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## The Effect of Cognitive Semiotics on The Interpretation of Urban Space Configuration

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### Abstract

Urban space is composed of various dimensions and contexts that generate urban forms. The spatial distributions of urban elements have different layers of connotative indications associated with Society's shared knowledge. The implying semiotics affect space configuration that could lead either to generate a compact or sprawl urban fabric. However, it is essential to know how the semiotic elements affect space configuration. The research aims to locate semiotic elements that have a role in space configuration. The research methodology depends on finding the semiotic values through a practical survey combined with a GIS tool to locate the correlations between the most valuable signs using the chi-square method. Also, to build a model for assessing the cognitive semiotic elements. The model gives a clue to explain how the spatial configuration is affected by the existence of semiotic values and shifts its values accordingly.

**Keywords:** Cognitive Semiotics; Urban Space Configuration; Connotative; Urban Sign; Shared knowledge.

### 1. Introduction

Semiotics as a system of signs has a primary role in transferring meaning, idea and behavior attitude from one system of communication to another. It is away for perceiving and interprets a cultural phenomenon which "is not only represented in language or verbal morphology but in actual practice, such as navigation through known or unknown environments or the joint action of building a house" (Theiring, 2015, p. 55). From the semiotic point of view, "semiology is based on linguistic, dyadic and quite static models of a sign relation, whereas semiotics stands on more general triadic and dynamic models. Therefore, identification of semiology with semiotics would be wrong. Sociological models represent the restricted special cases of semiotic models" (Emmeche & Kull, 2011, p. 23).

Transferring of meaning include any system of the sign, either it is linguistic, Metaphysical (Hutton, 2008) artistic or architectural. The case of the architecture is particular and need more studies and research as it is a result of mingled layers of meaning and criteria. Some of them are characterized as a "possibility of function" ( Leach, 1997, p. 174) or related to expression and behavior or "cybernetics, information theory, systems theory, and ergonomics" ( Mallgrave & Goodman, 2011, p. 39).

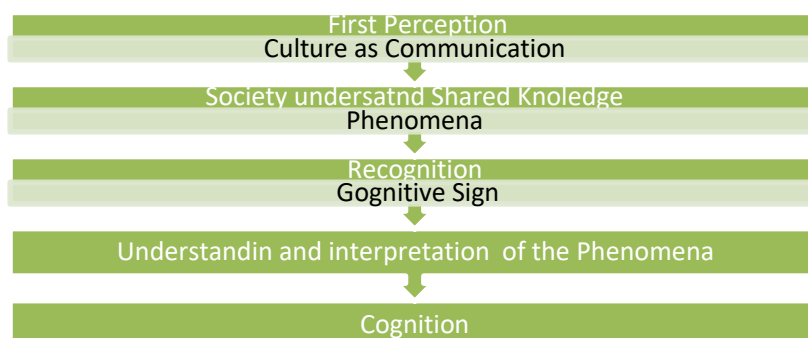
In the other hand, Umberto Eco believed in primary and secondary function for the sign, according to him it "is often intended to be primarily functional and not to be communicative" ( Leach, 1997, p. 173), thus according to him the case of architecture relate to the function. If the case of Architecture is functional, the situation is different with urban design as it connected to people behavior and attitudes, in this case, many different contexts have its system of information that needs to decipher. Space plays a role in transferring meaning that should be compatible with the social and physical context. The urban space is full with a conglomeration of elements that its relations with each other encountered in a variety of ways either as a semantic collision, oscillating in the space between complete identity and absolute divergence (Lotman, 2004). The design of urban spaces lead to a flow of the activities and affect the people behavior and attitudes as it leads to creating activities (Carmona & Tiesdell, 2007).

According to Jappy (2103), the urban space has a direct effect on people, and it accomplishes the effects through interaction between people and space through signs. The sign depends on " anything which is so determined by something else, called its Object, and so determines an effect upon a person" ( JAPPY, 2013, p. 4). Accordingly, an urban space has two objectives; one is functional, the other one relates to the communicative and affects the people, in this case, they are semiotic elements. Therefore "a house or the court building are semiotic objects " (De Morentin, 2011). If the urban space is a sign, then the urban space and its connection could not be understood separately, the sign itself cannot be understood independently from the process in which it occurs. Therefore, there is a need to an understanding based on semiotics signs to explain the urban space configurations. A model based on semiotic values as a method to define the urban elements configuration, to find the impact of those elements (semiotics signs) on the urban space configurations.

## 2. Cognitive Semiotic

Semiotics is a science studying all cultural phenomena as if they were systems of signs. The main hypothesis based on that all cultural phenomena are systems of signs or that culture is a system of communication (Kotkin, 2016). The experience of cities creates in the mind of an “equivalent sign, or perhaps a more developed sign” (JAPPY, 2013, p. 3). The system of sign become a part of society or culture when there is global understanding. Normally the urban semiotics are “populated by multiple systems that are in constant and dynamic interaction not only with each other but also with fragments of those systems which have been ‘destroyed’ as a result of which these systems are in dialogue” (Lotman, 2004, p. 11). Cognitive sign demands an understanding of the atmosphere which is related to urban space spatial configuration. The semiotic space that appears before us as the multi-layered intersection of various texts “which are woven together in a specific layer characterized by complex internal relationships and variable degrees of translatability and spaces of untranslatability” (Lotman, 2004, p. 23). Kevin Lynch affirmed that space become more powerful when it has a form (Lynch, 1960). The cognitive process depends on the shared experience that “each ‘portion’ of experience leaves its mark on our cognitive make-up, and contributes to our ability to adapt to each new situation ” ( JAPPY, 2013, p. 58).

The signs create a combination of signs that can deliver a message which “based on cognitive maps, scripts, scenes, image schemas, frame systems and mental models” (Theiring, 2015, p. 41). From the previous reading, it is clear that the signed bundle is a result of perception process and it is the final recognition of the observation procedure; there is an ability to change the mental cognition of the urban fabric and the understanding structure through the urban signs and semiotic. Figure 1 clarify the process of recognition through understanding the semiotics values of the urban space.



**Figure 1 . The Process of Recognition (Developed by the Author)**

## 3. The Sign Structure

The sign itself cannot be understood independently of the process in which it occurs. There is a different understanding of the sign by theorists and semioticians, but all of the definitions based on the interaction between two elements or issue one of them is physical, and the other one is related to the human interpretation of perceived phenomena. It is clear that there is no sign or symbol or any other indication without human interpretation that plays a big role in the semiotic structure of any component. In this section, the research will study the structure of the signs according to some famous semioticians in the world. However, it will try to build a comprehensive model for their understanding showing the structure of the sign and its relationship with each other.

### 3.1. Dual Sign, Ferdinand de Saussure (1857-1913)

A Swiss linguist whose work forms the base on which most contemporary structuralist thinking now rests. The linguistic sign can be characterized regarding the association between “dual aspects of concept and of the sound image or, to use the terms which Saussure’s work has made famous – signified (signifié) and signifier (signifiant) (Hawkes, 2003, p. 13). The relationship between the two parts are arbitrary and has no direct connection outside the human understanding. According to him, there is no reason to prefer any other word from any other source, to understand the sign has a meaning within a diachronic and synchronic relation. In this case, Rolan Barthes share many Sassanian attitudes in his application, epically in analyzing the Parisian sign and symbols.

### 3.2. Triple sign, Charles Sanders Peirce (1839 –1914) Representamen, Object and Interpretant

Referred to as semiosis which permeates the entire philosophy of representation. A sign is a vehicle conveying into the mind something from without or a sign is something by knowing which we know something more. A sign, or representamen, is something which stands to somebody for something in some respect or capacity ( JAPPY, 2013, p. 13). The definition of Peircean sign is wider that A sign or representamen is “something which stands to somebody for something in some respect it is anything which determines something else (its interpretant) to refer to an object to which itself refers (its object)” (Hawkes, 2003, p. 103). According to that the piercan theory is more comprehensive

and could represent any artifact, painting or architectural elements. Therefore, a sign “represents something (its object); it stands for something to somebody (its interpretant); and finally, it stands for something to somebody in some respect (this respect is called its ground). These terms, representamen, object, interpretant and ground can thus be seen to refer to the means by which the sign signifies; the relationship between them determines the precise nature of the process of semiosis” (Hawkes, 2003, p. 103). Figure 2 clarify Peircean semiosis.

### 3.3. Meaning through function, Eco (1932 –2016) & Baudrillard (1929 – 2007)

**Umberto Eco** indicated the “semiotic analysis is concerned with perception and meanings: specifically, the interpretations that you, I and others associated with words, images, objects or anything else that can be used to signify (indicate) some meaning or other” (Brown, 2016, p. 5). Eco argued that the semiotic approach give a better account of functions, and thus “the form of the object must, besides making the function possible, denote that function clearly enough to make it practicable as well as desirable. (Lukasz, 2011, p. 121). In this way, the perception plays a major role in understanding the sign and formulate the final image. In this issue, Baudrillard shared the view with Eco by suggesting the Use as a synonym to Ecos Function. Baudrillard suggested that the goods “symbolic value – that is, the value of the object to the consumer about that of another consumer (e.g., the coffee maker as a birthday present may come to symbolize a token from a loved one (Brown, 2016, p. 45). Therefore, according to both previous semioticians, the function has the main role in developing the system of understanding between people.

### 3.4. The Position of Mimic, Thomas Sebeok (1920 – 2001).

Tends to emphasize the position of mimic and described the mimicry as an example of iconicity in nature. “From the position of mimic, the process of changing itself or the surrounding environment to resemble the model can be considered as a creation of iconic resemblance” (Emmeche & Kull, 2011, p. 169). He found that the knowledge granted through the “realization that knowledge of whatever kind is a growth achieved through the action of signs, semiosis. (Deely, 2009, p. 132). The mimic of the icon of biology become the main part of his studies. Based on the previous statement “each urban increment would provide a clue to guide the next. That lead to recognizing that each new building design inherits its imagery, scale, detail and so on, from its architectural ancestor in an incremental process that mimics biological evolution” (Ganis, 2015, p. 87). The semiotics play a clear role in understanding the behavior and development of the biological realm according to the understanding of the details of the evolution of the living classes.

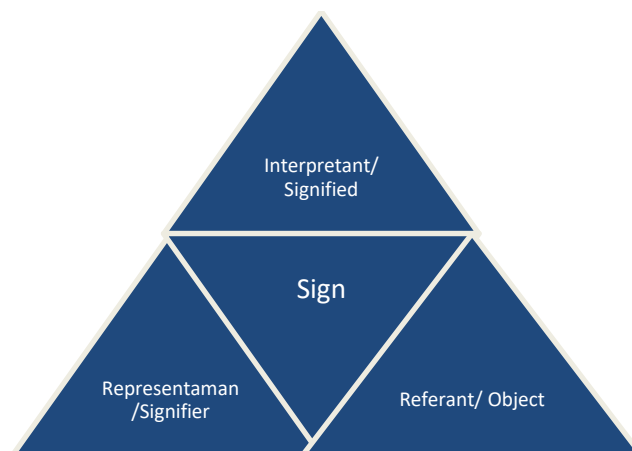


Figure 2. Peircean semiosis

### 3.5. Architectural and Urbanite Semiotic, Algirdas Julien Greimas (1917-1992)

Architecture is a specific kind of special semiotics. In a narrower sense, it is referring to buildings and how its meaning gains the form and appeals to our senses. A.J.Greimas, a French semiotician, has an extensive work in architectural semiotic, he believed in the extensiveness of the space. According to A.J. Greimas, “space starts from the extensiveness, which refers to space as a continuous and undifferentiated dimension of reality” (Kuznetsova, 2011). The duality of space meaning played an extensive role in Configuration his theory of Architectural sign. It is clear that the architectural element has two part one is functional, and the other is semantical and related to the meaning of the architectural elements within its context. The urbanite semioticians defend on the duality of the sign which is the urban space and relation to its context, the urban space, path and nodes with the other urban elements play one side of the sign while the society behavior plays the other role. The urban semiotic process is the understanding of through the interaction between the people and the urban space which is the main part of the urban fabric, however, “In many respects, urban spaces are contested spaces, not least through the exclusion of ethnic minority groups from particular areas of the city. However, conceptions of urban space are not universal. Table 1 shows the

concept of the sign and the structure of the sign according to some selected semiotician; however, it shows the main concern of the sign accordingly while they are urbanist or linguistics or biologists.

**Table 1.** the semiotic structure according to semioticians (Developed by the authors).

	Semiotician	Attitudes	Sign Type	Concern	Sign Depend on
1	Suassure 1906-1911	Structuralist	Dual	Structure between sign and signifier	Arbitrary connection
2	Rolan Barthes 1964	Structuralist	Dual	Structure between sign and signifier	self-contained system
3	Pierce 1903		Trichotomies system	Representamen object, and ground	Sequential meaning
4	Umberto Eco 1964	Functionalist	Dual	Perception and meaning through function	Understanding of the object through a context
5	Louis Trolle Hjelmslev		Dual	connotation and denotation	metasemiotic,
6	Jean Baudrillard	Post Modernism	Dual	Sign Consumption and Simulacra	object's sign and symbolic values
7	Thomas Sebeok 1920 – 2001	Post Modernism	Tripartite	emphasize the position of Mimic	Deep Knowledge
8	Francoise Choay		Dual	Urban Space	
9	Henri Lefebvre	Post Structuralist	Dual	Urban Space	Texture
10	A.J.Greimas 1970	Post Structuralist	Dual	expression and content	Urban
11	G.Broadbent 1974	Post Modernism	Four side	Architectural form	Urban
12	Henri Leve 1985	Social	Dual	Representational space	Society
13	Bjorklund 1992	Geographic Semiotic	Dual	Built Environment	Urban

#### 4. Denotative & Connotative Signs

A semiotic sign has two-fold of meaning, according to Longman Dictionary “mean something or to represent or be a sign of something” and Connotative which is the “quality or an idea that a word makes you think of that is more than its basic meaning” (Pearson, 2009). “For Barthes, the primary sign system is one of denotation, the secondary system one of connotation. At the denotative level, media texts express primary 'natural meanings.' At the connotative level, they conceal secondary, ideological meanings.” (Martin & Ringham, 2006, p. 213). That mean that the denotative meaning is direct and clear to the common people while the Connotative is canceled and hidden and need more understanding to decipher the hidden dimension of the meaning behind the clarified knowledge or the direct signifier. Jacobson clarified six functions for any sign he mentioned different communicative function:

A- **Emotive function.** The intent of the addressed in constructing a message is emotive in the sense that, no matter how literal the message might be, its mode of delivery invariably involves the latent presence of the addresser's emotions, attitudes, social status.

B- **Conative function.** The message invariably has an effect on its receiver, known as “conative,” no matter what the message contents might be because the way it delivered to the addresses involves such subjective features as the tone of voice, individual selection of words, and so on.

C- **Referential function.** Refers to any message that is constructed to convey Poetic information **function.**

D- **Phatic function.** Refers to any message that is designed to establish, acknowledge, or reinforce social relations.

E- **Metalingual function.** Refers to any message that is designed to indicate the code used ". (Danesi, 2004, p. 107).

The denotative and connotative has a big role in understanding the meaning of any sign at the outset its theoretical project. Although the denotative side of the sign composes the main role in any sign, the connotative side composes its eternal dimension. As a result, the connotative sign is obscure and hidden, so it needs a preparation or transformation layer to be used as a mean to understand its physical entities rather it is sound, smell or a material existence as a statue, painting or architecture." (Martin & Ringham, 2006, p. 229). The sign becomes clear when the both intentions are denotative, as well as when the first intention is denotative. Accordingly, the sign becomes obscure when one part or both intentions are connotative, the last type could find in the art and architecture field where there are no direct connections between the sign and the signifier. Table 2 clarify difference between the connotative and denotative.

**Table 2.** Difference between the connotative and denotative (Developed by the authors).

	Denotative	Connotative
1	Mimic - (Emmeche & Kull, 2011)	Quality or an idea- Sebeok (Emmeche & Kull, 2011)
2	Objective- (Martin & Ringham, 2006)	Subjective features- (Martin & Ringham, 2006)
3	Shared Knowledge- Lefebvre (Lefebvre, 1991)	meanings allotted to it- (Lefebvre, 1991)
4	Clear- (Pearson, 2009)	The signified is Concealed- (Pearson, 2009)
5	Primary level- (Brown, 2016)	operating at a secondary- (Brown, 2016)
6	Signified is Direct- (Martin & Ringham, 2006)	Signified is undirect- (Martin & Ringham, 2006)
7	Single layer- (Martin & Ringham, 2006)	Multiple- (Martin & Ringham, 2006)

Table 3 shows the essence of signs whether it is denotative or connotative, it is clear from the table that the urban space sign is the most obscure one, that is because both parts of the sign are connotative.

**Table 3.** The different types of signs indication (Developed by the authors).

	Sign type	Description	First Intension	Second Intension
1	Icon	Mimicable	Denotative	Connotative
2	Index	Correlation	Denotative	Connotative
3	Symbol	The signified is Hidden or Concealed	Connotative	Connotative
4	Words	meanings allotted to it	Denotative	Denotative & Connotative
5	Painting	Subjective features	Denotative & Connotative	Denotative & Connotative
6	Photography	Mimicable	Denotative	Denotative
7	Architectural Form	Signified is undirect	Connotative	Connotative
8	Statue	Mimicable & Subjective	Denotative	Denotative
9	Sound	Mimicable	Connotative	Denotative
10	Speaking	Subjective	Denotative	Connotative
11	Urban Space	Global behavior	Connotative	Connotative
12	Urban Place	Global behavior	Connotative	Denotative

## 5. Cognitive Urban Space

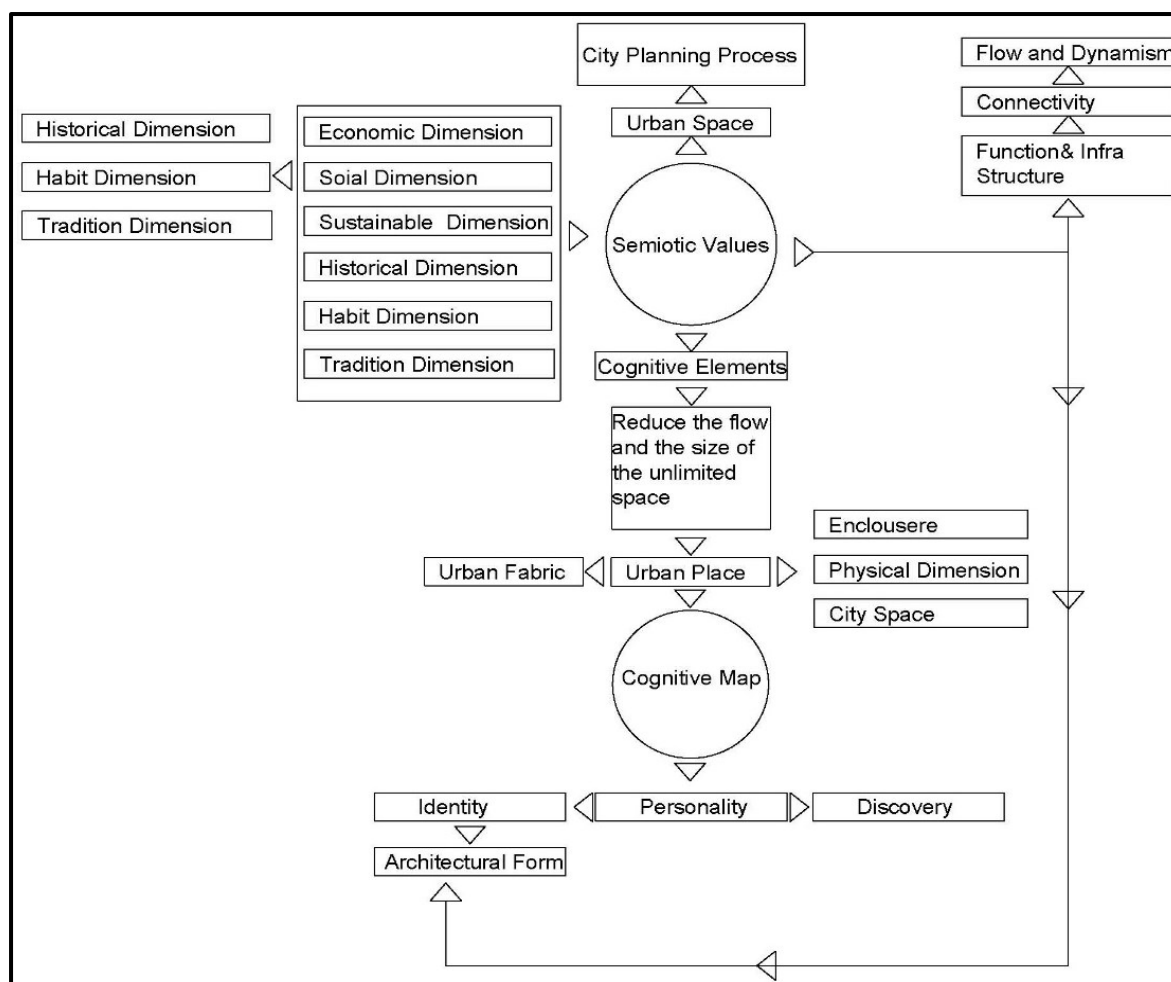
J Greimas and the Paris School in the early 1970s where it emerged as a branch of the Semiotics of Space developed the semiotics of the city. Later developed by James Gibson, M. Certeau and Svend Erik Larson amongst others (Grierson & Sharp, 2013). According to this school, the urban space has a role in connecting people and play a part in formulating the urban form, the spatial definition of the space with its semiotic feature does its part in bisecting the infinite space to smaller parts that what the urbanist call the place. The relationship between the space and its semiotic feature are dialectical and dynamic; it is a reflection of society activity. Accordingly, "The perception of differences may depend on meaning" (Rapoport, 1977, p. 163). Cognitive mapping attempts to capture how ideas about cause and effect relationships and desired outcomes implicated in planning discourse. However, "forms can aid the formation and transference of knowledge in urban spaces; and through these forms of cultural production processes of urbanization may be better understood" (Grierson & Sharp, 2013, p. 6).

The properties influx of changing and dynamic evolution, while some characters play a dominant role, these properties lose its power in gradual effect and complement with other social properties. Therefore "the New Urbanism focuses on recapturing the spatial definition typical in nineteenth-century cities and advocates for design response that seeks coherent, pedestrian-scale constructed environment using built form (Kapp & Armstrong, 2012, p. 303). The main part of the city that has a direct effect on the people behavior is the public squares which play an important role in the cultural, social and commercial life of cities. Squares should be designed or modified for diverse and flexible public uses. The function and design of buildings that form the enclosing edge of these spaces have a great impact on the success and popularity of an urban square. The semiotics of the city focuses on urban space as the prediction of meaning. However, urban space semiotic depends on of the different layers of meaning coming from different aspects. Cities should not be made to serve some ideological or aesthetic principle, but they should make life better for the vast majority of the urban design users. However, forces on new forms of urban space-making and advocates for a design response that utilizes alternative elements, such as landscape, to create a coherent urban condition.

## 6. Dynamic Cognitive-Semiotic Process

The urban semiotic is dynamic in its essence with total colliding and creation " which is in constant collision with the extra-cultural sphere within which it immersed, whose development is the result of a 'constant transposition of internal and external.'" (Lotman, 2004, p. XIII). The urban space has a power on the people with elements of that power create a cognitive effect on the receiver. Accordingly, public perceptions "dependent on a diversity of

interests working together” (Carmona, de Magalhães, & Hammond, 2008, p. 19). Because the relationship between the urban space and society is reciprocal, the changing in one direction cause the change in the other direction and confer dynamic change. Jan Gehl main notions of public space “is that the details of small, individual spaces determine how larger spaces are used and developed. Also, Experience is important in public space, and since in Gehl’s view of public spaces should be kept small. Streets should have a design about the number of people using them, mainly because of the communicative aspects and cognitive machinery of human beings” (Hellström, 2008). Therefore, the semiotics are Dynamic, and its values affect the cognitive process (Figure 3).



**Figure 3.** the process of affecting the architectural form through the urban semiotic

### 7. Cognitive Model and Paradigm.

According to the main hypothesis of the research, some urban features had semiotic values that lead to centralize people and emphasize centralization while some other principles lead to diffuse people and activities resulting in a sprawl in the whole urban fabric. Spaces with Axiality and movement characteristics tend to push people outside the center and make them leave the space, those values that lead to axiality are Uniformity, Disclosure, Diffusion, Peripherally, sprawl, and Outward. However, curved space gives the atmosphere of centrality and feeling of getting reached to the destination.

The values that are related to the previous state are Diversity, Enclosure, Connectivity, Centrality and Inward lead to the compactness of the space and create a feeling of the place. There are many factors that affect the semiotic values in the urban space, most of these factors have a quantitative values that could be calculated and manipulated. Those factors have the ability to affect the qualitative values for the semiotic values according to the human perception of its values and affect the human cognition that produces the final construction of the urban space. Table 4 clarifies the relationship between the perception and dual sign on the cognition process.

**Table 4.** The relationship between the perception and dual sign on the cognition process.

1	Perception	Dual Sign	Cognition	Configuration
	<b>1-Sense of Order</b>	Diversity/ Uniformity	The perception of these elements increases the sense attachments to space and lead to more specific belongs	Axiality
	<b>2-Diversity and traditional</b>			Direction
	<b>3-Varieties</b>			Oriented
	<b>4-Walkability</b>			Movement
				Flow
				Space
2	<b>1-Resting place</b>	Enclosure/ Disclosure	Personal or group engagement with space gives it meaning as a 'place', at least to the extent of being different from other places. Sense of place	
	<b>2-Safety</b>			
	<b>3-Solidity</b>			
	<b>4-Symmetry</b>			
3	<b>1-Identity</b>	Connectivity /Diffusion		Enclosure
	<b>2-Flexibility</b>			Inward
	<b>3-Legibility</b>			Place
	<b>4-Adaptability</b>			access
				Place
4	<b>1-Coherence</b>	Centrality/ Peripherally	Centrality increase the feeling to belongs, man feel safer while staying in the most important place comparing to the peripheral area where it is unstable and encourage dynamism and movement toward more stable places	
	<b>2-Flow</b>			
	<b>3-Heritage Existence</b>			
	<b>4- Permeability</b>			
5	<b>Pedestrian Access</b>	Compact/ Sprawl	The pedestrian access leads to direct contact and interaction between people that result in a social activity in place and encourage the feeling of intimacy and relationship with the building all around the space.	
	<b>Cars Movement</b>			
	<b>Social Space</b>			
	<b>People Direct Exchange</b>			
6	<b>1-Building defining space</b>	Inward/ Outward	This character related to space, so there is low part of the relationship of the building with space. Either space is a formed by the building around it or the building is floating in the space.	
	<b>2-Building in space</b>			
	<b>3-Façade defining space</b>			
	<b>4-Compactness.</b>			

perception of the urban space.

## 8. The Case Study.

### 8.1. Questionnaires about Semiotics Relationships Values

The object of the questionnaire was to find if there are signifying values for the variables the research is adopting as a key frame to classify the urban space configuration. The study sought to find out whether there is a connection between the semiotic signs and the related variables that have been chosen to adjust the semiotic values. Accordingly, the research based on Hypothesis (H1): there is a relation between the variables and the semiotic signs, The Alternative Hypothesis (H0): there is no connection between the variables and the semiotic signs. To achieve that goal the research adopted questionnaires composed of 43 questions to use for a sample constitute of 106 people (65 male, 41 female) from different education level and ages. The study divides the question into six group each group contained a range of question ranged from 6 to 8 questions to analysis the power of the semiotic values (Table 5).

**Table 5.** Questions and related values

No	Questions from	Semiotic	Related to	Question's Number
1	1-8	Diversity/Uniformity	Sense of Order Diversity and Traditional Variety Walkability	1-2 3-4 5-6 7-8
2	9-16	Enclosure/Disclosure	Resting Place Safety Solidity Symmetry	9-10 11-12 13-14 15-16
3	17-24	Connectivity/Diffusion	Identity Flexibility Legibility adaptability	17-18 19-20 21-22 23-24
4	25-32	Centrality/Peripherally	Coherence Flow Heritage Permeability	25-26 27-28 29-30 31-32

5	33-39	Compact/Sprawl	Pedestrian Access Cars Movement Social Space People direct Exchange	33-34 35-36 37 38
6	40-43	Inward /Outward	building defining space Building in space Façade defining space compactness	39-40 41 42 43

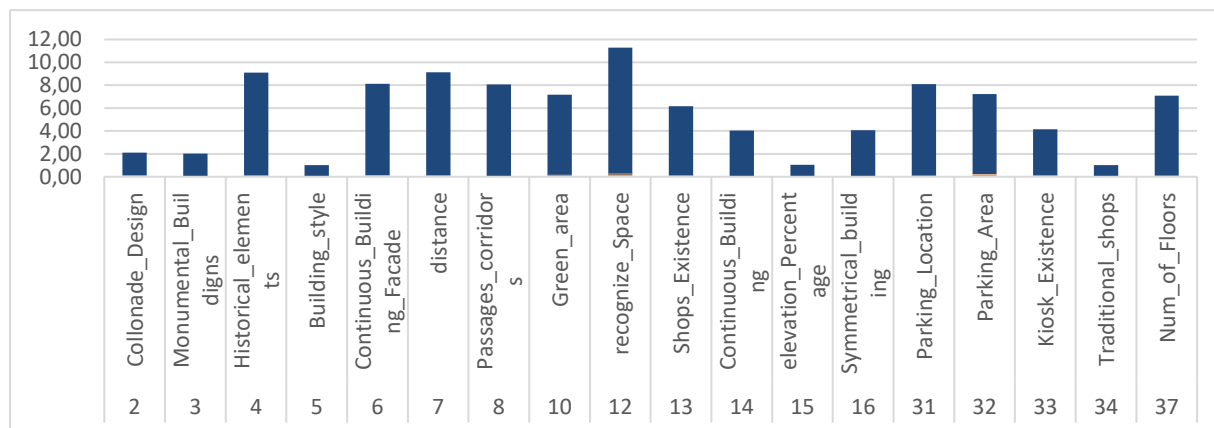
The participants were asked to recognize the characteristics of a better place for a human being and how to identify a specific characteristic in urban spaces. Therefore, the research implemented questions about variables which are related to the semiotics values and connected to the classifications of the urban semiotics values, the questions values classified between nominal and scale variables, so some of the answer were qualitative while others are totally quantities. From the (Table 6) which is the result of the answers, it is clear that 87% of the participants answered the questions in a positive way and agreed that those elements, principles, and values are important and has a significant role in understanding the urban space. The analysis showed that people take care to the previous points that the paper propose as keywords to analyze urban spaces, as well as there, are connections between many variables that people need to recognize urban spaces. The second step of the study was to find the connections between the variables used to by the research to understand the state of the urban space while it is Axial or Curved. Accordingly, the research used the chi-square test to find the correlations between all those variables. As a result, it found that there is a significant value between those variables. Accordingly, the research showed that there is a strong evidence of a relationship between the variables, where the ( $p < 0.05$ ). As a result (Figure 4) the answers show that some variables have a connection with too many variables, like the space recognition and the historical elements where it connected with more than 11 elements. Accordingly, the research rejected the null hypothesis and accepted the alternative hypothesis that there is a relationship between the proposed variables for understanding the urban space. So the research adopted the number of repetition as a semiotic power in the process of building the model in the next step.

**Table 6.** Questionnaire's responses

No	Questions	Percentage	Semiotic Power	Comment
1	Column_Prefernses	0.75		of modern or classic column.
2	Collonade_Design	0.92		Colonnade is important
3	Monumental_Buildigns	0.95	3	Monumental is attracting people
4	Historical_elements	0.93	10	Historical is attracting people
5	Building style	1.00	2	
6	Continuous_Building_Facade	0.92	9	
7	distance	0.92	10	less than 200 m
8	Passages_corridors	0.52	9	preferred pedestrian over cars
9	Resting_places	1.00		preferred exiting of resting places
10	Green_area	0.92	8	preferred exiting of resting places
11	Safety	1.00	1	
12	recognize_Space	0.91	12	
13	Shops Existence	0.92	7	
14	Continuous Building	0.90	5	
15	elevation Percentage	0.96	2	
16	Symmetrical_building	0.84	5	
17	urban_convivial_space	0.98		and 58 preferred different material
18	urbans_pace_Recognition	0.77		through mass and elevations
19	Vehicles_Accessibility	0.94		
20	Urban_spaces_activities_	0.40		should be hybrid
21	Node_Recognition	1.00		
22	Urban_Entries	0.92		prefer 4-5 entries
23	Urban_Space_Dominance	0.70		preferred dominance of 2-4 spaces
24	Natural_materials	0.67		different materials
25	Vehicles_cross_Space	0.73		
26	Parking percentage	0.78		less than 10% from the open space
27	Heritage existence	0.92		
28	Urban Rehabilitation	0.96		
29	Lane_Number	0.70		one lane
30	Urban_Space_Connection	0.71		1-4 connection
31	Parking_Location	0.70	9	50-200



32	Parking_Area	0.42	8	prefers cars/m
33	Kiosk_Existence	0.88	5	
34	Traditional_shops	0.91	2	
35	Urban_Function_Variety	1.00		
36	Residential_sector_Percentage	0.91		preferred 10-30
37	Num_of_Floors	0.92	8	less than 10 floors
38	Hi_rise_building	0.60		doesn't like hi rise building existing
39	Landmarks	0.86		
40	Colors Theme	0.94		
41	Building_Enclose_Space	0.88		
42	Pattern_ornament	1.00		
43	Floor_Area_Ratio	0.83		preferred 2-5



**Figure 4.** The frequency of Chi Square relationship between variables

Table 7 shows the values of a relationship through chi-square test as its computation done by analyzing the variables by SPSS. The questionnaire showed that most people inclined to think that recognizing urban spaces depends on the existing of some elements that are related to Urban Space Curve values as a vital point in understanding the atmosphere. Accordingly, the research adopted those variables as significant value to using it in the spatial analysis for some points in Erbil city. The research adopted the previous variables which have succeeded to show the significant values where the frequency of the answers is more than 0.7 and the Chi Squares values are significant at  $P < 0.05$ .

**Table 7.** Chi square values between variables

NO	Questions	11	17	18	19	20	21	22	23	24	25	26	28	29	30	39	41	42	43	Count
2	Collonade_Design	0.09																0.02		2.00
3	Monumental_Buildigns																0.02	0.00		2.00
4	Historical_elements			0.00	0.00	0.01		0.00	0.01		0.03	0.01			0.00			0.05		9.00
5	Building_style														0.01					1.00
6	Continuous_Building_Facade							0.00	0.01	0.00	0.05				0.00		0.02	0.06	0.00	8.00
7	distance		0.00	0.00	0.02					0.02	0.00		0.01		0.03			0.03	0.01	9.00
8	Passages_corridors		0.01	0.00		0.00			0.00	0.01		0.00			0.01	0.02				8.00
10	Green_area				0.08	0.06				0.00		0.01		0.01	0.00				0.00	7.00
11	Safty																			0.00
12	recognize_Space	0.02		0.05		0.00	0.08		0.04	0.03	0.02		0.02	0.01	0.00				0.01	11.00
13	Shops_Existence					0.04	0.03	0.04			0.02		0.04		0.00					6.00
14	Continuous_Building					0.00			0.00		0.02				0.00					4.00
15	elevation_Percentage								0.05											1.00
16	Symmetrical_building			0.03	0.02						0.02							0.00		4.00
31	Parking_Location					0.00			0.00	0.00	0.00	0.00		0.05	0.02			0.02		8.00
32	Parking_Area		0.00			0.00				0.00		0.05		0.03			0.09		0.05	7.00
33	Kiosk_Existence									0.08	0.05					0.00	0.03			4.00
34	Traditional_shops														0.03					1.00
37	Num_of_Floors		0.00			0.00			0.00	0.03	0.02				0.01				0.02	7.00

## 8.2. Case Study Application

The case study will be investigating a part of Arbil city; the study will take a route for studying from the peripheral area of the city to the center of the city, where the old citadel located. The route has different intersections and junctions; all those junctions will get studied. However, there will be a study for the land use, solidity, Vehicle dominance, walkability and the other elements that have effects on the semiotic of the space. Accordingly, there will be “findings” about the space shape configurations. The study will show that spaces with semiotic values have the power to stop people and let them get enclosed by the building and give them the feeling “belongs.” People within this kind of spaces can spend their time and feel the destination. The crucial point is that this kind of spaces works as a Sub-Spaces; its functionality in the domain of accessibility and to serve the purpose of sharing the function with other dominant spaces. These spaces are “Curve.” Moreover, “looking inward” and serving the other dominant spaces which are the Citadel space in the case study.

While the first type works as Subspace and shares function with the dominant space, the other spaces without semiotic values tend to be, longitudinal and let people has the feeling to “leave.” Therefore, these spaces work as “Movement” for other spaces. They are Axial without indications for staying, and people almost use them for movement. The two routes in the case study will show how the spaces with semiotic value have the power to attract people and work as nodes to share identity and values with other spaces in the city. This procedure will affect the whole urban fabric and give the city its personality and identity. The process of studying the area include

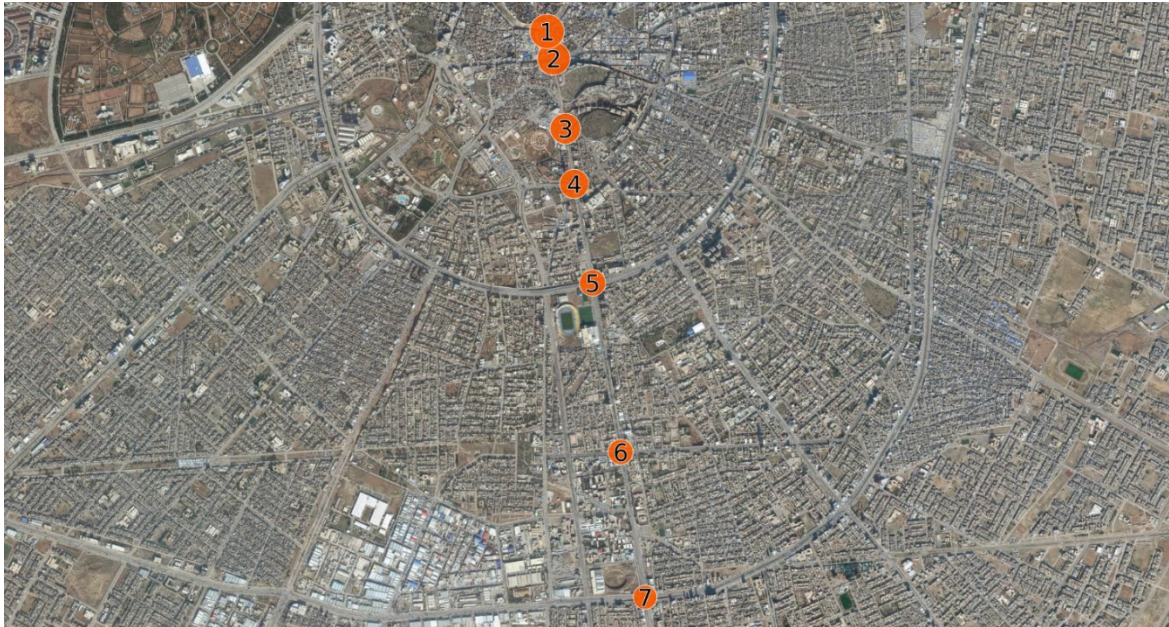
1. Define the direction of the route with its specific direction.
2. Define the intersection of the route which supposed that they work as urban intersections or urban space. The route intersections are numbered from the center to the peripheral area, from 1 to 7 and colored in orange as it clarified in (Figure 5).
3. By using **Carto DB** as a GIS system, we could go through the whole process and study the land use and the other elements that play a role in the space configuration.
4. Provide one point for each connection according to a binary scale, so the values (1+,1-) will be provided accordingly to each connection, these values depend on the frequencies values from Table 7.
5. All the upper values in the signed bundle have been given the (+1), while the lower values take (-1).
6. In case there are equal connections between the two parts the total Resultant is (0)
7. **The semiotic power which depends on the Chi-square relations added one point for each correlation where  $p < 0.05$ . Accordingly, the final power of the sign will be according to the following equation**

$$\text{Sign Power} = \sum_{i=1}^n F + Sp$$

Where F =values of from frequency

Sp= Semiotic Power depend on frequency of Chi Square

8. The resultant of the upper and lower values is the value that will go to the final analysis for the semiotic values sit clarified in Figure 6 & Figure 7.
9. Positive values indicate high space value while the negative one leads to diffuse people and cause diffusion of the activities and lead to the sprawl of the urban fabric in different directions.



**Figure 5.** Plan for the case study area clarifying the route of the study from both two points.

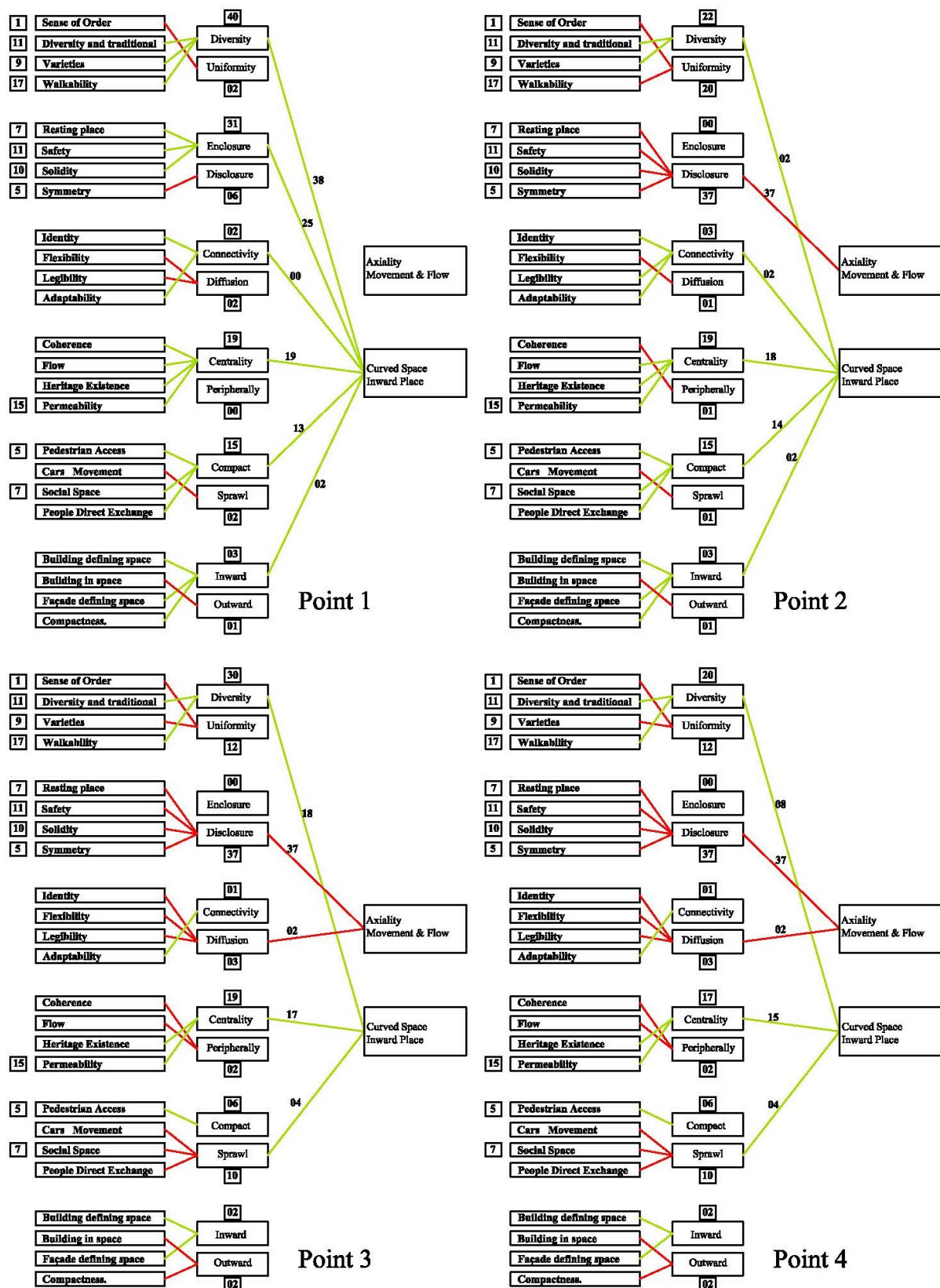


Figure 6. The resultant of the upper and lower values



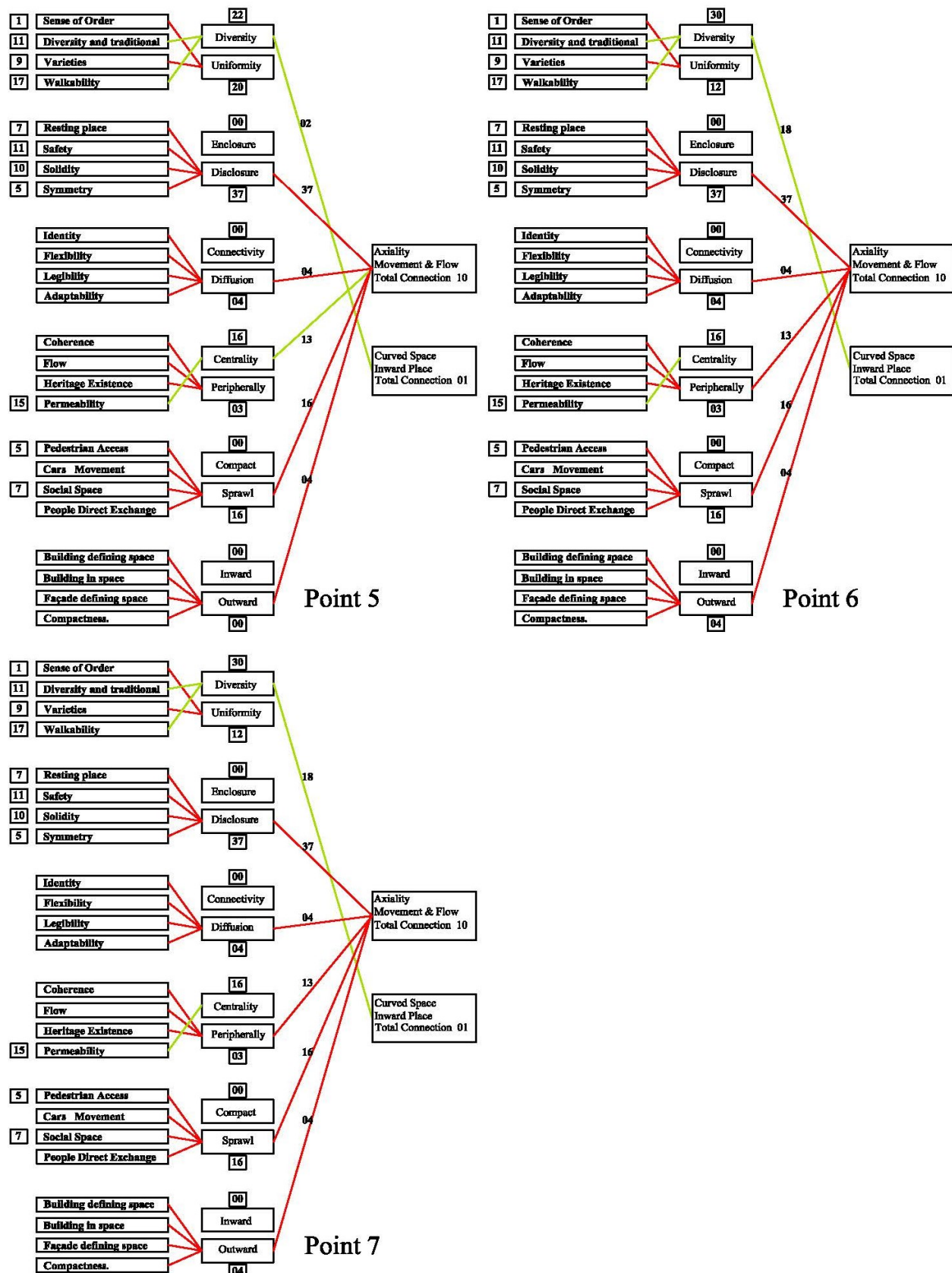


Figure 7. The resultant of the upper and lower values

## 9. Conclusion

The direct contact with each selected point in the studied area, the research observed that

1. some points have the power to go for “Axial Space” which is encouraging flow and Movement while the other points are more inclined to create “Curve Space” that is related to the Centrality and social contacts.
2. The research observed that points that have more positive value locate near the center while the Negative values locate in the peripheral area Table 8.
3. There is a gap between the negative and the positive value result in a concentration of the people in the center area which result in more flow and movements to that area, creating a rigid traffic congestion and environmental pollution.
4. Enclosure/ Disclosure is the most effected sign that has the power to change the indication of the urban space.
5. The first point O1 has the most significant positive semiotic power, where most of the values are positive which means that the most of the semiotic values lead to give a feeling of enclosure.

**Table 8.** The result of the semiotic connections

Point	Diversity/ Uniformity	Enclosure/ Disclosure	Connectivity/ Diffusion	Centrality/ Peripherally	Compact/ Sprawl	Inward/ Outward	Total
O1	38	25	0	19	13	2	97
O2	2	-37	2	18	14	2	1
O3	18	-37	-2	17	4	0	0
O4	8	-37	-2	15	4	0	-12
O5	2	-37	-4	13	-16	-4	-46
O6	18	-37	-4	-13	-16	-4	-56
O7	18	-37	-4	-13	-16	-4	-56
	104	-197	-14	56	-13	-8	

Accordingly, the signed bundle is a result of perception process, and it is the final recognition of the observation procedure, there is an ability to change the mental cognition of the urban fabric and the understanding structure through the urban signs and semiotic.

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### Conflict of Interests

The Authors declare no conflict of interest.

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