring information.

Incidentally, maps in tourist guides have the role of providing the positional information for each site introduced in the body text. Therefore, maps should be closely associated with the body text to efficiently convey the spatial infor-mation. This point is illustrated by "map grid" in Table 3. Even here, we can confirm Japanese guides contrived a way to tie a map to the text.

Next let us examine the frequency in use of maps and photographs (Table 3). The use frequency in the Japanese guides exceeded that in the American guides by as much as 4.5 times. This was especially true for the use frequencies of the Japanese guides for the Japanese cities. However, the use frequencies for Tokyo and Kyoto did not differ significantly. Accordingly, we can conclude that the map use rate of Japanese guides increased when they describe the more familiar (domestic) environment. Therefore we conclude that Japanese tourist guides are much more likely to depend on visual information as a primary medium for spatial description compared with American tourist guides. Results of two-way factorial analysis-of-variance on the coloration, use frequencies of

Tatsukichi-Boston. 189 State St. ☎ **617/720-2468.** Reservations recommended at dinner. Main courses $11–$22; sushi $2.50–$7.50 per order; lunch specials from $6.75. AE, DC, DISC, JCB, MC, V. Mon–Fri 11:30am–2:30pm; Sun–Thurs 5–10pm; Fri–Sat 5–11pm. Validated parking available. T: Blue Line to Aquarium. JAPANESE/SUSHI.

A block from Faneuil Hall Marketplace, this award-winning restaurant with an excellent sushi bar is a favorite with the Japanese community and other fans of the cuisine. At half of the tables, patrons sit on chairs; at the rest, they kneel on an elevated platform. Non-sushi offerings include an extensive array of authentic Japanese dishes, such as *shabu shabu* (beef and vegetables cooked in seasoned boiling water) and *kushiage* (meat, seafood, and vegetables on skewers, lightly battered and fried, served with dipping sauces). At lunch, the *unagi-don* (grilled eel) is as tasty as it is scary-sounding.

Downstairs is the more casual, less expensive **Goemon** (☎ **617/367-8670**). It serves all kinds of noodles—excellent for a quick lunch—and Japanese tapas (how's that for multicultural?). The little plates ($3.50 to $7.25), available at dinner only, are great for a group that wants some culinary adventure. They range from endive salad with Japanese plum vinaigrette to soy-flavored duck confit.

Figure 1b. A typical American layout of spatial description in the guidebooks with site list (the case of 'Tatsukichi,' Boston).
Source: Frommer's 2000, p. 103. original size 18.0×11.5 cm.

maps and photos all revealed a significant effect of publishing country (Table 4).

Analysis of linguistic information

The results of linguistic analysis are indicated in Table 5. The numbers in appearance of each reference frames and referents were divided by the number of samples. At the outset of the analysis, results of reference frame were analyzed. As shown in Table 5, the reliance on linguistic information of spatial information transmission increased when the guides described cities abroad compared with domestic ones.

In contrast, Japanese guides described their domestic cities with a higher frequency of map use than when they described foreign cities. It implies that increased reliance on linguistic information in unfamiliar environments is universal across countries. Thus in relatively un-familiar environments, linguistic information may be described in more detail to compensate for insufficient information provided by other spatial information vehicles.

To examine the relative effect of two factors (viz., publishing country and cities) on the usage of three types of reference frames, two-way ANOVA was carried out. Results of the analysis are reported in Table 6. Although for the relative frame of reference, the null hypothesis was rejected at $p < .01$ level indicating that publishing country produces a significant effect, for the other reference frames, both factors produce significant effects for. Also, a significant interaction between publishing country and cities was observed at $p < .01$ level in all reference frames.

I here intend to examine in more detail the ANOVA results referring to Table 5. Regardless of the reference frame types, the increase in
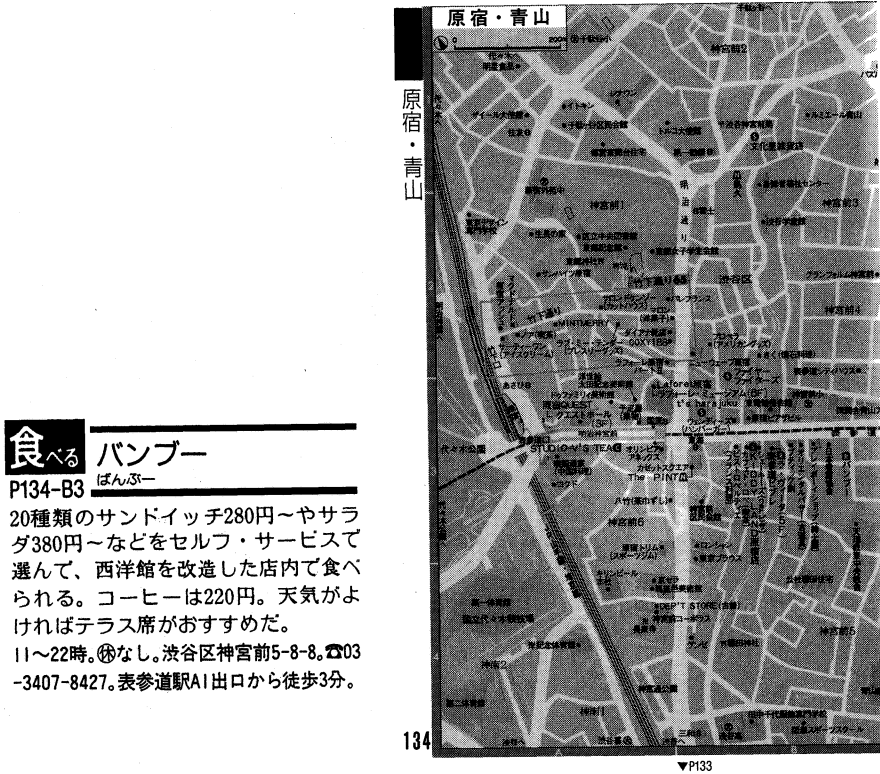
食べる バンブー
P134-B3 ばんぶー

20種類のサンドイッチ280円～やサラ
ダ380円～などをセルフ・サービスで
選んで、西洋館を改造した店内で食べ
られる。コーヒーは220円。天気がよ
ければテラス席がおすすめだ。
11～22時。㊡なし。渋谷区神宮前5-8-8。☎03
-3407-8427。表参道駅A1出口から徒歩3分。

Figure 2a. A typical Japanese layout of spatial description in the guidebooks (the case of 'Bamboo,'
Tokyo).
Source: JTB 2000, p. 134. original size 16.0×10.5 cm.

use frequencies for Japanese cities tended to be higher than those for the American cities. Also, the disparity between Japanese and American tourist guides in use frequency values was greater when they described Japanese cities. In contrast, the difference almost vanished when American cities were described. Such differences were comparatively apparent in case of intrinsic frame of reference, as compared to relative and absolute frame of reference. In particular for the description of American cities, some of use frequency highness ranks were found to be reversed.

The results for each city will be investigated. As for Tokyo, American guides primarily used a relative frame of reference. Their use frequencies ranged from a high value of 109.7 for Frommer's to a low of 54.5 for Lonely Planet. Use of an intrinsic reference frame was 31.6 for Frommer's and 16.8 for Lonely Planet. However, the use frequency values for a relative frame of reference were lower for Kyoto than

for Tokyo. In contrast, the values of intrinsic and absolute frames of reference for Kyoto generally exceed those for Tokyo.

In the meantime, the use frequency values of absolute frame of reference in Japanese guides have the same tendency in that those for Kyoto are higher than Tokyo. Consequently, at least we can conclude that absolute reference frames tend to be used more in relation to characteristics of the physical environment (viz., regularity of street pattern) than to social or cultural factors.

However, for the relative frame of reference, the use frequency values for Tokyo tended to fall short of the values for Kyoto. The use frequencies of relative frame of reference in Japanese guides were slightly higher for Boston than for New York.

Tokyo has comparatively irregular street patterns, and they make the city difficult to navigate through linguistic information alone. Therefore, it would appear that it is more reli-

Bamboo Sandwich House. 5-8-8 Jingumae. ☎ 03/3407-8427. Sandwiches ¥450–¥800 ($4.05–$7.20). No credit cards. Daily 11am–10pm. Station: Omotesando or Meiji-Jingumae (5 min.) or Harajuku (8 min.). Off Omotesando Dori, on a side street that runs beside the Paul Stuart shop. SANDWICHES.

This place offers more than 20 sandwich fillings on your choice of white or rye bread. What's more, it's probably the only place in town to offer a bottomless cup of coffee every day except Sunday and holidays for a mere ¥220 ($2), a price that hasn't changed in a dozen years. Popular with a young crowd, it's a good place for a coffee break in a cheerful setting, and it even has outdoor seating, though the sandwiches aren't quite as good as at Anderson (see above).
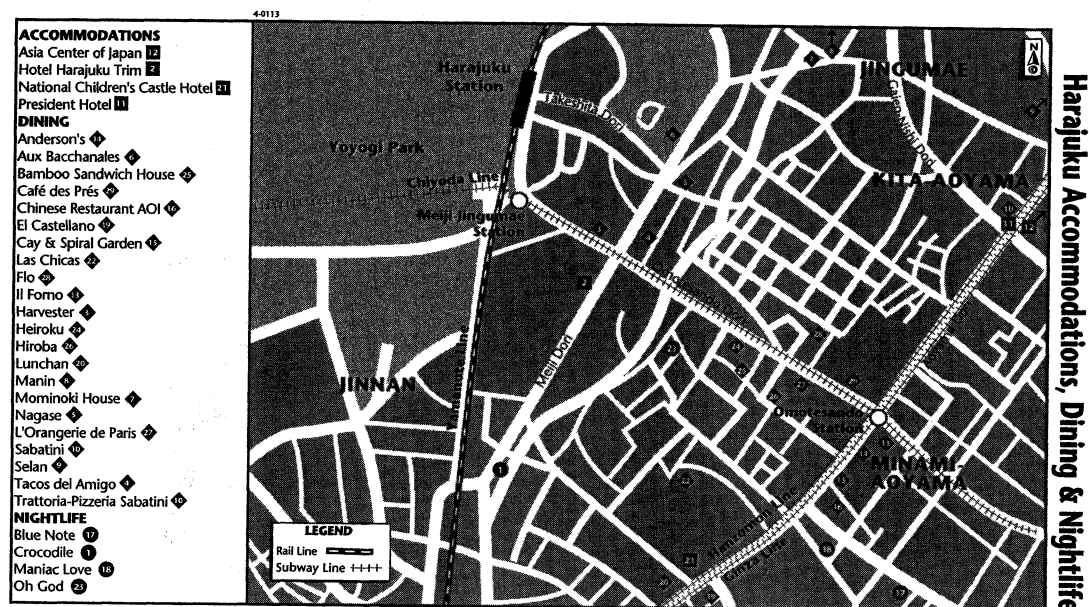

Figure 2b. A typical American layout of spatial description in the guidebooks (the case of 'Bamboo,' Tokyo).
Source: Frommer's 1998, p. 131. original size 18.0×10.2 cm.

able and efficient for Japanese guidebooks to depend on visual information. On the other hand, the American cities have different address systems, which certainly makes the iconic cues in visual information unfamiliar for Japanese and more difficult to describe than for domestic cities. Then we can consider that Japanese tourist guides have to supplement maps with linguistic information, as the American tourist guides do for describing Tokyo.

American tourist guides depend much more on linguistic information in describing foreign cities than do Japanese guides. In the Japanese guides, the highest use frequency of relative reference frame was for Boston (values of 25.6, 42.7, 49.2 respectively), which was about twice as high as that for Tokyo (9.7, 19.8, 14.0). In contrast, in the American guides the use frequency for Tokyo (109.7, 96.1, 54.5) was three

or four times as high as that for New York (29.5, 22.3, 33.7 respectively), and the values for Boston were almost identical to New York's. It is concluded that the American tourist guides generally rely more on linguistic information than do the Japanese ones, and this is especially true when unfamiliar environments are described.

The findings stated above confirm that the relative reference frame is the most basic and frequently used one for orienting oneself in a large-scale environment. The other reference frames are subsidiary and flexibly employed with reference to the place characteristics.

As stated above, even though they are all categorized as linguistic information, some linguistic usages tend to be tied to the environmental characteristics strongly, and others not. Frames of reference are not necessarily tied to

environmental features or cues. On the contrary, referents by themselves are able to describe the features or cues. Therefore, it is conceivable that referents reflect the socio-

Table 4. ANOVA: Visual information variable

	factor	df	F	p
map use	publishing country	1	12.9	<.01
	cities	3	1.7	n.s
	country×cities	3	1.2	n.s
photo use	publishing country	1	41.6	<.01
	cities	3	0.4	n.s
	country×cities	3	0.1	n.s

n.s: not significant at 0.05 level
df: degree of freedom; F: F value; p: significance level

Table 6. ANOVA: Types of reference system

frame of reference	factor	df	F	p
intrinsic	publishing country	1	12.9	<.01
	cities	3	15.5	<.01
	country×cities	3	15.8	<.01
relative	publishing country	1	17.0	<.01
	cities	3	2.4	n.s
	country×cities	3	8.2	<.01
absolute	publishing country	1	14.4	<.01
	cities	3	19.1	<.01
	country×cities	3	22.4	<.01

n.s: not significant at 0.05 level
df: degree of freedom; F: F value; p: significance level

Table 5. Frequency in use of linguistic information by types

city	guide book	number of samples	frame of reference			referent			
			intrinsic	relative	absolute	landmark/node (intersection)	path (traffic)	district	edge
Kyoto	JTB-K	352	0.9	10.2	2.6	8.0 (0.0)	4.6 (0.0)	0.9	1.4
	Sho.-K	749	2.8	35.0	9.1	34.3 (0.5)	9.1 (0.0)	2.2	3.6
	Jit.-K	363	4.1	31.4	8.8	32.0 (0.3)	8.0 (0.0)	6.9	3.1
	Fro.-K	107	42.1	101.9	65.4	114.0 (4.7)	103.7 (1.9)	15.0	6.5
	Lon.-K	342	45.9	58.8	43.3	104.7 (1.2)	71.1 (27.2)	5.0	2.6
	Fod.-K	132	65.9	51.5	49.2	134.1 (0.8)	102.2 (44.7)	19.7	4.5
Tokyo	JTB-K	227	0.4	9.7	0.0	8.4 (0.0)	4.0 (0.0)	1.8	0.9
	Sho.-K	967	2.2	19.8	1.2	12.0 (0.9)	2.7 (0.1)	2.9	1.0
	Jit.-K	415	1.3	14.0	0.4	19.5 (1.0)	8.0 (0.0)	3.7	0.9
	Fro.-K	433	31.6	109.7	14.3	93.1 (8.1)	67.7 (1.9)	34.9	3.0
	Lon.-K	513	48.0	96.1	11.3	105.1 (2.7)	32.9 (2.5)	32.7	1.6
	Fod.-K	286	16.8	54.5	10.8	62.9 (1.4)	23.4 (2.7)	21.0	1.0
New York	JTB-K	428	1.2	32.9	6.5	16.4 (0.0)	25.2 (0.9)	8.9	0.9
	Sho.-K	319	1.6	30.1	14.1	11.3 (0.0)	19.4 (0.3)	10.7	4.1
	Jit.-K	296	1.7	26.4	4.1	18.9 (0.0)	33.1 (0.3)	8.1	1.4
	Fro.-K	628	1.3	29.5	1.6	15.6 (0.0)	7.0 (0.5)	15.1	0.6
	Lon.-K	628	3.7	22.3	4.6	12.7 (0.0)	15.0 (1.6)	10.7	0.3
	Fod.-K	205	0.5	33.7	0.5	11.2 (0.0)	18.5 (1.0)	16.6	1.5
Boston	JTB-K	43	0.0	25.6	4.7	16.3 (0.0)	9.3 (0.0)	11.6	0.0
	Sho.-K	89	4.5	42.7	4.5	24.7 (0.0)	41.6 (3.4)	18.0	2.2
	Jit.-K	63	6.3	49.2	27.0	46.0 (0.0)	30.2 (3.2)	7.9	3.2
	Fro.-K	350	5.1	45.7	2.6	33.1 (0.0)	20.0 (1.1)	28.3	1.1
	Lon.-K	633	4.3	28.0	2.4	12.8 (0.0)	13.6 (0.6)	17.7	0.6
	Fod.-K	130	0.9	10.2	2.6	16.2 (0.0)	8.5 (0.8)	0.9	1.4

Note: The use frequencies represent the percentages in use of each guidebook, which were calculated by times in use of each frame of reference and referent divided by the numbers of samples of each guidebook. Because one site may contain the sentences consisting of more than one frame of reference and referent, the percentages may be more than one hundred percent.

Table 7. ANOVA: Types of referent

referent type	factor	df	F	p
landmark/ node	publishing country	1	55.4	<.01
	cities	3	23.9	<.01
	country×cities	3	24.5	<.01
path	publishing country	1	21.7	<.01
	cities	3	7.8	<.01
	country×cities	3	20.6	<.01
district	publishing country	1	34.3	<.01
	cities	3	3.4	<.05
	country×cities	3	5.5	<.01
edge	publishing country	1	0.2	n.s
	cities	3	4.7	<.05
	country×cities	3	2.1	n.s

n.s: not significant at 0.05 level

df: degree of freedom; F: F value; p: significance level

cultural contexts or environmental characteristics more directly than reference frames.

Two-way factorial analysis of variance was applied with respect to the variables of publishing country and cities for referent types (Table 7). Effects of interaction were found in all types of referents except for "edge." Moreover, the results for referents disclosed a main effect of the cities factor for all referent types, whereas the result for reference frame revealed the unilateral main effects of publishing country.

In case of the Japanese guidebooks, the use frequency of "landmark/node" for Kyoto exceeded that for New York, then the explanation that the high value is related to the difference between the cities of Japan and America does not work. Instead, the use frequency for New York was the second lowest following that for Tokyo. Therefore, the explanation that the street patterns affect the use frequency also does not work. Consequently, as for Japanese guidebooks, the usage of "landmark/node" indicates a marked tendency to be determined arbitrarily. The use frequency for the referent term "path" was highest for Boston followed by New York, then Kyoto, and finally Tokyo, and the same trend was found for the "district" referent.

Then, use frequencies of American guidebooks will be considered. For all of the referents except "district," the use frequencies were highest for Kyoto followed by Tokyo, then Bos-

ton, and finally New York.

For "path," the streets in American cities having their own names is supposed to be the reason that the use frequency rate of American guides contend with the rate of Japanese guides. And yet the results clearly indicate higher rates for Japanese guides compared with American guides.

A different result was found for "district," with the rank order progressing from the highest: Tokyo, Boston New York to Kyoto. It is conceivable that this order is dependant on the street pattern complexity. Specifically, Tokyo has irregular street patterns and an unfamiliar environment for most readers. As with the "traffic" referent, "district" was most frequently used in Japanese guides describing Boston and American guides describing Kyoto. The result can be due to the modes of transportation in both cities, in that people in Boston have to rely on metro for transition just as the people in Kyoto depend heavily on city bus.

Consequently, we can conclude that the usage of referents varies with their types. Some referents are affected by socio-cultural factors, but others are affected by environmental characteristics.

Intra-urban Variations of Spatial Descriptions

In the last section I established that the usages of given types of linguistic information were considerably influenced by differences in environmental characteristics of the city. This implies that the spatial description varies also with local conditions of the environment within the city. Hence, I will make a further examination of this matter comparing intra-urban districts in a given city, focusing on their environmental characteristics.

The case of Boston

The central area of Boston is located on a peninsula which extends between the Charles River and Fort Point Channel. Excluding the surrounding areas of Cambridge, Charlestown, and South Boston districts, the central area can be divided into two zones (Figure 3). One is the precinct comprising the North End, Beacon Hill,
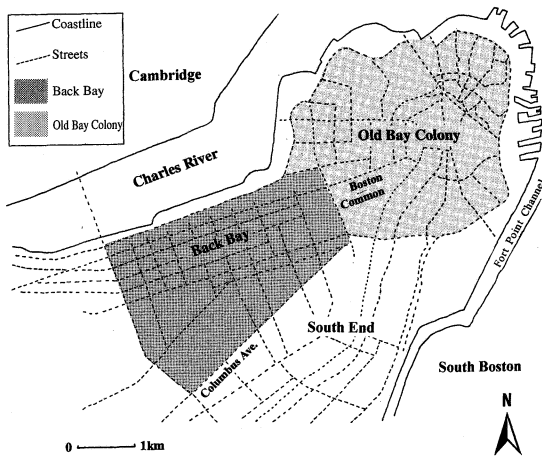
Figure 3. Map of central Boston with the seg-
mented areas.

or Downtown districts. This precinct, formerly
called Bay Colony, was colonized by England
circa 1630 A.D. Most of the early historical
buildings are clustered here, and the street pat-
terns are irregular. I labeled this region "Old
Bay Colony."

The other precinct, called "Back Bay," faces
the old bay colony from the west side. The
Boston Common is sandwiched in between
these two precincts. Back Bay was formed by
the reclamation of waterfront since 1857. The
street patterns are regular because of the recla-
mation and community planning (Whitehill
1959). Most of the retail shops and stores are
clustered here.

The "Financial District," "North End," "Down-
town" and other zones within Old Bay Colony
are commonly known names, and they are
sometimes coupled to each other and used in
accordance with the given intentions of the
tourist guides. Also, the Back Bay is sometimes
coupled to the South End in some of the tourist
guides. However, there was no categorization
which coupled Old Bay Colony districts to Back
Bay. Therefore I divided central Boston into
three segments: Old Bay Colony, Back Bay, and
other areas (Figure 3).

The results indicated the predominance of
the Old Bay Colony in use frequency rates for
both reference frames and referents (Figures 7
(a), 7(b)). As for the proportion of each reference
frame in use frequencies, Figure 7(a) indicates a

significant dependency on relative frame of ref-
erence in Back Bay, regardless of the publishing
countries. The component ratio of the use fre-
quency is changed considerably in the Old Bay
Colony. The greater amount of linguistic infor-
mation by mixed expression using plural
frames of reference was applied for describing
the sites in Old Bay Colony. The same tendency
was found for referents (Figure 7(b)). Conse-
quently, we can hypothesize that the character-
istics of Old Bay Colony increased the necessity
of depending on linguistic information. Also, it
can be deduced that as the linguistic descrip-
tion used more detail to describe an intricate
environment, other frames of reference and ref-
erents were added to the relative reference
frame and landmarks.

The case of New York City

The most urbanized area of New York City is
located on Manhattan Island and can be divided
into two districts. One comprises the southern
part of Manhattan that was originally named
"New Amsterdam" and inhabited since around
1625. The other comprises the central and
northern part of Manhattan. That area has
developed by a town demarcation project called
"The Commissioners' plan of New York City"
(Koolhaas 1978).

Because the southern part of Manhattan
opens onto estuaries, the landform is tapered,
and the street pattern is irregular because it
had developed before the city planning. In
contrast, the street pattern in central and north-
ern part of Manhattan is regular as a result of
city planning (Figure 4). Historical and urban
morphological variance is also reflected by the
system of addresses in both districts.

In the central and northern part of Manhat-
tan, street numbers extend from south to north,
and avenues extend from east to west. In con-
trast, the address for southern Manhattan is
less systematic. Some order can be seen, in that
the alphabetical numbering system is applied
on the avenues around East Village, but street
names are randomly assigned to quasi-regular
roads, which stem from the irregularly shaped
landform. Therefore, the northern part (Chel-
sea, Gramercy, Midtown, etc.) can be divided
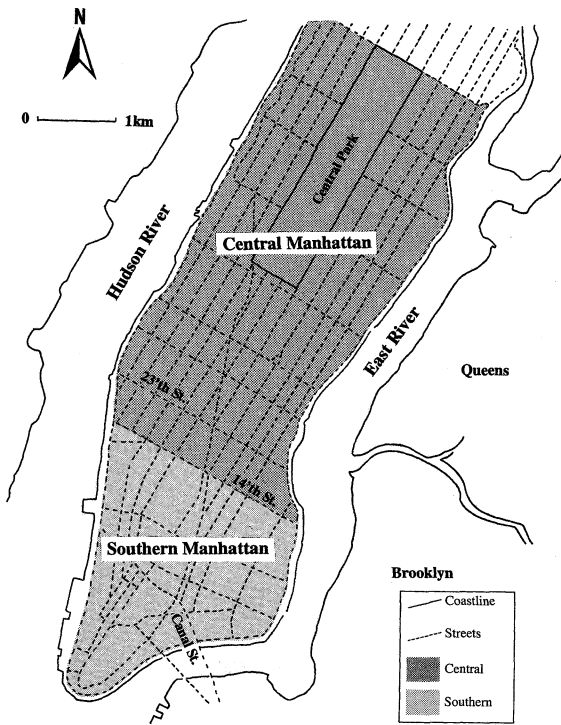from the southern part (Villages, SoHo, Little

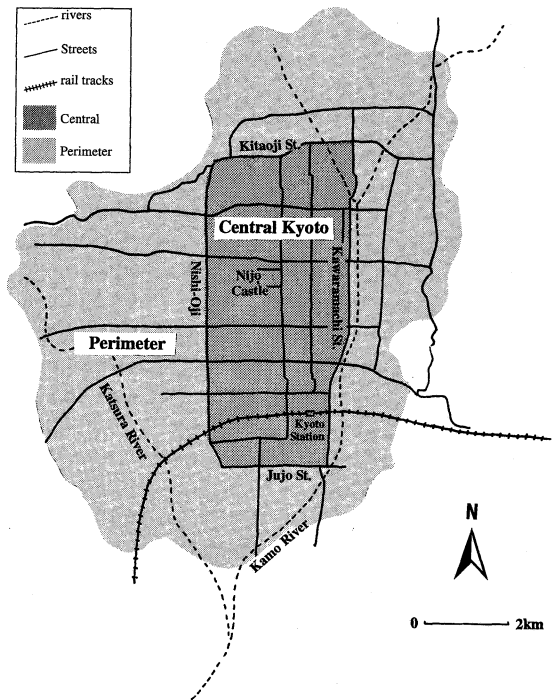Figure 4. Map of New York City with the segmented areas.

Figure 5. Map of central Kyoto with the segmented areas.

Italy, Lower Manhattan, etc.) at 14th Street. Figures 7(c) and 7(d) show the results for analysis of use frequency rates for both frames of reference and referents.

First, let us consider the result for frames of reference. As noted, the two parts of Manhattan can be distinguished by the street pattern regularities. If frames of reference are chosen relevant to the environmental characteristics, the use frequency of absolute frames of reference should be different between the two zones of Manhattan. Figure 7(c) demonstrates that this hypothesis holds true for Japanese tourist guides. However, the result for American guidebooks defies the prediction.

The most striking difference among referents can be seen for the "district." In all tourist guides, the frequency rates for the southern part exceeded those for the central part. It can be due to the difference in street pattern complexity. Consequently, as in the case of Boston, we can conclude that environmental characteristics influence the usage of linguistic information.

The case of Kyoto

Japanese and American tourist guides differed in the way they divide Kyoto into sections. Japanese guides divided up the city in detail using common names (Nishijin, Kitayama, Higashiyama), and then described each site within the area. However, American guides tended to use absolute directional categorization on the basis of four cardinal points from central Kyoto (eight cardinal points or common names were used accessorily). In other words, the American guides used an arbitrary categorization and did not employ Japanese place names. Since there were no clear borders among them, there is no way but to comply with their categorization.

Historically and morphologically, the street pattern of Kyoto is based on the urban planning of ancient Kyoto (Heian-kyo), which used a grid pattern. However, the address system is complicated because of the mixed existence of historically established block zoning and the more modern postal address system, which was constituted in Meiji-era (Hiraoka 1978). On account
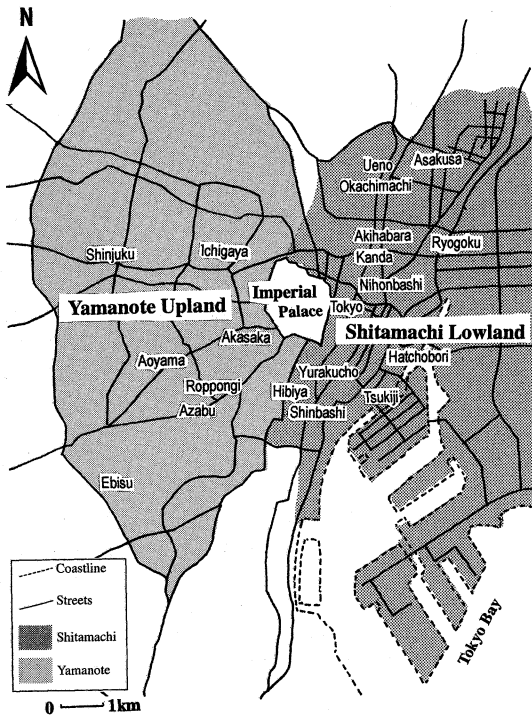
Figure 6. Map of central Tokyo with the segmented areas.

of this, it seemed not worth to make the detailed categorization in reference to Japanese guides. Therefore, a dichotomous sorting was employed for Kyoto. As indicated in Figure 5, one region is "central" (Raku-chu area) and the other is the "perimeter." Figures 7(e) and 7(f) indicate the predominance in use frequency rates of "perimeter" compared with those of "central," without reference to the publishing countries. As for use frequency rates of each frame of reference, Figure 7(e) clearly demonstrates the higher use frequency rate of intrinsic reference frame in the "perimeter" area. As with the case of Boston and New York city, this trend can be due to street pattern complexity.

As for the rates of referents, the rate of "traffic" was higher for Kyoto than for the other cities, and the rate was higher in the "perimeter" area than in the "central" area. This was a distinctive trend for Kyoto. Therefore, I investigated in more detail the sites which used the referents in their linguistic information and found that almost of all the sentences consisted of the route numbers of public transportation

systems or of route-based directional expressions. For example, "take bus No.205 or Toku 17 from Kyoto station (bus terminal) to the Kawaramachi-marutamachi-mae stop" (Lon.-K, p. 155). Kyoto depends heavily on the city bus as the primary means of transportation. Therefore it can be concluded that it is more effective to indicate the topological relationships of origins and destinations using bus stops and pathways than to describe their geographical relationships, and it forced a change in the way of describing relationships in the tourist guides.

The case of Tokyo

All tourist guides employed the historical names of given regions or station names for sectionalizing Tokyo, so this classification was adopted in the present study. However, especially in Japanese guides, the classifications were too finicky and made the numbers of sites for each group too small to be analyzed in a quantitative way. Also, some guides grouped together more than one region (e.g., Roppongi and Azabu). Therefore, taking care that the grouped regions were kept together, I divided the regions in two categories on the basis of street-pattern regularities. One is the Yamanote upland area, characterized by relatively non-regular streets because of many hills, and the other is the Shitamachi lowland area, consisting of old downtown Tokyo with relatively regular street patterns (Figure 6).

Figures 7(g) and 7(h) demonstrate that use-frequency rates were correlated with the degree of street pattern complexity. However, this result contradicted the ones for other cities, asserting that street pattern complexity does not always explain the degree in dependency of linguistic information. This tendency was seen without regard to publishing country. Therefore, it does not stem from socio-cultural differences in the way of expression, but from the environmental characteristics in Tokyo. We can not easily find the reason of this inconsistency. Perhaps, the spatial scale of Tokyo (which is much larger than the others) affected this result (see Figure 7). Each region in Tokyo bears comparison with the whole central areas of the others in square measure, which may make it difficult for the two areas to be com-
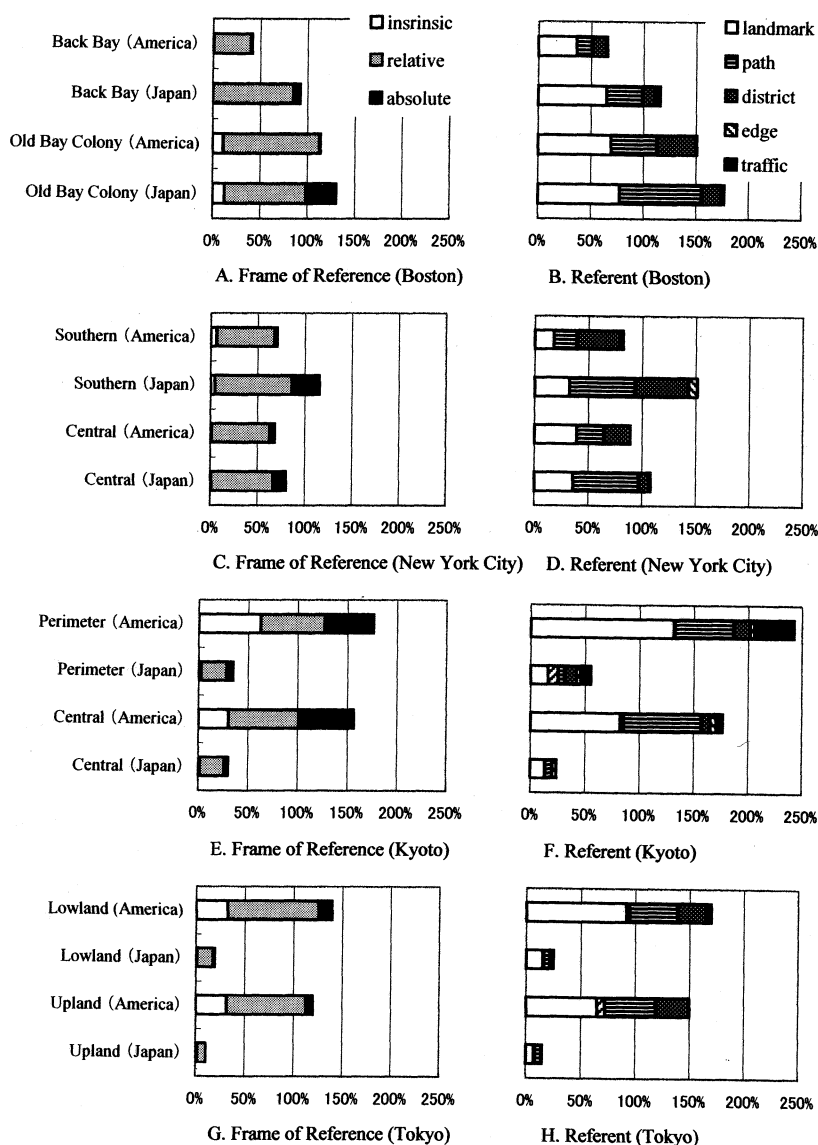
Figure 7.   Use frequencies of frames of reference and referents for each city.
(America: American guidebooks   Japan: Japanese guidebooks)

pared simply by street pattern.

Consequently, we can summarize the results in this chapter as follows. First, the results obtained from the cities except Tokyo generally indicated that there is an inverse relationship between the degree of regularity of street pattern and the quantity of spatial description by language demonstrating the street pattern complexity.

Second, the way of employing reference frames also varies in relation to street pattern complexity.   The more complicated expressions, with mixed use of frames of reference in addition to relative reference frames, tended to be employed in urban regions with relatively lower street pattern complexity. We can conclude the same for the usage of referents. In general, landmarks were the most fundamentally used referent type as asserted by Tversky and Taylor (1996). In addition, it became clear that the other referents were likely to be additionally employed in places with relatively

lower street pattern. In such a case, the expression can be significantly influenced by environmental characteristics such as the dependence of referents on public transportations in Kyoto (city bus) by American guides or in Boston (tram) by Japanese guides.

Concluding Remarks

The present study aimed to examine socio-cultural variations in spatial description by analyzing tourist guides as spatial information vehicles. The results obtained supported those of Suzuki (2001), who showed that Japanese guides are likely to depend heavily on visual devices such as maps and photos for communicating spatial information. The present study further demonstrates that American guides tend to rely more on linguistic means of communicating spatial information. Moreover, we found a large difference in the proportionate use of visual versus linguistic description between the two countries.

The qualitative and quantitative predominance of maps in the Japanese guides corresponds to the way of ordering each site in the body of the text. The use of map is correlated with actual locations of each site, rather than the category of business, because maps are devices to edit the sites based on their spatial proximity or unity. To give a certain direction with maps, it is justified to classify each site based on the criterion whether they fit into a given map. Hence, Japanese guides arrange spatial information primarily in reference to visual. This leads the maps in Japanese guides to contain many kinds of information of environmental features. Therefore, the descriptions of maps need to be sophisticated and fully colored, as we found.

In contrast, American guides depended basically on linguistic information. Hence, they do not necessarily describe the precise locations of each site, and all the information about the sites can be sorted in reference to their functional characteristics such as categories of business. Also, the maps in the guides tend not to contain a variety of environmental features, and they employed signs that are relatively simplified and highly abstract. This suggests they empha-

size route description and the sites' categories of business rather than their locations. In short, the style of expression in Japanese guides resembles survey maps, while that in American guides more resembles route maps.

Next, linguistic expressions that give directions were inescapably influenced by characteristics of representing environment. Hence, we should be aware of important differences between Japanese and Euro-American social schemata for ordering space. For instance, in using the expression of "Yokocho" and "Gai," Japanese guides intend to deal them with as districts. Therefore, use of a place name "Ameyoko" refers to the American district (JTB-T, p. 37), although it tends to be translated as Ueno-American "Arcade" or "Street" in English (Lon.-T, p. 150). In the same way, Japanese guides used the word "Gai" to communicate the meaning of street names such as "Fifth Avenue" in New York. Thus, we must consider whether given spatial categories used in different regions or social groups adequately point out the same referents or environmental features, if we intend to investigate spatial cognition in large-scale environment from a cross-cultural perspective (Berque 1982).

The present study also clarified that verbal spatial descriptions can be classified into typical sentence structures and environmentally-related ones, which tend to be added supportively. The results show that in order to construct spatial information properly, we should realize that generalized spatial description is sufficient in some situations. We should also take into account that environmental characteristics should be considered for constructing given spatial information in some situations. Clarification of these issues is necessary to understand the nature of comprehensible spatial representation.

Acknowledgement

Notes

1. For example, Stea et al. (1996) pointed out that (1) mapping behavior was investigated in one's childhood, (2) map-like forms have been used widely since the Old Stone Age, and (3) a map-like form goes into and exists in every culture, consequently proving that mapping abilities were culturally universal. A similar opinion is seen in Blaut (1991).
2. This concern is not special for the researcher studying cultural differences in spatial description by language over the probability of the Sapir-Wharf hypothesis. Herskovitz (1986) attempts to explain the structural category and usage of spatial description by use of ideal meaning and use type. Differences in categorization for specific languages were studied by Bowerman (1989) for Dutch, Talmy (1983) for Russian, Pederson (1995) for Tamil, and Vandeloise (1991) for French.
3. Although Lonely Planet Publications is an Australian publishing company, it was chosen because it was widely used throughout America and the two countries employ the same street based address system.

References

Allen, G. L. 2000. Principles and practices for communicating route knowledge. *Applied Cognitive Psychology* 14: 333–359.

Appleyard, D. 1970. Styles and methods of constructing a city. *Environment and Behavior* 2: 100–117.

Berque, A. 1982. *Vivre l'espace au Japon*. Paris: Presses Universitaires de France.

Blades, M. 1990. The reliability of data collected from sketch maps. *Journal of Environmental Psychology* 10: 327–339.

Blades, M., Blaut, J. M., Darvizeh, Z., Eluguea, S., Sowden, S., Soni, D., Spencer, C., Stea, D., Surajpaul, R., and Uttal, D. 1998. A cross-cultural study of young children's mapping abilities. *Transactions of the Institute of British Geographers, New Series* 23: 269–277.

Blaut, J. M., 1991. Natural mapping. *Transactions of the Institute of British Geographers, New Series* 16: 55–74.

Blaut, J. M. 1997. Children can. *Annals of the Association of American Geographers* 87: 152–158.

Blaut, J. M., McCleary Jr., G. S., and Blaut, A. S. 1970.

Environmental mapping in young children. *Environment and Behavior* 2: 335–349.

Bowerman, M. 1989. Learning a semantic system: What role do cognitive predispositions play? In *The Teachability of language*, ed. M. L. Rice et al., 133–169. Baltimore: Paul H. Brookes.

Brown, M. A., and Broadway, M. J. 1981. The cognitive maps of adolescents: Confusion about intertown distances. *Professional Geographer* 33(3): 315–325.

Dennis, M., Pazzaglia, F., Cornoldi, C., and Bertolo, L. 1999. Spatial discourse and navigation: An analysis of route directions in the city of Venice. *Applied Cognitive Psychology* 13: 145–174.

Downs, R. M., and Liben, L. S. 1991. The development of expertise in geography: A cognitive developmental approach to geographic education. *Annals of the Association of American Geographers* 81: 304–327.

Downs, R. M., and Liben, L. S. 1993. Mediating the environment: Communicating, appropriating, and developing graphic representations of place. In *Development in context: Acting and thinking in specific environments*, ed. R. H. Wozniak and K. Fischer, 155–181. Mahwah: Lawrence Erlbaum Associates.

Downs, R. M., and Liben, L. S. 1997. Can-ism and Can'tianism: A straw child. *Annals of the Association of American Geographers* 87: 159–167.

Evans, G. W., Marrero, D. G., and Butler, P. A. 1981. Environmental learning and cognitive mapping. *Environment and Behavior* 13: 83–104.

Freundschuh, S. M., and Blades, M. 1998. Put the house NEXT to the lake and FAR from the water tower: The development of locative understanding in large- and small-scale model spaces. *Paper presented at the Annual Meeting of Association of American Geographers*, Boston.

Gladwin, T. 1970. *East is a big bird: Navigation and logic on Puluwat Atoll*. Cambridge: Harvard University Press.

Golledge, R. G., and Stimson, R. J. 1997. *Spatial Behavior*. New York: Guilford Press.

Hart, R. A. 1981. Children's spatial representation of the landscape: Lessons and questions from a field study. In *Spatial representation and behavior across the life span*, ed. L. S. Liben, A. H. Patterson and N. Newcombe, 194–233. Academic Press.

Herskovitz, A. 1986. *Language and spatial cognition*. Cambridge: Cambridge University Press.

Hiraoka H. 1978. Jukyo hyoji sisutemu to toshi kozo. *Comprehensive Urban Studies* 30: 111–126. (J)

Hisatake T. 1978. Sunae-chizu to iwae-chizu. *Konan-Daigaku Kiyo* 32: 37–99. (J)

Imai M. 2000. Rethinking the Sapir-Whorf hypothesis: Role of language in shaping thought. *The Japanese Journal of Psychology* 71: 415–433. (JE)

Irwin, C. 1984. Inuit navigation, empirical reasoning and survival. *The Journal of Navigation* 38: 178–

190.

Jinnai H. 1985. *Tokyo no kukan jinrui gaku.* Tokyo: Chikuma Shobo. (J)

Koolhaas, R. 1978. *Delirious New York.* New York: Oxford University Press.

Kovach Jr., R. C., Surrette, M. A., and Aamodt, M. G. 1988. Following informal street maps: Effects of map design. *Environment and Behavior* 20: 683–699.

Levinson, S. C. 1996. Frames of reference and Molyneux's question: Crosslingustic evidence. In *Language and space.* eds. P. Bloom, M. A. Peterson, L. Nadel, and M. F. Garrett, 109–169. Cambridge: MIT Press.

Lewis, D., and George, M. 1991. Hunters and herders: Chukchi and Siberian Eskimo navigation across snow and frozen sea. *The Journal of Navigation* 44: 1–10.

Lynch, K. 1960. *The image of the city.* Cambridge: MIT Press.

MacEachren, A. M. 1995. *How maps work: Representation, visualization, and design.* New York: The Guilford Press.

Mark, D. M., and Egenhofer, M. J. 1994. Modeling spatial relations between lines and regions: Combining formal mathematical models and human subjects testing. *Cartography and GIS* 21: 195–212.

Milgram, S., and Jodelet, D. 1976. Psychological maps of Paris. In *Environmental psychology: People and their physical settings,* ed. H. M. Proshansky, W. H. Ittelson, and L. G. Rivlin, 104–124. Holt, Rinehart and Winston.

Omura K. 1995. Topographical Acumen and subsistence in Netsilik Inuit society: The relation between subsistent activity and cognitive organization. *Proceedings of the 9th International Abashiri Symposium*: 69–90. (JE)

Pederson, E. 1995. Language as context, language as means: Spatial cognition and habitual language use. *Cognitive Linguistics* 6(1): 33–62.

Pocock, D. C. D. 1976. Some characteristics of mental maps: An empirical study. *Transactions of the Institute of British Geographers, New Series* 1: 493–512.

Rovine, M. J., and Weisman, G. D. 1989. Sketch-map variables as predictors of wayfinding performance. *Journal of Environmental Psychology* 9: 217–232.

Sowden, S., and Blades, M. 1996. Children's and adult's understanding of the locative prepositions 'next to' and 'near to.' *First Language* 16: 287–299.

Stea, D., Blaut, J. M., and Stephens, J. 1996. Mapping as a cultural universal. In *The construction of cognitive maps,* ed. J. Portugali, 345–360. Dordrecht: Kluwer Academic Publishers.

Suzuki K. 2000. Note on the development of mapping abilities: Controversy between nativism and constructivism. *Human Geography* 52: 385–399. (JE)

Suzuki K. 2001. A cross-cultural comparison of cartographic communication with maps in tourist guide books. *Maps* 39(3): 10–17. (J)

Talmy, L. 1983. How language structures space. In *Spatial orientation: Theory, research and application,* ed. P. Herbert and L. Acredolo, 225–282. Plenum Press.

Taylor, H. A., and Tversky, B. 1996. Perspectives in spatial description. *Journal of Memory and Language* 35: 371–392.

Vandeloise, C. 1991. *Spatial prepositions: A case study from French.* Chicago: University of Chicago Press.

Vanetti, E. J., and Allen, G. L. 1988. Communicating environmental knowledge: The impact of verbal and spatial abilities on production and comprehension of route directions. *Environment and Behavior* 20: 667–682.

Ward, S. L., Newcombe, N., and Overton, W. F. 1986. Turn left at the church, or three miles north: A study of direction giving and sex difference. *Environment and Behavior* 18: 192–213.

Whitehill, W. M. 1959. *Boston: A topographical history.* Cambridge: The Belknap Press of Harvard University Press.

Yamano M. 1985. Spatial perception of children: A comparative study of Sri Lanka and Japan. In *Kodomo bunka no genzo,* ed. K. Iwata, 37–63. Tokyo: NHK Press. (J)

(J): written in Japanese
(JE): written in Japanese with English abstract

Appendix: List of the guide book

city	abbre-viation	guidebooks
Kyoto	JTB-K	Shimojima, T. 2000. *JTB poketto gaido 42 Kyoto*. JTB Press.
	Sho.-K	Nishimura, M. 2001. *Earia mappu tabi okoku 29 Kyoto*. Shobunsha.
	Jit.-K	Buru-gaido nippon hensyubu. 2000. *Buru-gaido nippon 27 Kyoto*. Jitsugyo no Nihon sya.
	Fod.-K	Cashion, D. S. 2000. *Fodor's updated edition*. Fodor's Travel Publications.
	Fro.-K	Reiber, B. 2000. *Frommer's Japan*. IDG Books Worldwide Inc.
	Lon.-K	Florence, M. 1999. *Lonely planet Kyoto*. Lonely Planet Pubcations.
Tokyo	JTB-T	Rurubusha. 2000. *JTB pokettogaido 15 Tokyo*. JTB Press.
	Sho.-T	Tainihon Insatsu CDC jigyobu. 2000. *Earia mappu tabi okoku 12 Tokyo*. Shobunsha.
	Jit.-T	Burugaido nippon hensyubu. 1999. *Burugaido nippon 10 Tokyo*. Jitsugyo no Nihonsha.
	Fod.-T	Cashion, D. S. 2000. *Fodor's updated edition Japan*. Fodor's Travel Publications.
	Fro.-T	Reiber, B. 1998. *Frommer's Tokyo*. Macmillan.
	Lon.-T	Rowthorn, C., and Taylor, C. 1998. *Lonely Planet Tokyo*. Lonely Planet Publications.
New York	JTB-N	Kanbe, T. 2000. *JTB no poketto gaido 139 New York*. JTB Press.
	Sho.-N	Tsugami, K. 1994. *Earia gaido 115 New York*. Shobunsha.
	Jit.-N	Saruya, K., Yamamoto, H., and Roth, Y. N. 1999. *Burugaido wa-rudo 20 Nyu-Yoku Amerika tobu*. Jitsugyo no Nihonsha.
	Fod.-N	Adler, S., and Wolf, S. 2001. *Fodor's New Edition U.S.A*. Fodor's Travel Publications.
	Fro.-N	Doty, D., Baker, C., DeSimon, S., and Andrusia, D. 1999. *Frommer's 99 New York City*. Macmillan.
	Lon.-N	Ellis, D. 1997. *Lonely Planet New York City*. Lonely Planet Publications.
Boston	JTB-B	Rurubusha kaigai gaido bukku henshubu. 2001. *JTB no poketto gaido 115 Amerika higashi-kaigan*. JTB Press.
	Sho.-B	Owaki, Y. 1990. *Earia gaido 103 Amerika higashi-kaigan*. Shobunsha.
	Jit.-B	Saruya, K., Yamamoto, H., and Roth, Y.N. 1999. *Buru-gaido wa-rudo 20 Nyu-Yoku Amerika higashi-kaigan*. Jitsugyo no Nihon sya.
	Fod.-B	Adler, S., and Wolf, S. 2001. *Fodor's New Edition U.S.A*. Fodor's Travel Publications.
	Fro.B	Morris, M. 2001. *Frommer's Boston 2001*. IDG Books Worldwide.
	Lon.-B	Grant, K. 2000. *Lonely Planet Boston. Lonely Planet Publications*.