

Systematizing Public Signage Systems for Smooth Urban Pedestrian Movement

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Abstract

While it is common for landscaped and well-marked urban streets to have sufficient identification signs, which display place or street names, they often face issues regarding the provision of information (e.g., in sign placement) and inadequate orientation signs, which play an indispensable role in facilitating pedestrian movement. Insufficient signage can be partially addressed by supplementing signs with non-informational urban elements, such as streetlights or other urban features that provide different sorts of information. In order to result in smooth urban pedestrian movement, public signage systems require a balance between districts and streets and a system for presenting linked information. This study proposes that an urban element design system can be applied to the construction of public signage systems for pedestrians. There are several methods by which to accomplish this; each fulfills the needs of different districts and streets. For example, some strategies suggest ways to integrate information in areas with many urban elements, such as public signage, while others offer strategies for adding pedestrian signs and other elements alongside vehicular signs in areas with insufficient information. This article proposes a distribution graph of public signage as a concrete method for organizing the construction of public signage. Such a distribution graph is a way to visualize different distributions of sign type, and see clusters of street patterns. It is an effective way not only to planning new pedestrian signage systems, but also for revising plans with biased or insufficient signage distribution.

Keywords: Public signage system, Public Design.

1. Aim and Methods

Japan has recently seen the implementation of pedestrian signage plans as a means of urban development. However, streets are lined with various signs not aimed at pedestrians, such as those for traffic control. This study focused on the distribution of public street signs by type and how they relate to street structure and nearby environments. The aim is to propose a method for constructing a pedestrian public sign system that supports the smooth movement of pedestrians in the city, including the use of public signs installed for control purposes.

I selected three major streets in downtown Fukuoka with similar specifications but different nearby environments and development situations. The distribution of public signs by type was surveyed on-site. Streets were divided into 14 sections, with intersections and installation roads within walking distance (ca. 100–200 m). I then analyzed the relation between the distribution of public signs by type and each section's road structure and nearby environment. Public signs were categorized into three types: pedestrian, motorist, and dual (pedestrian and motorist). For the distribution quantities

by type, I quantified the number of signs (signs/100 m) to compare streets and sections.

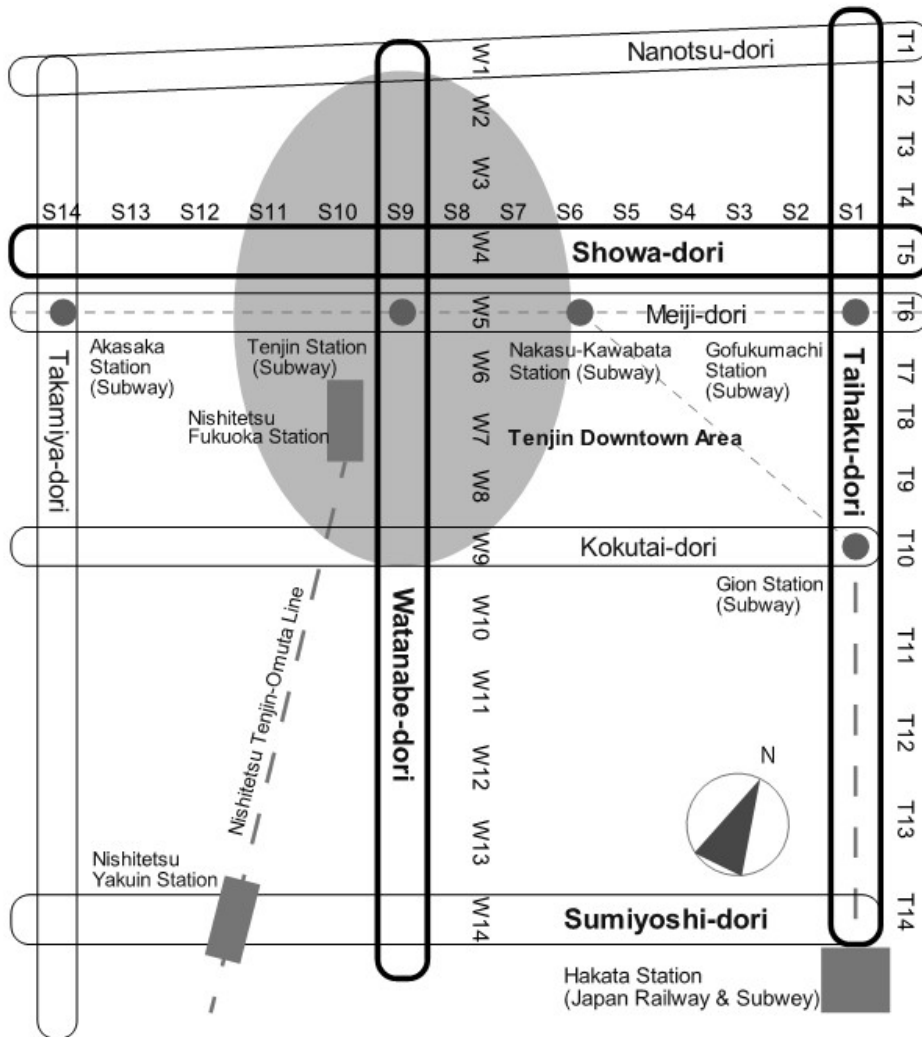


Figure 1 Schematic diagram of surveyed streets

- Watanabe-dori: extension: 1,750 m; width: 50 m (sidewalk width: 10 m; 4 traffic lanes on each side); “Green Promenade” completed
- Taihaku-dori: extension: 1,994 m; width: 47–50 m (sidewalk width: 10 m; 4 traffic lanes on each side); “Symbol Road: Historical Promenade” completed
- Showa-dori: extension: 2,014 m, width: 36–50 m (sidewalk width: 6–10 m; 3–4 traffic lanes on each side); townscape development to be completed

2. Results

2.1. Distribution of All Information Types

Table 1 shows the types and average number of signs on the three streets.

Table 1. Surveyed types and average number of public signs

Way to use	Classification	Type	Watanabe-dori	Taihaku-dori	Showa-dori		
Pedestrians' information	Geographic information	Orientation signs		2.02	2.50	1.25	
			City block guide board (plate)	0.22	0.47	0.11	
			Orientation sign for pedestrians	0.05	0.13	0.06	
			Travel guide board (plate)	0.17	0.33	0.03	
				0.00	0.02	0.02	
		Identification signs		1.39	1.94	1.04	
			Japanese addressing system board	0.50	0.99	0.80	
			Streetlight incidental display place	0.34	0.00	0.05	
			Electric pole incidental display place	0.00	0.00	0.06	
			Call box incidental display place	0.08	0.16	0.13	
			Streetlight incidental avenue name	0.47	0.80	0.00	
		Other signs		0.41	0.09	0.11	
			Subway entrance	0.34	0.03	0.05	
			Bicycle parking lot guide sign	0.03	0.00	0.03	
			Direction of the restroom	0.00	0.06	0.02	
			Administrative border sign	0.00	0.00	0.02	
		Traffic information	Taxi stop signs		0.79	0.67	0.77
					0.13	0.08	0.03
				Taxi stand guide sign	0.04	0.03	0.00
	Taxi stand identification sign			0.09	0.05	0.03	
	Bus stop signs			0.45	0.36	0.72	
			Bus stop guide sign	0.05	0.02	0.08	
			Bus stop name sign (ride dedicated)	0.37	0.28	0.60	
			Bus stop name sign (getting off dedicated)	0.02	0.06	0.05	
	Subway entrance signs			0.10	0.24	0.02	
	Railway station signs			0.11	0.00	0.00	
			Train stop guide sign	0.09	0.00	0.00	
		Train stop name sign	0.02	0.00	0.00		
	Traffic and behavior management information	Traffic management information/signs		2.45	2.14	2.11	
			Pedestrian and bicycle zone	0.40	0.44	0.33	
			Pedestrian crossing prohibited	0.35	0.37	0.33	
			Pedestrian crossing prohibited	0.05	0.06	0.00	
		Traffic management information/pedestrian traffic signal	1.56	1.70	1.68		
		Behavior management information/signs		0.49	0.00	0.09	
			Littering prohibited	0.05	0.00	0.03	
			Bicycle left prohibited area	0.43	0.00	0.06	
			0.36	1.03	0.13		
	Other public information	Notice board	0.09	0.00	0.05		
		Friendship city guide	0.27	0.72	0.00		
		History-related signs		0.00	0.31	0.08	
			Historical promenade	0.00	0.28	0.00	
			Historical stone monument	0.00	0.03	0.08	
	Motorists' information	Geographic information		6.90	5.73	6.97	
			Orientation signs		0.99	0.68	0.99
				Direction sign	0.74	0.67	0.89
				Prominent place	0.13	0.14	0.08
				Prominent place	0.55	0.48	0.75
Direction of highway entrance				0.07	0.05	0.06	
Avenue identification signs				0.02	0.02	0.00	
			Japan national route number	0.02	0.00	0.00	
			Prefectural route number	0.00	0.02	0.00	
Parking signs				0.23	0.00	1.00	
			Orientation sign for parking	0.08	0.00	0.02	
		Direction sign for parking	0.11	0.00	0.06		
		Parking entrance	0.03	0.00	0.02		
Traffic and behavior management information		Traffic management information/signs		5.91	5.05	5.98	
				4.58	3.57	4.42	
			Traffic regulatory sign	3.85	3.04	3.88	
			Wheel stopper sign	0.70	0.53	0.51	
			Road condition information	0.04	0.00	0.03	
		Traffic management information/automotive traffic signal	1.28	1.48	1.53		
		Behavior management information/signs: No parking area	0.05	0.00	0.03		
		0.76	1.14	1.07			
Dual (Pedestrians' and motorists') information	Geographic information		0.17	0.37	0.46		
		Direction of the facilities	0.02	0.13	0.08		
		Common name of the avenue	0.15	0.22	0.38		
	Traffic management information		0.19	0.25	0.05		
		Intersection	0.19	0.08	0.05		
		Bicycle crossing zone	0.00	0.08	0.00		
		Pedestrian and bicycle crossing zone	0.00	0.09	0.00		
	Disaster information	Fire hydrant	0.39	0.55	0.57		
	Total of the average of the number installed according to the avenue			13.27	13.22	12.29	
	Numeric value is the average distribution number of installed signs according to the avenue (number installed/100m, the second decimal place rounded).						

The average number of signs for all information types on Watanabe-dori was 13.27 signs/100 m (5.62 pedestrian, 6.90 motorist, 0.76 dual). While there was a large distribution of pedestrian information in the downtown section around Tenjin (ca. 10 signs/100 m or more), surpassing that of motorist signs, it decreased (ca. 4 signs/100 m or more) when moving away from downtown. Motorist information had a fairly regular distribution (ca. 5 signs/100 m) across all segments.

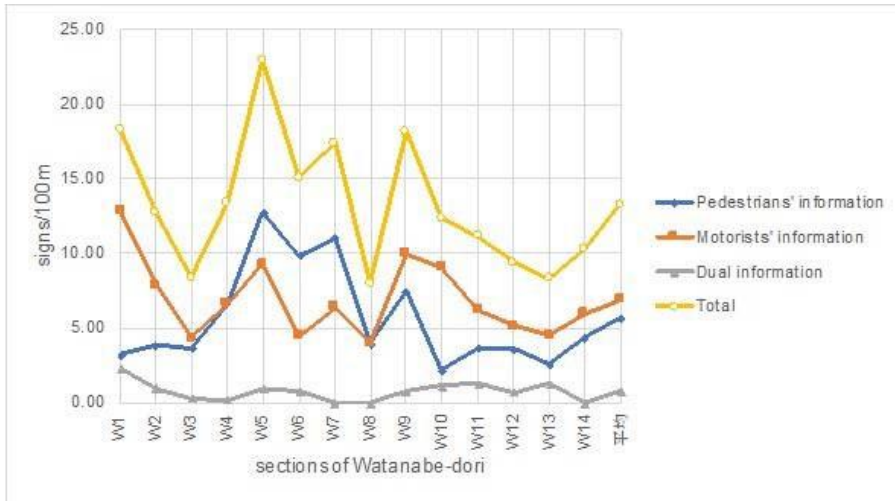


Figure 2-1. Number of public signs by type, Watanabe-dori

On Taihaku-dori, the average number of signs for all information types was 13.22 signs/100 m (6.34 pedestrian, 5.73 motorist, 1.14 dual). The pedestrian average was higher than the motorist average, with both pedestrian and motorist signs tending to cluster around sections intersecting with major roads.

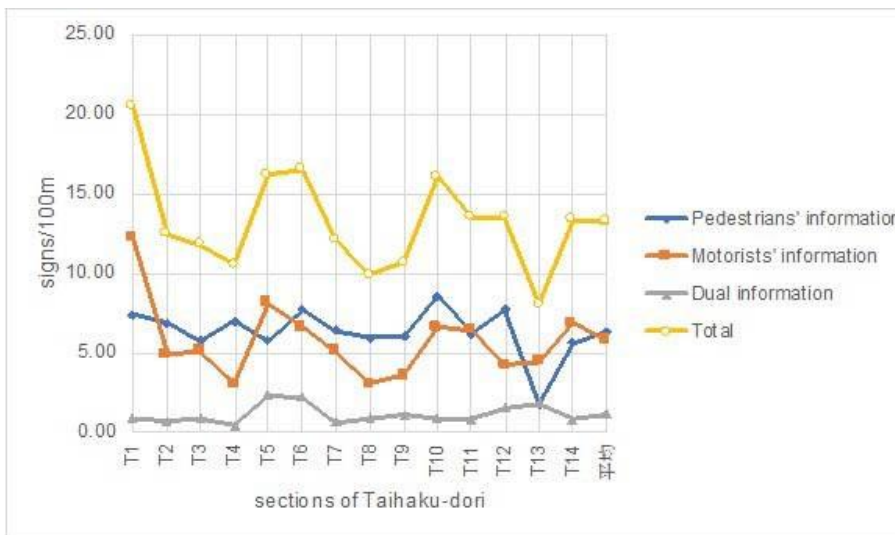


Figure 2-2. Number of public signs by type, Taihaku-dori

The average number of signs for all information types on Showa-dori was 12.29 signs/100 m (4.52 pedestrian, 6.97 motorist, 1.07 dual). There was a low distribution of pedestrian information, and motorist information was more prevalent in almost all segments. Distribution was especially high in segments S7–S10 close to Tenjin and in sections intersecting with major roads.

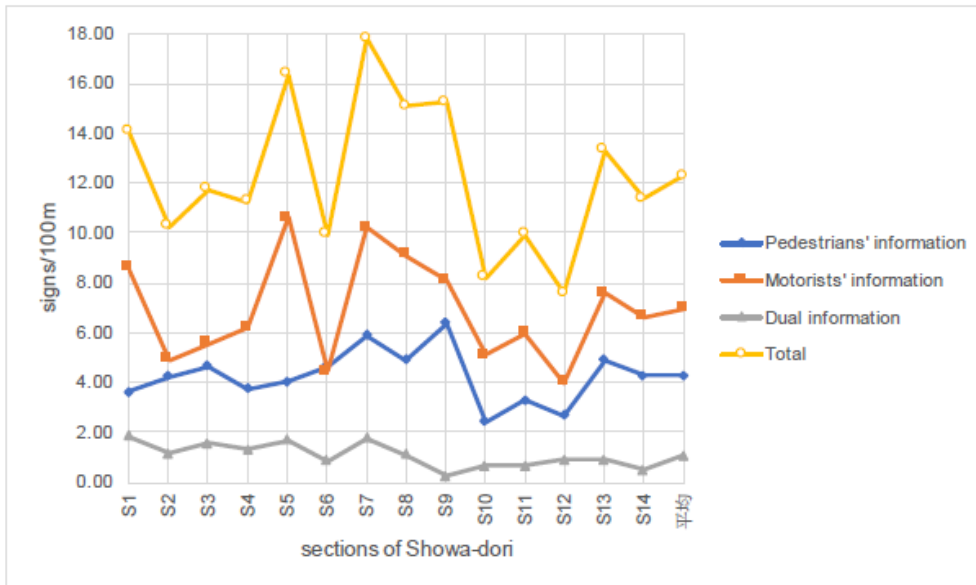


Figure 2-3. Number of public signs by type, Showa-dori

2.2. Distribution of Pedestrian Information

On Watanabe-dori, the types of pedestrian information concentrated around the Tenjin downtown area included geographic (ca. 2–7 signs/100 m), transportation (ca. 1–3 signs/100 m), and public (ca. 2 signs/100 m or less) information. Traffic and behavior management information tended to be concentrated in sections intersecting with major roads (ca. 4 signs/100 m).

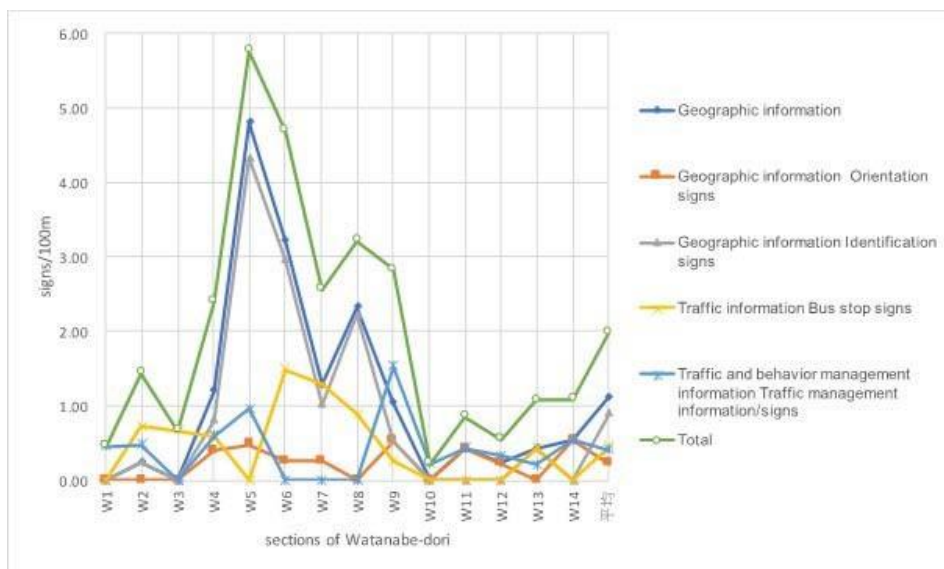


Figure 3-1. Pedestrian sign distribution, Watanabe-dori (by section)

On Taihaku-dori, geographic information was prevalent in sections T1–T6 (ca. 3–5 signs/100 m), while transportation and public information were extremely scarce (ca. 0.5 signs/100 m or less). Meanwhile, in the area between T7 and Hakata Station, geographic information decreased (ca. 1–2 signs/100 m) while transportation and public information increased.

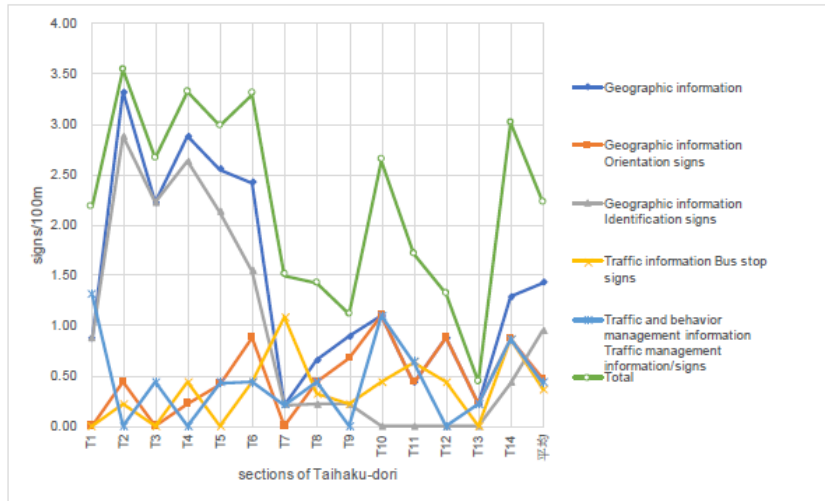


Figure 3-2. Pedestrian sign distribution, Taihaku-dori (by section)

On Showa-dori, the overall number of signs was low. Geographic (ca. 1–3 signs/100 m) and public transport (ca. 1–3 signs/100 m) information was concentrated in the Tenjin downtown area while a small number of public information signs were distributed in a few locations. Traffic and behavior management information signs tended to concentrate around intersections (ca. 3 signs/100 m).

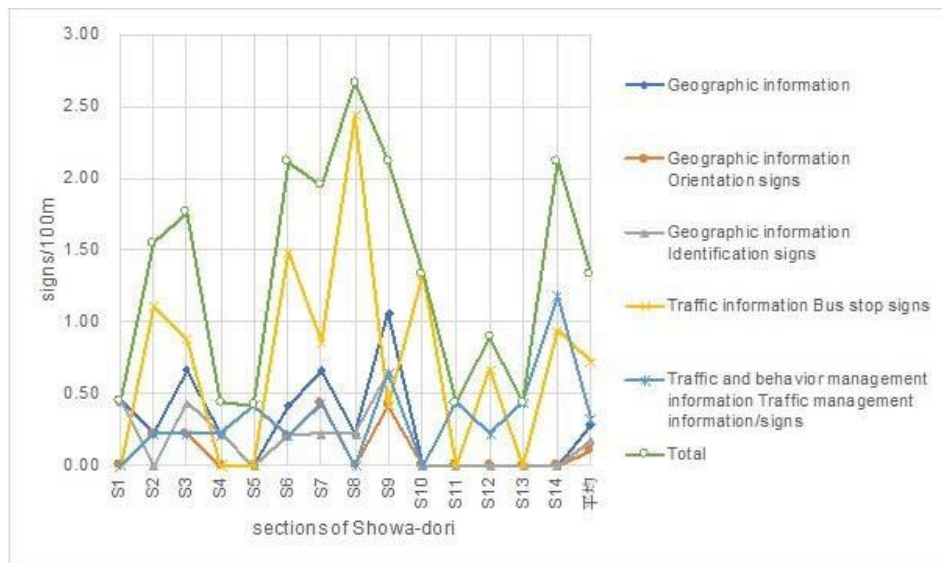


Figure 3-3. Pedestrian sign distribution, Showa-dori (by section)

Figure 3 shows the distribution of pedestrian signs by section, excluding those limited to particular sections (e.g., information about taxis).

(1) Signs with Geographic Information for Pedestrians

On Watanabe-dori, the concentration of site identification signs has a significant effect on the Tenjin downtown area. Area and street signs on street lamps are especially numerous. Areas further away from downtown have less geographic information because of the scarcity of site identification information on street lamps. Orientation signs were evenly distributed, appearing only slightly more frequently in sections intersecting with major roads (ca. 0.5 signs/100 m).

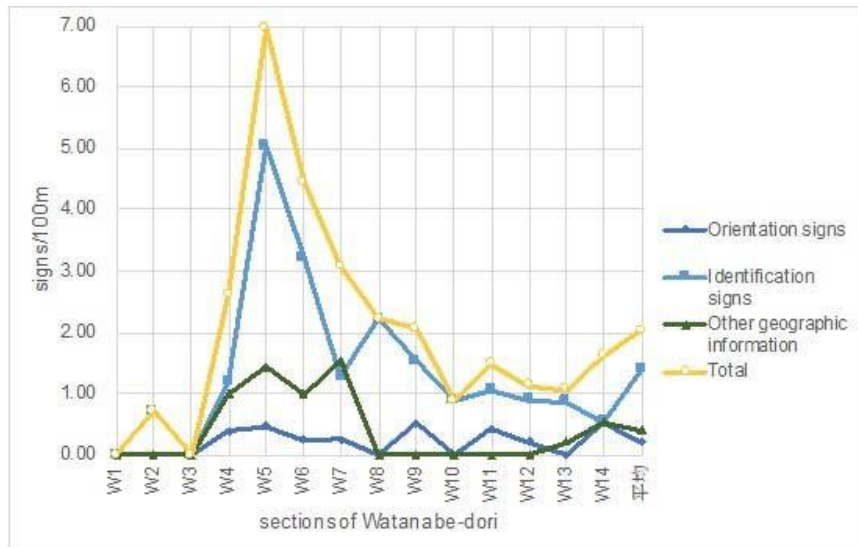


Figure 4-1. Pedestrian geographic information sign distribution, Watanabe-dori (by type)

Sections T1 and T6 of Taihaku-dori had a concentration of geographic information, consisting mostly of site identification signs, with street signs on street lamps comprising the majority. Meanwhile, there were no identification signs on street lamps beyond T7, halving the amount of geographic information in those areas. Orientation signs were concentrated in sections intersecting with major roads (ca. 1 sign/100 m).

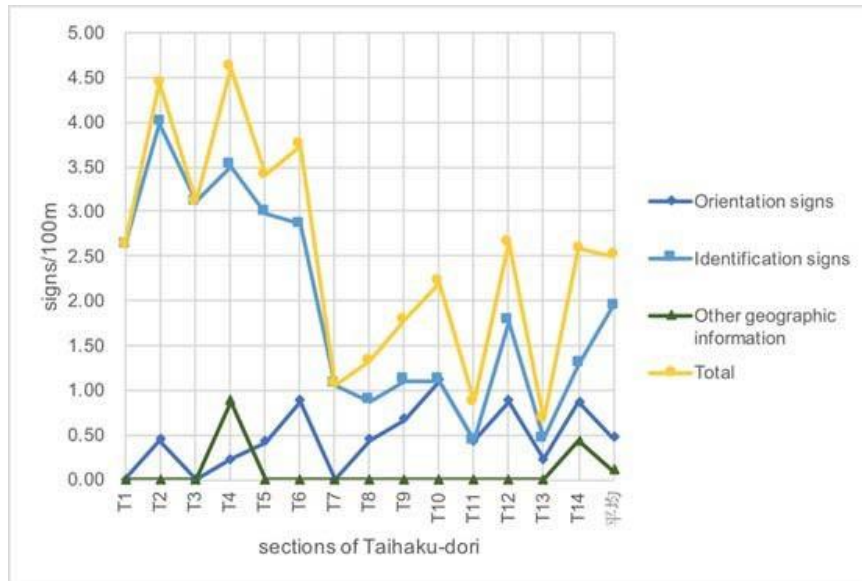


Figure 4-2. Pedestrian geographic information sign distribution, Taihaku-dori (by type)

Though the overall number of signs on Showa-dori was low, many were present in the S9 section in the Tenjin downtown area. Most site identification signs were address board distributed mostly evenly along the other two streets. Meanwhile, identification signs on street lamps and elsewhere were scarce. Orientation signs were only found between T1 and T9 (ca. 0.2–0.5 signs/100 m).

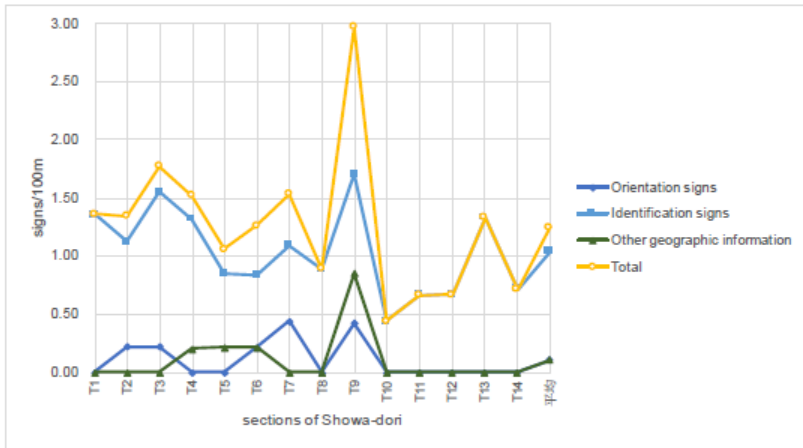


Figure 4-3. Pedestrian geographic information sign distribution, Showa-dori (by type)

(2) Signs with Transportation Information for Pedestrians

Watanabe-dori has a concentration of public transportation, with a high distribution of transportation information—especially in the Tenjin downtown area—and bus stop signs in sections W2–W8 (0.6–1.5 signs/100 m). Taihaku-dori has subway stations, with a concentration of public information in the section intersecting with major roads (T6–T7, T10–T12) and a mostly even distribution of bus stop signs (ca. 0.2–1.0 signs/100 m). On Showa-dori, bus stop signs were fairly frequent around the Tenjin downtown area (ca. 1.5–2.5 signs/100 m) but were sparsely distributed in other sections. Taxi signs were distributed only in sections with designated taxi stops.

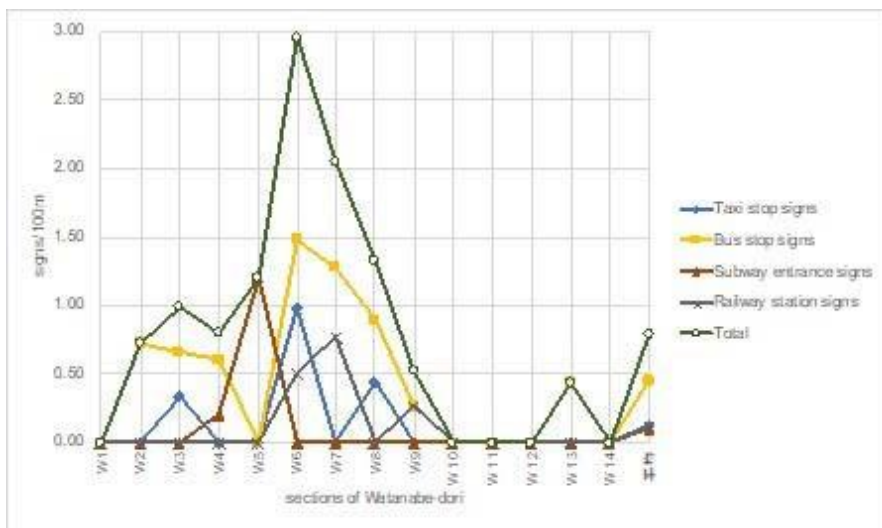


Figure 5-1. Pedestrian transportation information sign distribution, Watanabe-dori (by type)

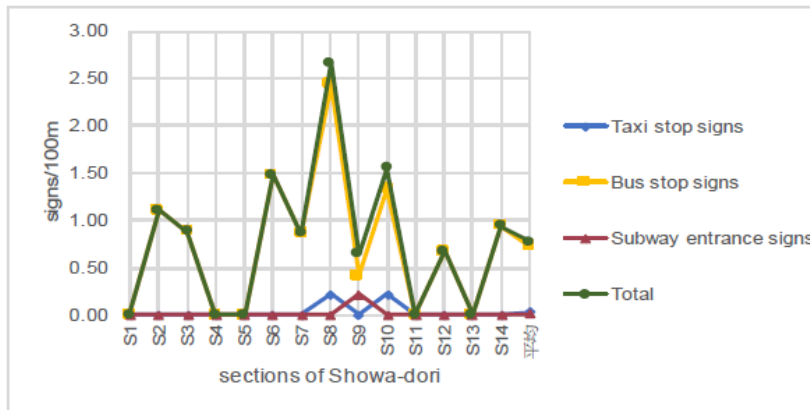


Figure 5-2. Pedestrian transportation information sign distribution, Taihaku-dori (by type)

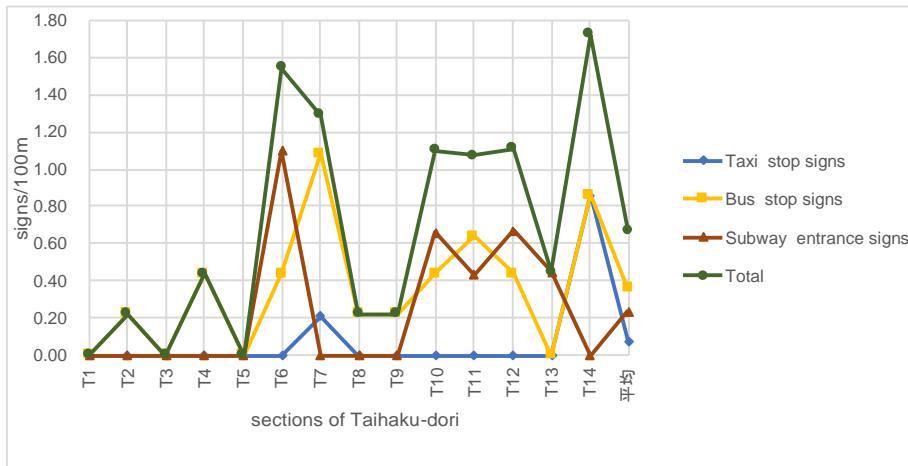


Figure 5-3. Pedestrian transportation information sign distribution, Showa-dori (by type)

(3) Signs with Traffic and Behavior Management Information for Pedestrians

On all three streets, pedestrian traffic lights (Watanabe-dori average: 1.56 signs/100 m; Taihaku-dori: 1.7 signs/100 m; Showa-dori: 1.68 signs/100 m) made up 50–80% of pedestrian control information (Watanabe-dori average: 2.45 signs/100 m; Taihaku-dori: 2.14 signs/100 m; Showa-dori: 2.11 signs/100 m). These were concentrated around intersections with major roads, as with traffic management signs. There was a high distribution of no-bicycle-parking signs around the Tenjin downtown areas of Watanabe-dori and Showa-dori (ca. 0.2–0.7 signs/100 m).

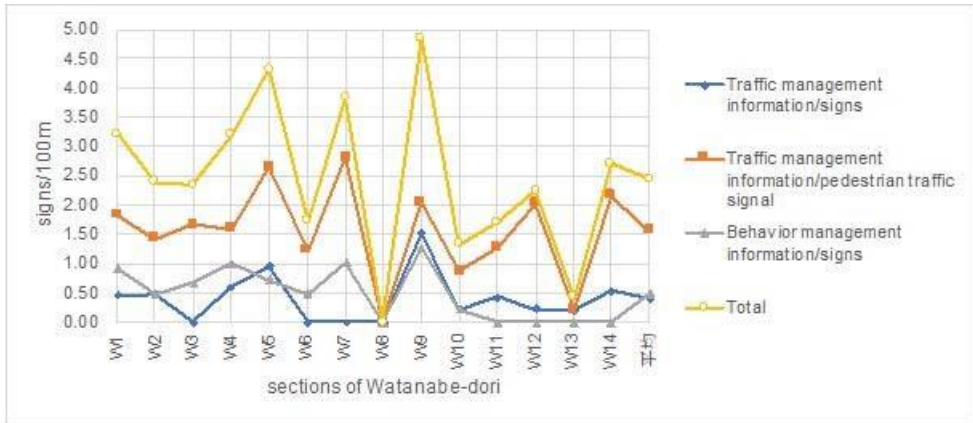


Figure 6-1. Pedestrian traffic and behavior management information sign distribution, Watanabe-dori

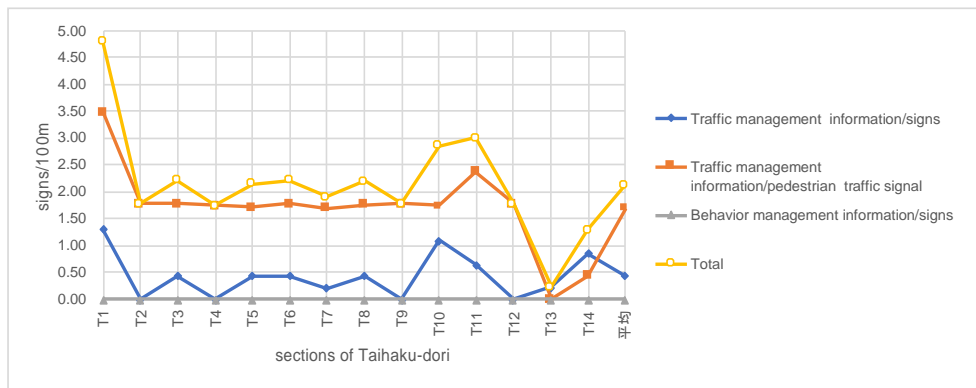


Figure 6-2. Pedestrian traffic and behavior management information sign distribution, Taihaku-dori

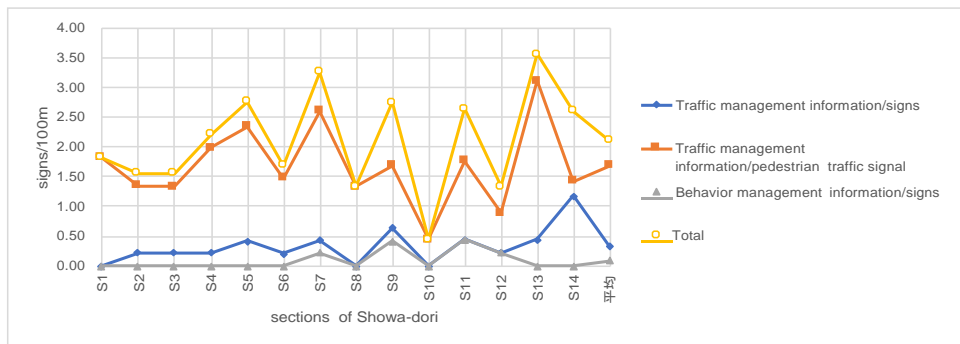


Figure 6-3. Pedestrian traffic and behavior management information sign distribution, Showa-dori

(4) Signs with Public Information for Pedestrians

Public information was concentrated (ca. 2 signs/100 m) in particular sections (e.g., friendship city guides around the Nishitetsu Fukuoka Station area of Watanabe-dori) or was mostly evenly distributed (ca. 0.2–0.7 signs/100 m) along historical promenades, such as Taihaku-dori, in the form of history-related signs.

2.3. Signs for Motorists

On all three streets, motorist information was concentrated in sections intersecting with major roads. Control information in particular tended to be concentrated in those sections (compared to other sections, they differed by ca. 5–8 signs/100 m). Geographic information was also somewhat highly distributed (ca. 1–2 signs/100 m) in sections intersecting with major roads, but they did not differ significantly from other sections.

(1) Signs with Geographic Information for Motorists

On all three streets, orientation signs were prevalent in sections intersecting with major roads (ca. 0.8–2 signs/100 m), with a high ratio of signs identifying important sites and a low ratio indicating directions (ca. 0.2 signs/100 m). Moreover, there was a high distribution (ca. 0.5 signs/100 m) of parking signs in the Tenjin downtown area, where there is a concentration of public parking spaces.

(2) Signs with Traffic and Behavior Management Information for Motorists

On all three streets, traffic control signs comprised more than 80% of traffic management information signs, concentrated in sections intersecting with major roads (ca. 4–8 signs/100 m along Watanabe-dori and Taihaku-dori; ca. 5.0–7.5 signs/100 m along the Nakasu–Tenjin section of Showa-dori). Motorist traffic lights were mostly evenly distributed (ca. 1.0–1.5 signs/100 m) along all three streets.

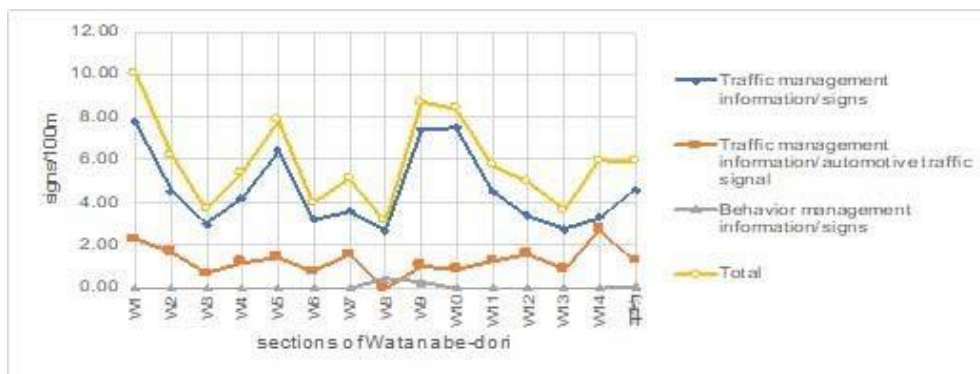


Figure 7-1. Motorist traffic and behavior management information sign distribution, Watanabe-dori

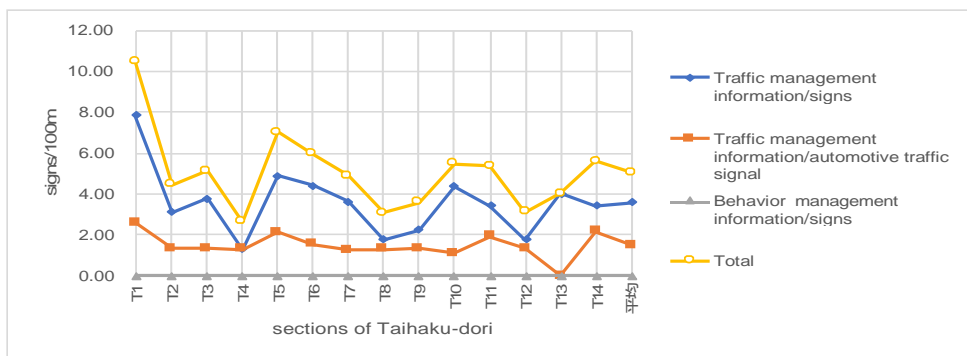


Figure 7-2. Motorist traffic and behavior management information sign distribution, Taihaku-dori

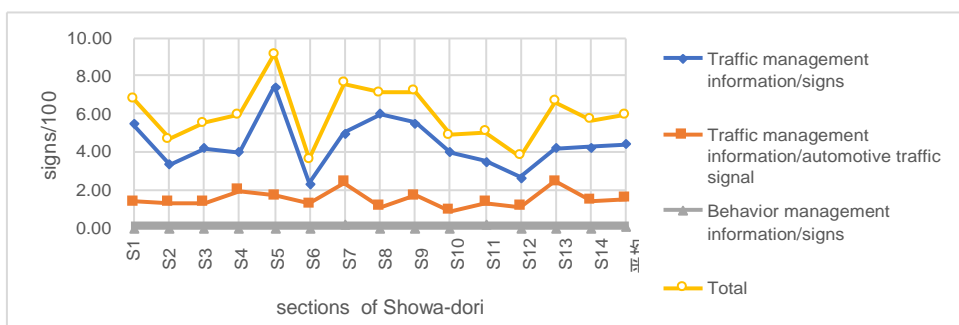


Figure 7-3. Motorist traffic and behavior management information sign distribution, Showa-dori

(3) Signs for Both Pedestrians and Motorists

Geographic information for both pedestrians and motorists mainly consisted of street name signs. On Taihaku-dori in particular, geographic information had a distribution of ca. 0.5–1.0 signs/100 m in all sections, meaning every other section. Similarly, the distribution in nine sections on Showa-dori was 0.2–1.0 signs/100 m. There were few directions to facilities. Dual traffic management information, such as pedestrian crossing signs, consisted mainly of pedestrian crossing signs for installation roads on all three streets. Fire hydrant signs comprised half of the dual information signs and had a distribution of ca. 0.2–1.0 signs/100 m on all streets.

Due to space limitations, graphs for pedestrian information and motorist management information relevant to the creation of a pedestrian public sign system can be found in Figures 4–7.

3. Method for Constructing a Pedestrian Public Sign System

3.1. Analysis and Discussion

(1) Effects of Townscape Development with Regard to Pedestrian Information

Compared to Show-dori, whose townscape development was delayed, Watanabe-dori and Taihaku-dori had higher distributions of pedestrian information. This suggests that townscape development makes streets more suitable for pedestrian use. In particular, Taihaku-dori, which was developed as the Symbol Road of Fukuoka, systematically includes pedestrian information that considers pedestrian–motorist dual use and has a high level of organized motorist information.

(2) Possible Combined Use of Orientation and Site Identification Signs

Even streets with townscape development had a low distribution of orientation signs, which are important for pedestrian movement. In sections intersecting with major roads, there was one sign every 200 m. In other sections, the distance between signs was 450 m or greater, which exceeds the distance one can walk without feeling insecure (200 m).

Overall, there were not enough orientation signs. Even so, there was a high distribution of area and street name signs, the majority being attached to streetlamps and similar objects. In some places, there was one sign every 40 m (distance between streetlamps), indicating that the combined use of nonsign installations can effectively compensate for a lack of specialized signs. Therefore, we should also consider combined use with orientation signs.

(3) Possible Dual Use of Orientation and Other Public Signs

One possible way to compensate for the lack of orientation signs is the dual use of other public signs. Though pedestrian–motorist dual use signs were observed, they mainly consisted of street name and fire hydrant signs, and there was no dual use of orientation signs. Since there are already other public signs with similar distributional features placed around intersections and public transportation facilities (where people change movement behaviors), they could be dually used as orientation signs. Since public signs and orientation signs transmit information differently, an effective approach would be to aggregate, substitute, or equip existing signs rather than combine

them.

Public signs are concentrated around intersections. Thus, they can substitute for orientation signs with pedestrian traffic management information and motorist geographic information, be aggregated with motorist traffic management information signs, or be equipped with transportation information.

(4) Need to Consolidate Public Signage

Public signs are often concentrated in areas with many travelers, typically areas intersecting with major roads. For such sections with concentrations of a wide variety of public signs, signs should be consolidated beyond the immediate management area. Methods such as aggregation, substitution, combined use, and equipping can be useful for this purpose (Japan Society of Civil Engineers, 1985). [1]

3.2. Constructing a Pedestrian Public Sign System

Lines, levels, and nets are regarded as possible ways to configure new pedestrian public sign systems (Research Society on Community Design, 1993). For diverse and unpredictable movements in urban environments, however, a net configuration is ideal. This survey has clarified that budget and time constraints cause a limited number of signs to be placed in lines or levels. As such, a net configuration is proposed that involves the consolidation of public signs, as well as dual and combined use

(1) Street Patterns and Distributional Features

When placing public signs in a general street plan, it can be difficult to detect whether certain types are too prevalent or too scarce. To remedy this, three street patterns (A–C) with differing public sign distributional features were derived from the survey results. A schema for urban organization was created by aggregating these street patterns with information on transportation facilities and local features. By entering the public sign distributions for each street pattern by type (dual information distributions are added to the respective pedestrian information distribution), we can designate public sign types for consolidation, dual use, or combined use based on their values. Figure 8 shows case studies from Showa-dori, whose pedestrian information is not yet completed. One section was selected for each of the three street patterns, showing the possibilities of aggregation, substitution, combined use, and equipping based on the survey results' distribution values.

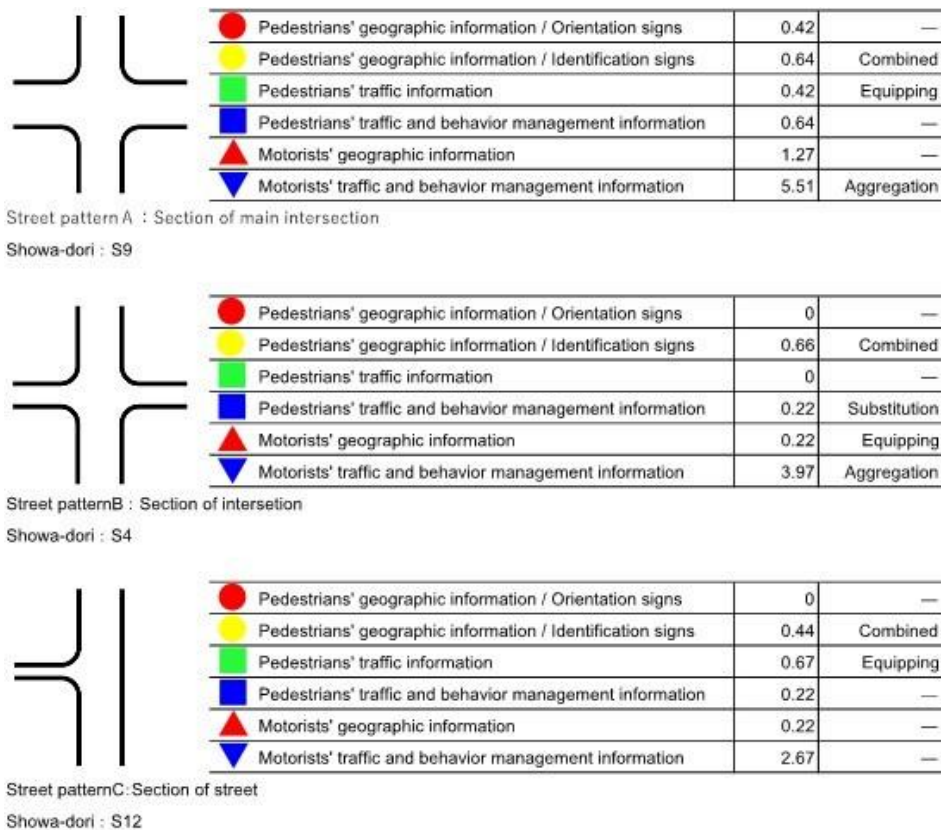


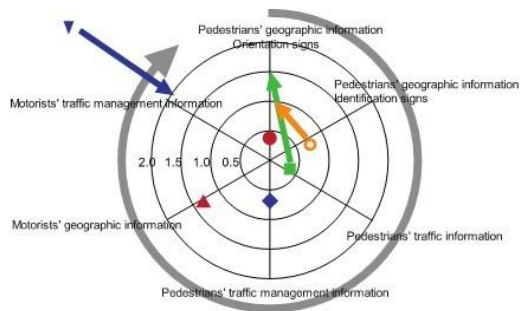
Figure 8. Distributions by street pattern: Showa-dori (3 sections)

(2) Distribution Graph for Public Signs

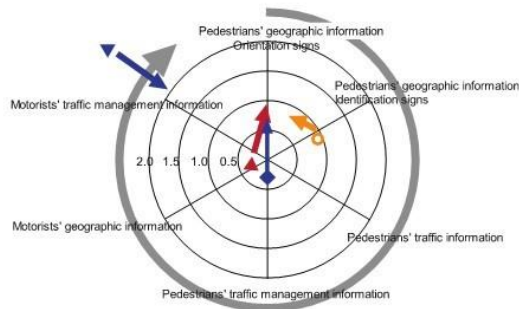
The distribution graph for public signs visualizes the distribution values by type (Figure 9 uses the same street pattern case study data as above). This allows us to calculate the variable prediction value of the distributions by the designated consolidation method (aggregation, substitution, combined use, equipping) and by street pattern (straight arrow in Figure 9).

In case the variable prediction value is too low, as a rule we want there to be at least one sign every 200–300 m (safe walking distance). Pedestrian signs intended to orient pedestrians must provide information continuously as the pedestrian moves. They fulfill an especially important function by providing appropriate information at walkable intervals for those unfamiliar with the geography. For this study, we determined that the interval at which information is transmitted should be such that it can be conveniently walked. However, an actual pedestrian signage plan must determine a suitable interval based on local environmental features, street conditions, and how frequented the street is by locals and visitors.

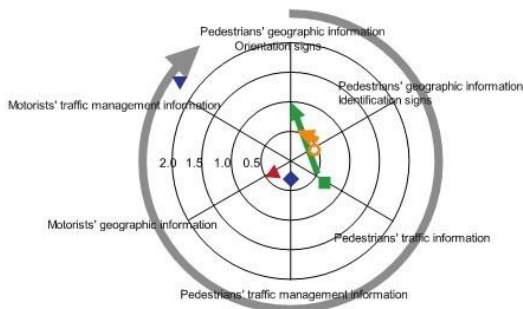
Figure 9 shows a conceptual model for creating a pedestrian public sign system. The clockwise arrows signify the order of precedence for consolidation, taking into account what distance can be conveniently walked. The straight arrow represents the direction of consolidating existing public signs in case there is a need to compensate for a lack of orientation signs with pedestrian geographic information.



Street pattern A : Showa-dori : S9



Street pattern B : Showa-dori : S4



Street pattern C : Showa-dori : S12

Figure 9. Public sign distribution graph: Showa-dori (3 sections)

(3) Consolidating Informational Urban Environment Installations

A pedestrian public sign system must be able to reduce public sign distribution imbalances for the sake of smooth pedestrian movement. Therefore, the aforementioned street pattern and public sign distribution graph must be combined with a consideration of actual urban organization, making adjustments to coordinate the plan with variable prediction values. When making adjustments, it is important to consider the potential implementation of dual and combined use, and to eliminate dispersions of variable prediction values in adjacent sections.

Furthermore, applying this method to a new pedestrian signage plan allows us to calculate the optimal locations and numbers of new signs needed to provide the required pedestrian orientation information. Thus, it facilitates the creation of a more effective pedestrian sign system.

4. Conclusion

This study surveyed differences in the distribution of public signs by type and used the results to identify problems. For example, despite the prevalence of public signs along urban streets (ca. 1 sign every 7.5 m), there is a lack of useful information for pedestrians, and the townscape seems unorganized. The study also evaluated whether newly installed pedestrian signs are actually effective. While there is a high distribution of pedestrian geographic information on systematically developed streets, the same is not true of undeveloped streets, highlighting the challenges of systematic street development.

There is a need, therefore, to reduce the current public sign distribution by street and local area, and develop a system that provides coordinated information. This study proposes the organizational method of informational urban environment installation as suitable for creating a new public sign system. Combining methods to accommodate area and street features is considered an effective way forward. For example, aggregation is suitable for organizing areas with a concentration of many structural elements. Meanwhile, the substitution, combined use, and equipping of motorist signs and other structural elements with pedestrian signs is suitable for areas that lack information. In particular, this study demonstrated the need to consolidate public signs—which comprise the majority of informational urban installations—to both secure pedestrian spaces and transmit accurate information.

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References

- Japan Society of Civil Engineers (Eds.). (1985). *Street Townscape Planning* (街路の景観設計) (Gihodo Books, 1985), p. 209. According to this source, aggregation means gathering multiple functionally related installations in one place and designing them as a unit. To substitute, combine, and equip means to use the installation's original functional form and add another function. The relative importance for street use of the original function (A) and added function (B) can be expressed as substitution ($A > B$), combined use ($A = B$), and equipping ($A < B$), allowing for convenient classification.
- Research Society on Community Design (Eds.). (1993). *Community Design for Pedestrians* (歩行者のためのコミュニティサイン) (Urban Design Center).

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