

Mapping of Semi-Fixed Elements and Pedestrian Behaviours as Indicators of Attractive Urban Environments

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ABSTRACT

The present research aims to explore the urban environment to find physical indicators of spatial attractiveness in Yanaka Ginza; a commercial street located in Shitamachi Downtown Area, Tokyo. The case study is addressed from the spatial attractiveness of shotengais (commercial streets) due to their particular accumulation of elements and diversification of commercial uses and social interactions. According to literature reviewed, built environments are appraised from the arrangement of place elements. This arrangement is divided into three groups: a) Fixed elements as buildings, subjected to major urban regulations; b) Semi-fixed elements, attachable elements such as street furniture and advertising signs; and c) Non-fixed elements, referred to pedestrian behaviours related to environments and other individuals. The research develops for the analysis a combination of qualitative and quantitative methods based on measurements of Semi-fixed elements and observations of pedestrian behaviours as main indicators. The qualitative method is based on photographic material and the pixel proportion of Semi-fixed elements. The quantitative analysis, collects number of Semi-fixed elements, pedestrians and walking speed along a twelve hour timespan. The results show how the measures of location and number of Semi-fixed elements along with the number and walking speed of pedestrians; are important indicators to be considered. More specifically, the strong number correlation between semi-fixed elements and pedestrians provides a first significant validation on the attractiveness of urban environments.

1. INTRODUCTION AND OBJECTIVE

The Commercial Shop Street in Japan or so-called Shotengai, represents a particular urban typology characterized by its lively pedestrian zones and social interactions. A typical Shotengai is originated from the association of groups of stores along a single street emphasising group orientation, co-operation and interdependence (Larke, 1994:131).

This typology is ideal for the study case due to the diversification of commercial uses and socio-spatial dynamics. The present research aims to identify physical indicators related to pedestrian behaviours in terms of attractiveness of open urban spaces such as Shotengais.

The neighbourhood of Yanaka, located in the zone of Shitamachi, Tokyo, is a residential area which was developed during the Tokugawa period (1603 to 1868) and prior to modern planning controls of 1919. At that time, foot mobilization was the common way of transportation and housing development was not required to contribute to road space producing a narrow network of pedestrian roads and alleys. In addition, Yanaka was not

affected by the Great Kanto Earthquake in 1923 nor during the bombings of the Second World War which helped to preserve its urban fabric and pedestrian scale to present days (Sorensen, 2009).

The spatial attractiveness can be understood by the accumulation of physical features in the environment that provide meaning as non-verbal communicators in urban contexts (Rapoport, 1982). Rapoport (1982) characterized these physical features into three main groups: Fixed, Semi-fixed and Non-fixed. Fixed elements such as buildings, have a subjected condition to major regulations, therefore they represent the most static type to change. On the other hand, Semi-fixed elements are regarded as complements to Fixed elements. They can change easily, and provide a richer spatial meaning. These can be understood as attachable elements such as street furniture, curtains or advertising signs. Non-fixed elements are regarded as the human behaviour within the physical environment as actions. In other words, the management of Semi-fixed elements may influence how urban spaces can be experienced by promoting more complex social activities and behaviours.

2. HYPOTHESES

Based on literature reviewed and field surveys, the following research question arise: What indicators are the most significant in the relationship between street elements and pedestrian behaviours in order to promote attractiveness by architectural means. Two initial hypotheses are proposed: 1) the attractiveness of urban spaces are related to the location, number and temporality of Semi-fixed elements; 2) the attractiveness of urban spaces is related to slower walking speed of people.

3. ANALYSIS AND METHODS

The methodology adopted by this research is a combination of qualitative and quantitative analyses for the data collection (Table 1). The field survey aimed to describe the weekend condition of a weekend day in Yanaka Ginza on January 10th, 2016.

3.1 Qualitative analyses

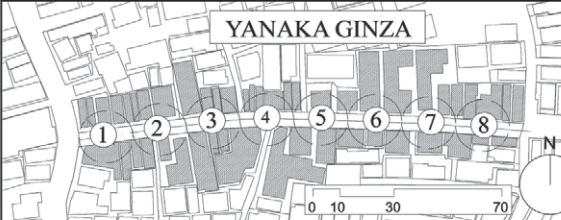
As a first stage, it was carried out a photographic mapping of 160 meters at eye level (1.70 meters) in Yanaka Ginza with samples every 20 meters in both directions. The samples were organized to present three periods of four hour each. Semi-fixed elements were identified and classify into two groups following their easiness to be attached to Fixed elements (buildings and roads) and proximity to people: Semi-fixed Type A as stores' furniture, signs or flowerpots; and Semi-fixed Type B such as canopies, flags or pole signs. Then, the samples were de-layered to count the pixel percentage occupied by Semi-fixed elements in which every photo frame represents the 100 percent of the visual field (Figure 1). Through this approach, it is possible to obtain an average value from each resulting group. Also, pedestrian counting was conducted to identify two basic people's actions: standing and walking. These may support to identify possible attraction areas along the commercial street.

3.2 Quantitative analyses

The second stage of the field survey collected on-site number and speed of pedestrians and number of pedestrians on a 12 hour span during a whole day (Figure 2). The samples were collected by performing walkthroughs along the commercial street and the speed samples by timing the walking pace on three different spots of 10 meter each.

Additionally, statistical correlation was conducted between the number of Semi-fixed elements and the number of people in Yanaka Ginza on the 12 hour span (from 9 to 20 hours) with a significant validation of 1% ($p \leq 1\%$) (Figure 3).

Table 1: Fixed, Semi-fixed and Non-fixed

YANAKA GINZA														
														
SCENE NUMBER AND SECTION		1	2	3	4	5	6	7	8					
Number of Shops		9	6	8	8	9	8	8	12					
FIXED ELEMENTS	Walking Path (meters)	Width	5.40	5.40	5.62	5.80	5.70	5.66	5.60	5.60				
		Length	20	20	20	20	20	20	20	20				
	Building Height (meters)	Left Side	10	5	5	7.50	5	5	7.50	7.50				
		Right Side	7.50	7.50	7.50	2.50	7.50	5.00	7.50	5.00				
HOURS		Period I				Period II				Period III				
		9	10	11	12	13	14	15	16	17	18	19	20	
SEMI-FIXED ELEMENTS	Counting	Semi Fixed Type A	328	368	508	526	545	575	584	562	536	482	263	270
		Semi Fixed Type B	248	248	251	251	251	252	252	252	250	248	247	246
	Percentage (%)	Semi Fixed Type A		27.12				27.82				20.76		
		Semi Fixed Type B		18.79				18.41				16.40		
NON-FIXED ELEMENTS	Photographic Counting	Walking		19				106				15		
		Standing		10				113				10		
	Number of People (On Site Counting)		14	129	196	244	254	302	253	231	149	64	28	12
	People Speed (m/s)		0.74	1.04	1.34	1.01	1.10	1.13	1.04	1.00	0.93	0.71	0.71	0.62
	Square Meters Per Person (m2)		65.82	7.14	4.70	3.78	3.63	3.06	3.65	3.99	6.17	14.40	32.62	76.78

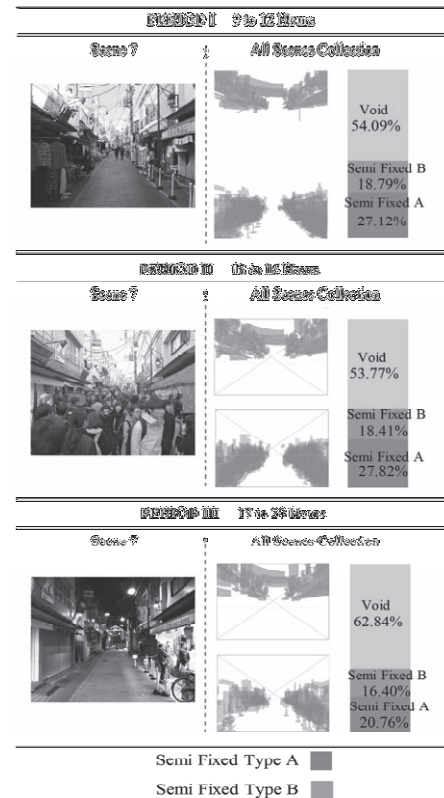


Figure 1: Percentage of Void Space and Semi-fixed Type A and B

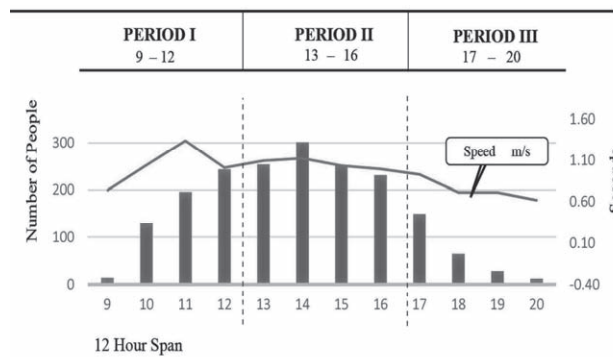


Figure 2: Number of People and Speed

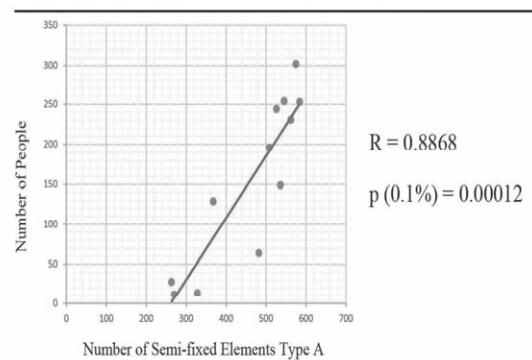


Figure 3: Correlation of Number of People and Semi-fixed Type A

3. RESULTS AND DISCUSSION

1. As a first finding, the photographic mapping differentiates two temporalities from the percentage of Semi-fixed elements during three moments of a day: Semi-fixed Type A and Type B. Type A presents an increase of 0.70% during Period II (13 to 16 hours) over Period I (9 to 12 hours) and a noticeable decrease of 7.06% with Period III (17 to 20 hours). Whereas, Type B shows a decline of 0.38% between Periods I and II, and 2.01% between Periods II and III. These temporalities could be associated to their easiness of manipulation and closeness to pedestrian flows.
2. A second finding shows an inverse relation between a higher number of people with a slower walking speed along Periods I, II and III. Particularly, it is worth noting when the number of people increases during Period II (13 to 16 hours) and their speed is reduced, the highest presence of Semi-fixed elements type A is detected. Also, Period II is the moment when the number of standing people (112) observed on the photographic material exceed the number of walking people (100).
3. As a final finding, the results of statistical correlations of the number of people with Semi-fixed elements Type A shows a stronger ($R=0.8868$) and more significant validation (p value = 0.00012) rather than the correlation with Semi-fixed Type B ($R= 0.6858$) which presents a weaker validation (p value = 0.1981). This result can be associated to the wider value range and temporality that Semi-fixed elements Type A presented during the twelve hour on-site observation.

4. CONCLUSION

The samples collected and analysed on this ongoing research indicates correlations among Semi-fixed Elements, number of people and speed providing initial evidence of indicators of spatial attractiveness. It is fundamental on future stages of the present research, the inclusion of more study cases for comparison as well as the expansion of samples and the utilization of statistical regressions for significant validation.

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