

A Tentative Approach to Mapping Street Space: A Case Study of Chinese Central Urban Districts

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This paper focuses on exploring a quantitative approach to mapping street space; the most common type of urban public space. The characteristics of street space can hardly be described and explained using only a description and analysis of the traditional architectural forms of street space in modern cities. The difficulty arises because of the lack of relevance between these forms and people's activities in them. This phenomenon presents a challenge to mapping methods. Expanding mapping elements is one viable and ongoing path. Which element could be an effective one, and how it should be measured and mapped are vital questions. Considering the characteristics of Chinese cities, interface signs have been selected as the experimental elements in the article. An area of 1.8 x 2 km, within the central district of the city of Nanjing (Xinjiekou district), has been selected as the research sample; the test area where the distribution and physical characters of interface signs and the pedestrian flow are investigated. Database and statistics of interface signs (consisting of 6,613 groups of valid data) and pedestrian flows (approximately 2,500 groups of valid data) have been established and inserted into the GIS (Geographical Information System), where a series of correlation analyses between basic mappings and pedestrian flows are carried out.

Interface Signs – Media for Street Space and People's Activities

As the most common type of urban public space,

street space is not only a space with physical forms, but is also a place for daily public activities. In recent decades, researchers have realized that studies on street space should pay attention not only to the formal characters of space, but also to the use of the space, human activities, and people's cognition of the space. Mapping street space should not only make representations of physical forms through plan, elevation, section, axonometric, and perspective drawings, but also through descriptions related to human activities and human perceptions of the street.

Proceeding from people's perceptions of space, *The Image of the City* summarized the image of the city in a certain number of residents' minds based on their answers to a questionnaire, and plotted a cognitive map of the city, thus opening up a new era in the study of urban space, and offering brand new possibilities for urban space mapping.¹ Environment-behaviour scholars tried to summarize the relationship between human activities and the characteristics of urban space by observing, summarizing, and mapping people's activities in urban space.² Using mathematical methods to calculate and map topological relationships between streets, Space Syntax demonstrates that space configuration is closely related to human activities.³ Subsequently, scholars have further advanced this method, achieving related research by comparing the calculated values of street configurations to the survey mapping of human activities.⁴

The methods and experiments mentioned above could certainly be applied while investigating the characteristics of street space in Asia; simultaneously they should be proven to meet the characteristics of Chinese urban space. Since Asian street space has unique characteristics, is it possible to explore a unique method for describing and measuring its street space considering people's intervention? From this perspective, this paper creatively proposes to describe street space through mapping 'Interface Signs'. Here, the concept 'Interface Signs' is proposed as a medium for investigating street space and people's activities in it.

Definition of Interface Signs – 'Signifier' and 'Signified'

The interface signs herein refer to visual displays in the form of text or graphics that are distributed on street interfaces to transfer functional information about the architecture (or the area), thus attracting pedestrians' attention on the street or guiding pedestrians. More specifically, they are signboards, billboards, nameplates of an entity, building name, and so forth (wherein the signboards and billboards account for the largest proportion). Widely distributed on Chinese street interfaces, interface signs are largely used as commercial signs and advertisements, which are distributed through every corner of the city with the spread of businesses along its streets.

The precondition of the study lies in the characteristics of the 'Interface Signs'. In the semiotic theory proposed by Ferdinand de Saussure and Roland Barthes, 'Signifier' and 'Signified' are two important concepts of signs.⁵ *Learning from Las Vegas* tried to redraw the map of Las Vegas by mapping its signs:

[...] it is the highway signs, through their sculptural forms or pictorial silhouettes, their particular positions in space, their inflected shapes, and their graphic meanings, that identify and unify the megatexture.

They make verbal and symbolic connections through space, communicating a complexity of meanings through hundreds of associations in few seconds from far away.⁶

For Las Vegas, the 'Signifier' of the signs refers to the specific information regarding a building or the space that it needs to express: hotels or restaurants. The 'Signified' refers to its architecture's spatial symbol, with more formal meaning than the architecture itself. Following the semiotic theory, it is not difficult to understand that signs in a city follow their own system of logic; the interface signs in this system have the meanings of both the Signifier and the Signified. The 'Signifier' refers to its function of transferring information as a medium between the business and the consumer, while the 'Signified' refers to the deeper potential association of the Interface Signs with society, people, and space. Thus this association is the theoretical basis for the mapping and related studies in this paper.

Mapping Interface Signs – Operational and Technological Paths

Detailed operations relate to the concept and application of mapping methods. James Corner highlighted the creative meaning of mapping in his article 'The Agency of Mapping: Speculation, Critique and Invention', revealing more content by expressing and reproducing the hidden forces existing in reality.⁷ 'What already exists' not only refers to the physical properties of the terrain of a given location (topography, rivers, roads, buildings), but also includes many forces that are not visible but still support normal operation. For example wind, sunlight, historical events and local stories, economical and legislative bodies, even political interests, regulatory mechanism and organizational structure and so on. In this sense, the 'Interface Sign' is just such an entity.

From the perspective of operational methods, James Corner proposed that the operational

structure of mapping had three levels: 'fields', 'extracts', and 'plottings'. In the process of interface sign mapping, 'fields' means the representation of the basic conditions of the street space to which the interface signs are attached: the space's geometrical conditions, enclosing degree, opening degree, etcetera. 'Extracts' is the interface signs; the 'selected, isolated and pulled-out' of the 'Extract' is the process of recording, extracting, and digitizing the interface signs. How to accurately, effectively, and conveniently record the interface signs and extract information from them is a very important part of this study. Information recorded using cameras draws on the researches of William Whyte and Gehl.⁸ The 'plottings' herein means using the database and graphical system in the GIS (Geographical Information System) to carry out descriptions and spatial analysis of the distribution of the interface signs.⁹

Upon completion of the basic mapping of interface signs, it is possible to carry out a series of correlation analyses within the GIS platform. The setting of the related items and the technical method for correlation analysis have already been involved in some other research.¹⁰ For interface sign mapping, correlation analysis can be carried out for the function of street interface, the formal line-of-sight analysis, spatial syntax analysis values, and so on. Due to the limited length of this article, only the correlation analysis on the interface signs' mapping and pedestrian flows are included. But this primary attempt and its conclusions can illustrate that it is possible, and effective, to describe street space by mapping interface signs.

Establishing a Database: The Physical Properties of Interface Signs – Research and Statistics

Interface signs have physical properties such as shape, size, position, colour, direction, content, material, etcetera. [fig. 1]

Shape: Interface signs are attached to the interface, a very small part of them is presented independently as texts attached onto a building (generally the name of building, etcetera), most of them consist of bodies or faces supported by the interface; the spreading shapes of these bodies or faces are largely rectangular, a few of them are polygons, circles, or irregularly shaped. Following architectural shapes, the planes of the interface signs can appear as an arc, a broken line, etcetera. So, defining the length as L , width as W and plane type as S , the expansion drawing is generally a rectangle, with special shapes otherwise highlighted.

Size: The size of the interface sign has several constraints: a) the store's bay size; b) hanging position; c) general technical conditions; d) laws and regulations; and e) facade design constraints. The length L is determined by the store's (or building's) bay size, and can be as small as one or two metres, or as large as tens of metres; the value of the width W is varied: the width of the general store sign is one to two metres, the width of the large advertising face of a large shopping mall can be as small as three to four metres and as large as tens of metres; it can even be at least three to four metres wide for rooftop advertisements; for the thickness T , except when it varies with specific architectural conditions such as corners – most of which can be ignored.

Since the size of interface signs is related to such conditions as the store's and building's bay size, and the suspended position, it is more convenient to summarize according to bay and storey height than accurately measure the size of every interface sign, especially when recording and summarizing data through photographs of the interface (which will be described in detail later). The specific method of operation is to divide the bay and floors for the building's interface, and record the building's bay size l and storey height h , and then get the relative relationship with l and h through comparing the length of the interface sign and the building's bay

size, for example, 3l stands for the length of the interface sign occupying three bays of the building, while 0.5h stands for the height of the interface sign being half the building's storey height. [fig. 2]

The inconvenience of this method lies in the fact that since the building's bays vary greatly, the values recorded cannot be directly compared, that is, the related values of the attached buildings need to be multiplied while making the comparison; and some buildings' bay size and storey height vary greatly, resulting in statistical errors; additionally, for signs perpendicular to the building's interface there is significant statistical error.

Position: Similar to the size of the interface sign, its position is limited by the conditions of the architectural interface. Generally, interface signs are distributed between the floors of a building; the position above window lintels (door buckets) of the first floor and below the windowsill of the second floor are the most common; corresponding positions on second and third floors are also available; and on the roof of the building we often see large interface signs that are as high as one to two storeys; on the second to fourth floors of a commercial complex we often see large signs crossing several floors.

In order to record their position, it is necessary to number the bays and floors based on the above-mentioned division of the building interface's bays and floors, and then use the number to express its horizontal position X (01, 02, 03, ...), vertical position Y (G1, G2, G3, middle floor M and roof floor R). As shown in Figure 3, X=01,02,03 stands for the interface sign being located within bay 01, bay 02 and bay 03 simultaneously, while Y=G1 stands for the interface sign being on the first floor. To limit the expression of vertical position, if the interface sign is between floors, it is recorded as the symbol of the lower floor. In this recording method, since all bays the interface sign crosses are recorded, it is convenient for future summarization of the identifying

numbers within a certain number of bays.

Colour (C): The colours of most interface signs are generally selected by building users whose main purpose is to attract attention. According to the tentative summary of the small street block, the distribution of the colour of interface signs is random, with saturated colours such as red, yellow, and blue being the more common.

Content (T): Generally, the content of an interface sign is mainly text, with the larger area containing both patterns and texts; the text content directly indicates the building's function or use, such as a clothing store, food store and so on. By analysing the structure of the text of the interface sign, research shall record some of the important keywords, such as 'bank', 'hotel', 'supermarket' and so on.

Material (M): The material of interface signs is constrained by the general techniques of the market; the current typical types include colour spray light boxes, neon signs, LED screens, acrylic characters, and so on. Interface signs of different materials have different contents and visibility distance.

Direction (D): The interface sign is generally parallel (P) or vertical (V) to the interface to meet different line-of-sight requirements.

Based on these physical properties, the relevant research tables are set to take pictures of the streets' interface segments, montage and draw reference lines, number and summarize the interface signs in such interface segments one by one, and mark the positions of every interface sign on the overall regional plan. The research covers an area of 1.8 x 2 km within the central district of Nanjing city (Xinjiekou district), with a total of 65 students divided into 11 groups participating in the research. All data is imported into the database afterwards; one set of data for each interface sign, with a total of 6,613 sets of valid data. [fig. 3]

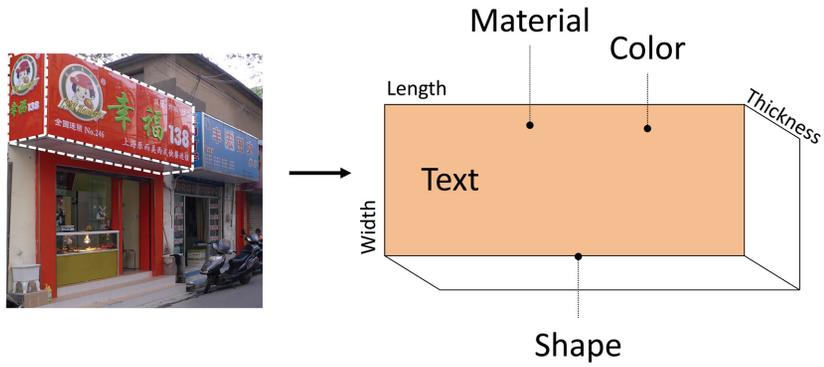


Fig. 1

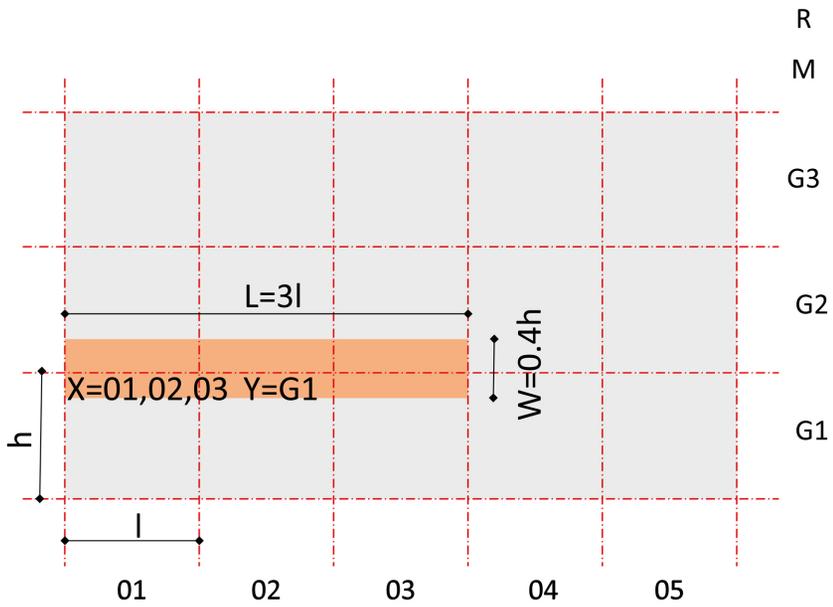


Fig. 2

Fig. 1: Physical properties of interface signs.

Fig. 2: Summary of the signs' size according to the bay and storey height; summary of the signs' position according to the bay and storey height.

Distribution Type of Interface Signs

Obviously, it is not enough to record and summarize the information of a single interface sign. The basic properties of the individual interface sign reflects its physical properties as a material body of the street space. For this study, a simple description of these basic properties cannot reflect all the characteristics of the interface signs; in particular, it cannot reflect the state shown after the interface signs are covered (nor the relationship between an interface sign and its adjacent interface signs, and the relationship between the interface sign and the interface, especially the interface bay and floors.) In order to more clearly describe, classify, and calculate, a simple coding system has been devised to simplify the expression of the interface signs on the interface.

With street elevations recorded and montaged during the survey of the individual interface signs and the bay lines and floor lines drawn while filling in the form, each interface segment is divided into several smaller units of façade, and encoded according to the distribution of interface signs within each small unit. The encoding rules are as follows:

- a. Each interface element corresponds to a value, in the case of there being no interface sign this is marked as 0; in the case of an interface sign divided into two levels according to the coverage of the interface signs these are respectively recorded as 1, 2; if the area of the interface sign is less than or equal to half of the unit, this is recorded as 1; and if the area of the interface sign accounts for half to all the interface unit, this is recorded as 2.
- b. For the convenience of recording and classifying, interface signs between floors are recorded as being on the lower floor.
- c. If one interface sign is within several cells, horizontal or vertical lines are used to link the values.
- d. The interface sign on the rooftop is directly represented as R. Generally, the default area value of the rooftop interface sign is 2, in special cases this is

marked as R1 and so on.

- e. Provisionally, the interface sign perpendicular to the interface is not represented.

According to these different cases, the interface segment is divided into the following types. [fig. 4]

According to different types, related polylines on the overall regional plan are plotted and imported into the GIS.

Upon completion of the above two steps, the GIS platform shall have two databases with geographic positions based on the overall plan of the region: a) data of the spatial distribution and the related attributes of all the interface signs within the region; b) spatial distribution of the sub-type line segments of the interface segment.

Correlation Research between Basic Mappings and Pedestrian Flows

To prove the effectiveness of the interface sign mappings, carrying out studies correlated with pedestrian flows is the most concise (and necessary). If the characteristics or distribution of the interface signs is related to the pedestrian flow, using the interface signs as the physical elements within the street space to characterize the activity density of the people becomes possible.

The summarizations of the pedestrian flow are also supported by a large number of university students. Within the same region, a total of 98 students divided into 14 groups participated in the research. The specific operation method: set several observation points on each road section (a total of 332 observation points within the region), each team chooses three to four time periods on both work and rest days (a total of six to eight time periods) to observe these observation points (making records using video cameras) and summarize pedestrian flows within five-minute periods and distinguish between walking forwards and walking

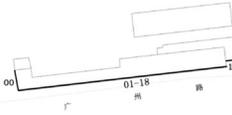
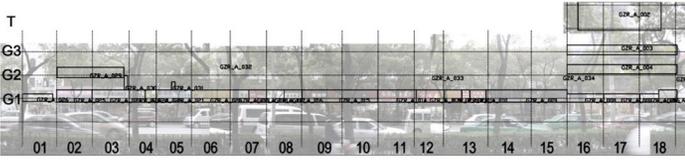
GZR_A												<p>*Marked with advertising interfaces and the corresponding axis of building unit.</p> <table border="1"> <tr> <td rowspan="2">Axis of building</td> <td colspan="2">plan</td> <td colspan="2">facade</td> </tr> <tr> <td>01-18</td> <td>04,12</td> <td>G</td> <td>M</td> </tr> <tr> <td>Length/Height of unit(m)</td> <td>6</td> <td>4</td> <td>3.9x3</td> <td>0xX</td> <td></td> </tr> <tr> <td>Function of building</td> <td colspan="4">Mixed use(commercial and office)</td> <td></td> </tr> </table>			Axis of building	plan		facade		01-18	04,12	G	M	Length/Height of unit(m)	6	4	3.9x3	0xX		Function of building	Mixed use(commercial and office)				
	Axis of building	plan		facade																															
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Function of building	Mixed use(commercial and office)																																		
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Index	Position in the plan		Position in the facade		Towards_ relative to the building	Towards_type	Material	Content	Shop_type	Others	Notes																								
	unit_n	unit_ratio	layer_n	layer_ratio																															
GZR_A_001	19	1	G1	0.3	A	1	1	A	bank																										
GZR_A_002	16-18	3	G3	0.3	P	1	1	SS	restaurant																										
Encode each billboard as XXX_A_001, XXX stands for different block.	Draw axes according to the building bay, give each bay one number. Record the position of each billboard with unit_n and the length ratio with unit_ratio.		G1-first layer G2-second layer G3-third layer M-middle layers T-roof		Record the relationship between billboards and buildings. P-Parallel V-Vertical A-Angled	 <p>Note the value shown in figure.</p>	1-general 2-rolling 3-LED 4-Neon light 5-other	SS-store signs SA-Store ads A-other ads	Required-Bank, supermarket, public service Selectable-Continuous same type stores	Selectable Amount of information, size, colors, etc.	Abandoned, etc.																								

Fig. 3: Survey table of individual interface signs.

backwards. Once imported, the positions of the observation points then correspond to the 332 sets of summarized data.

Basic Mapping and Statistics of Individual Interface Signs

The basic statistics of valid data of the interface signs' individual attributes show the occupying proportion of each attribute by which the data partitioned when mapping is determined. Taking the length (L) data statistics and mapping as an example, the statistics of the interface signs' number (by length) show that among the 6,613 groups of valid data, there are 5,002 interface signs with a length of less than or equal to 1 (unit: bay unit), accounting for 76 per cent of the total; there are 990 interface signs with a length of between 1 and 2 (2 is included), accounting for 15 per cent of the total. Based on these statistics, the data is divided into six levels (0-1, 1-2, 2-3, 3-4, 5-13), and displayed separately in GIS. In the same way, other attributes such as width (W), position (X, Y), and colour (C) are counted and mapped in a basic manner. [fig. 5]

These methods of display are simply technical operations. To make such operations meaningful, comparison with other attributes of street space must be made in order to establish their correlation.

Basic Mapping and Statistics of Interface Type Segment

Relevant statistics regarding interface type segments have also been carried out. Among the whole research range, Type-1 has the largest number, approximately 1,192 segments, 27,016 m long, accounting for 75 per cent of the total length of the sign's interface segment; wherein, Type-1_1 has about 580 segments (accounting for 36 per cent of the total), total of 15,513 m long (43 per cent); Type-1_3 has about 214 segments (13 per cent), total of 5,517 m long (15 per cent); Type-1_0 ranks third, about 211 segments (13 per cent), total of 3,356 m long (9 per cent). Type-2 ranks second,

about 194 segments, total of 3,569 m long, accounting for 10 per cent of the total.

Also, in the GIS system, interface segments of different types can be separately mapped, as shown in Figure 8, for example, only the interface segments of Type-1_1 are displayed, that is, the interface signs are only closely distributed at the first floor of the buildings along the street, and presented as continuous interface segments. Or, only interface segments of Type-3_1 are displayed, that is, the interface signs are distributed between the first and third floors of the building, with the area at each floor being no more than 1.

Basic Mapping and Statistics of Pedestrian Flows

By analysing the pedestrian flows on each small block in different time periods, we find that 8 a.m. and 5 p.m. on work days are rush hour for most of the road sections. For example, among the 25 observation points on the Central Block, 16 points' peak values appear at 5 p.m. On rest days, some of the rush hours are the same as on work days, and some appear during other time periods, for example, among the 25 observation points on Block 6, 18 points' peak values appear at 1-2 p.m. Relatively speaking, however, the average value of every observation point can roughly reflect the traffic conditions of the corresponding road sections. To simplify the research, in this paper we take the average value of the data of all observation points by work and rest days, thus obtaining the pedestrian flows of the road sections corresponding to each observation point. Importing 332 sets of valid data into the GIS and corresponding it to the polylines, this displays the pedestrian flows by thickness of line. While displaying, it is classified into five levels: Level 1, 0-50 persons every five minutes; Level 2, 50-100 persons every five minutes; Level 3, 100-150 persons every five minutes; Level 4, 150-250 persons every five minutes; Level 5, 250-500 persons every five minutes. [fig. 6]

Examples of Encoding					
Type name	Floors where interface signs are distributed	Continuity of distribution state	Number of bays with interface sign B2/Total number of building bays B1	Number of bays for a single interface sign	Expression
Type-1_0	G1	Discontinuous	0.3-0.6	≤ 2	1 0 1 0 0 0 0 1 0 or 1 0 1 0 <u>1 1</u> 0 0 1 1
Type-1_1	G1	Continuous	0.7-1	≤ 2	1 0 1 1 0 1 1 1 1 0 or 1 1 1 1 1 1 1 1 1 1
Type-1_2	G1	Continuous	0.7-1	≤ 2	0 2 2 1 0 1 1 1 1 0 or 1 2 1 1 1 2 1 2 1 1
Type-1_3	G1	Continuous	0.7-1	> 3	0 <u>1 1 1</u> 0 <u>1 1 1</u> 1 0 or <u>1 1 1 1 1 1 1 1 1 1</u>
Type-1_4	G1	Single Word	-	-	-
Type-2_0	G2 G1	Discontinuous	0.3-0.6 0.3-0.6	-	1 0 1 0 0 0 0 0 1 0 1 0 1 0 1 1 0 0 1 1
Type-2_1	G2 G1	Continuous	0.7-1 0.7-1	-	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Type-2_2	G2 G1	Continuous	0.7-1 0.7-1	-	2 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 1
Type-2_3	G2 G1	Continuous	0.7-1 0.7-1	-	2 1 2 2 1 1 2 1 2 2 1 1 1 1 1 1 1 1 1 1
Type-2_4	G2 G1	Continuous	0.7-1 0.7-1	-	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Type-2_5	G2 G1	Continuous	0.7-1 0	-	2 2 2 2 2 2 2 2 2 2 0 0 0 0 0 0 0 0 0 0
Type-3_1	G3 G2 G1	Continuous	0.7-1 0.7-1 0.7-1	-	1 1 1 1 0 1 1 0 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1
Type-3_2	G3 G2 G1	Continuous	0.7-1 0.7-1 0.7-1	-	2 2 2 2 2 2 2 1 2 2 2 2 1 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 1
Type-3_3	M G3 G2 G1	Continuous	0.7-1 0.7-1 0.7-1 0.7-1	-	1 1 0 1
Type-3_4	M G3 G2 G1	Continuous	0.7-1 0.7-1 0.7-1 0.7-1	-	2 2 2 2 2 2 2 2 2 2 1 0 0 0 0 0 0 0 0 0 0

Fig. 4: Examples of encoding and classification criteria of interface type.

The mapping plotted in this way can concisely reflect the differences in the pedestrians' activity density within the street space. However, this is only used to verify whether the mapped interface signs are valid references.

Interface Signs – Pedestrian Flow Association Research

Correlation analysis is intended to study whether there is a certain dependence between the phenomena, and discuss correlated direction and degree of the phenomena with dependence; it is a kind of Statistical Method for studying the correlation relationship between Random Variables.

The first step of correlation analysis is to carry out data association in the GIS. This step links the information on the pedestrian flows of the road sections where the interface signs locate to the interface signs, and then export the data for correlation analysis, thus analysing the correlation between various attributes of the interface signs and the pedestrian flows.

- a. Interface signs' length L , width and the pedestrian flow. The horizontal axis is the length of the interface sign, the longitudinal axis is the pedestrian flow of the road sections where the interface signs are located, while the points in the chart indicate the distribution of the related pedestrian flows of different length. We can see that the distribution of the peak flows decreases with the length of the interface signs, that is, large flows usually appear in the area where the interface signs are shorter, especially when $L \leq 1$, 165 points where the flow is more than 150 appear. Other distribution laws are not obvious, basically all flows for different lengths can be found. The situation regarding width and area is similar to length.
- b. Floors where interface signs are distributed and the pedestrian flow. The statistics of the pedestrian flows of the road sections corresponding to the interface signs distributed at different floors show that within

floor 1-3, the higher the floor of the interface signs' distribution, the greater the corresponding flow; above the third floor, pedestrian flow decreases, and the interface signs on the roof floor do not have greater pedestrian flow. [fig. 7]

- c. Other cases. The statistics of other attributes, such as material, direction, text, and colour, have little correlation with the pedestrian flows of the corresponding road sections. The average values of the pedestrian flows corresponding to the interface signs at three directions (parallel, vertical, angled) are very close.

Interface Type Segment – Pedestrian Flow Association Research

Also in the GIS, the pedestrian flows of the road sections where the interface type segment is located is linked, and then the data is exported for correlation analysis. Obviously, Type-4 (the interface signs are distributed at floor 3 and above) has the largest pedestrian flow, Type-3 (the interface signs are distributed at all three floors) takes second place, Type-2 (the interface signs distributed at both floors), third place, Type-1 (the interface signs distributed at the first floor), fourth place, and Type-0 (there isn't any interface sign) has the smallest pedestrian flow.

The method of interface segment classification depends on the signs' distribution on the interface. The parameters corresponding to different distributions include: main distributed floors, amount of interface signs in unit interface length, area of interface signs in unit interface length, average length of interface signs in unit interface length, and average width of interface signs in unit interface length. [fig. 8]

If we carry out linear regression analysis on the detailed data of the sub-type of various type segments and pedestrian flows, we get the following conclusions:

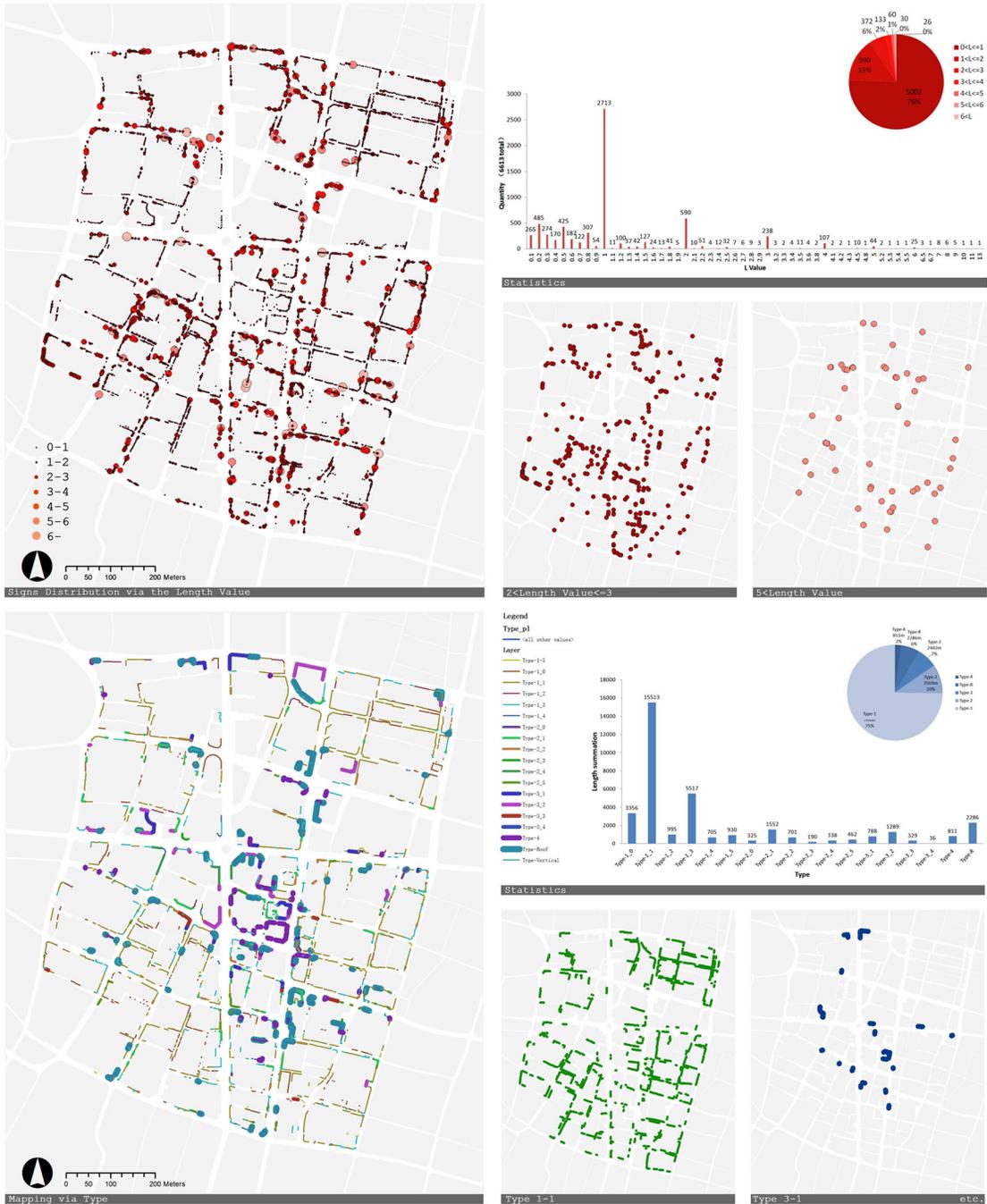


Fig. 5: Statistics and basic mapping via length value; statistics and basic mapping via segments type.



Fig. 6

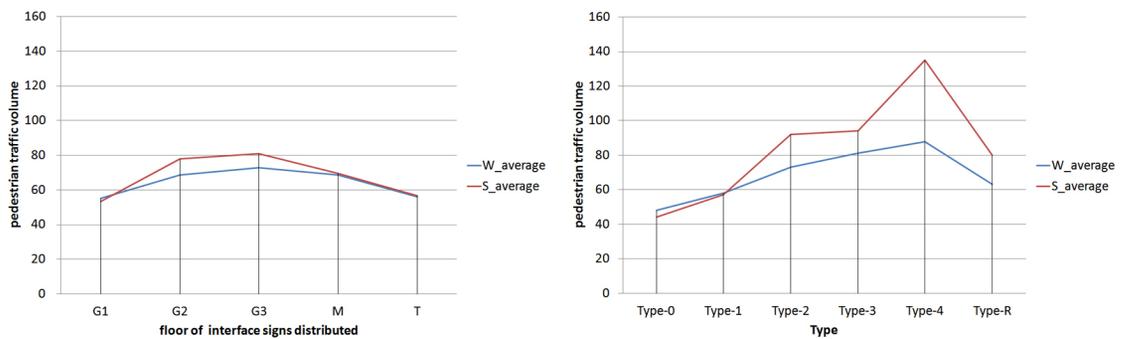


Fig. 7

Fig. 6: Basic mapping via pedestrian flows in a work day.

Fig. 7: Correlation analysis between position and average pedestrian flow; correlation analysis between interface segments' types and average pedestrian flow.

	Interface signs linked to type				Type Segmen	Parameters				Pedestrian traffic volume	
	Count	Length sum	Width average	Area		SLength	Count/SLength	Area/SLength	L/SLength	L/Count	W average
Type-1_0	569	503	0.88	203	3356	0.17	0.06	0.15	0.88	52	44
Type-1_1	3532	3758	0.43	1562	15513	0.23	0.10	0.24	1.06	55	52
Type-1_2	198	238	0.55	120	995	0.20	0.12	0.24	1.20	58	48
Type-1_3	577	968	0.55	475	5517	0.10	0.09	0.18	1.68	64	66
Type-1_4	63	89	0.74	58	705	0.09	0.08	0.13	1.40	70	86
Type-1_5	64	47	0.70	34	930	0.07	0.04	0.05	0.74	50	47
Type-2_0	23	27	0.52	13	325	0.07	0.04	0.08	1.15	36	42
Type-2_1	322	470	0.62	237	1552	0.21	0.15	0.30	1.46	66	81
Type-2_2	157	226	0.69	156	701	0.22	0.22	0.32	1.44	68	70
Type-2_3	35	33	1.45	44	190	0.18	0.23	0.17	0.94	113	182
Type-2_4	58	48	0.67	29	338	0.17	0.09	0.14	0.83	107	137
Type-2_5	86	93	0.63	62	462	0.19	0.13	0.20	1.08	50	40
Type-3_1	172	201	1.00	188	788	0.22	0.24	0.26	1.17	94	130
Type-3_2	278	308	0.97	291	1289	0.22	0.23	0.24	1.11	90	117
Type-3_3	76	140	0.62	72	329	0.23	0.22	0.43	1.84	86	110
Type-3_4	16	17	0.89	9	36	0.44	0.25	0.46	1.04	55	19
Type-4	134	132	1.42	163	811	0.17	0.20	0.16	0.98	88	135
Type-R	200	337	0.79	273	2286	0.09	0.12	0.15	1.68	63	80

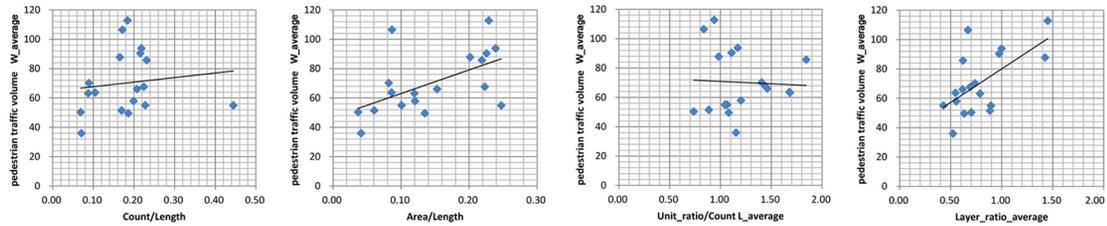


Fig. 8: Statistics of interface signs in type segments; correlation analysis between interface segments' parameters and average pedestrian flow.

a. Within the unit length of street interface, the more the number of the interface signs are distributed on the interface, the greater the pedestrian flows.

b. Within the unit length of street interface, the greater the area of the interface signs, the greater the pedestrian flows.

c. Within the unit length of street interface, the greater the average length of the interface signs, the smaller the pedestrian flows.

d. Within the unit length of street interface, the greater the average width of the interface signs, the greater the pedestrian flows.

Obviously, a series of analyses that shows the correlation between interface signs and pedestrian flows exists, which provides a solid foundation for the future study of mapping in detail. That is to say, it is feasible to represent the street space by defining a series of parameters of interface signs and quantitatively describing them, and by mapping the interface signs.

Conclusion and Extension

This research started with a reflection on the method and content of mapping the existing street space, as well as on the observation and thinking about Chinese street space. The purpose of the research is to find a new physical media that is not traditional architecture's concern, and to try and complement the characteristics of the street space by quantitatively describing this media. The research method is a relatively scientific exploration, and the process of 'research on the interface signs – extracting information – mapping – correlation analysis' shows the feasibility of mapping interface signs. In this paper we realized that the detailed statistics and classification of the interface signs, as well as the predefining of related indicators, proved the effectiveness of this method through the analysis of the correlation with pedestrian flows. Ongoing and further studies will

include:

a. Correlation analysis of the interface signs distribution and street block functions.

b. Correlation analysis of the interface signs distribution and the visibility of the street space interface.

c. Correlation analysis of the interface signs distribution and Space Syntax values of the street space.

Notes

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