



A Framework for Urban Morphology with Respect to the Form

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ABSTRACT: Rapid urban population is widely known as the main inducement of growing cities in terms of quantity and variety in form. However, the city expansion entails physical challenges and it has profound impacts on the issue of urban morphology. It raises global awareness beyond the urbanism and includes sociology, psychology, economics as well as environmental studies due to the implications of broadness. The accentuation on morphological studies is on the grounds of fabric segregation in cities of developing countries where the patterns of modern developments are usually not in good agreement with traditional part. Causing several concerns, it urges morphological studies to attain urban fabric integrity. Therefore, this research aims to study morphology in respect to the form and subsequently proposes a framework of to-be-investigated indices. This study looks for identifying modules and excerpts of traditional core of cities in order to be fostered in future development and to make achievement of physical integration more viable. Having a conceptual-comparative approach, the study unveils the framework consists of urban paths and blocks in details of indices and items. It distinguishes seven indices for paths whereas the blocks have thirteen. Benefiting urban design and planning, setting a framework needs regulation and guideline for future development from morphological point of view and it could be applied for urban regeneration particularly from physical aspect.

Keywords: Urban Morphology and Form, Block and Path, Old and Historical Fabrics, Physical Development and Urban Regeneration.

INTRODUCTION

Cities have always been developing in the course of history, and their physical appearance have experienced a variety of changes resulted from different events (Aliakbari et al., 2013) which can challenge the identity and functions in a city. As growth and development are undeniable, a desirable city is defined as an urban area that has regenerated the old and historical elements with regard to current needs and made use of them to create new spaces. Cities should be enabled to have a significant role in the process of creating a constructive and reasonable space between the old and the new spaces. This process has been among the main challenges and concerns of urban planners, particularly in developing countries which are, for various reasons, more seriously

grappling with this issue. This important point seriously affects the intervention policies, because before the global movements resulted from the industrial revolution, the changes in urban communities of our country were very slow and subtle, and as a result, the physical characteristics of cities did not undergo substantial changes. Concurrent with economic and socio-cultural changes, the form and foundation of urban fabrics have also been changed. As intervention in the old urban fabric of Iran, basically the term “historical fabric” was hardly appreciated. With the beginning of the modern era and the transformation of economic structures and the growing relationships with foreign countries, changes in the spatial organization of the urban areas began. These changes in the spatial organization which were due to rapid growth of urbanization and urban development led

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to split between the old and modern fabrics (Azizi, 2000). Therefore, due to its significant role in organizing the urban fabric, morphology is of great importance.

Urban morphology is an approach to studying and designing urban form which considers both the physical and spatial components of the urban structure of plots, blocks, streets, buildings and open spaces, all of which are part of the evolutionary process of development of the particular part of the city under consideration (Sanders, 2008). Recognizing the development of urban landscapes over lengthy periods, and awareness of the unique cultural, social, economic and political influences of distinct periods are fundamental principles of morphology. This allows the urban landscape at any point to be recognized as a palimpsest of the achievements and investments of successive generations (Larkham, 2006). Understanding the morphology helps the urban designer to be aware of the development of local patterns and processes of change (Behzadfar and Sanei, 2012). Nowadays, morphological study of territory has become a field of a great multidisciplinary convergence (Caglioni et al., 2005).

Therefore, we can identify factors affecting the physical characteristics of cities such as typology and morphology and also develop appropriate indices for each, to analyze the physical dimensions of the cities. This knowledge will help us to establish a link between the old and new fabric of the cities, or it can help us to create new fabric based on the principles of the old fabric which has its own identity and special structure.

METHODOLOGY

From the perspective of sociology, urbanism is a global trend in the 21st century, which increasingly attracts not only the industrial countries, but also the third world countries. The points that should not be overlooked in this trend are the growth patterns and physical development or form of cities (Gharakhlou and Zanganeh Shahraki, 2009). The challenge of the new knowledge of cities is to understand the links between urban morphogenesis, efficiency and resilience. It is also to understand the relationships between self-organization and planning. The large number and diversity of agents operating simultaneously in a city suggest that cities are a multi-fractal emergent phenomenon (Salat et al., 2014). Urban morphology is characterised by factors such as the way buildings and streets are configured and building properties. Sky-view factor and aspect ratio are widely used indicators (Theeuwes et al., 2014). As the structure of cities are composed of blocks and the

paths between them; forms in the urban fabrics could be investigated from these two aspects which are known as major components of cities. The study of form is urban morphology which is based on two general foundations: formology (qualitative) and measurement (quantitative). The qualitative aspects of urban morphology is known as formology which is the most important part by its analysis, one can get the overall structure of the area. Making use of formology, we can provide detailed information about distribution of paths, overall shape of building sites, blocks, their orientation, placement of areas adjacent to each other, and etc. Measurement is the quantitative aspects of morphology through which we can get information about the density, building floor area, the number of building sites. In fact, the total of qualitative and quantitative information can provide a general analysis about the impact of urban morphology. In this process, as content analysis is replicable, especially in the new approaches which take the form into account, it is a common and useful method (Hodder, 1994). The significance of this method is due to the fact that it could be used quantitatively and qualitatively, and the reviewed documents could be evaluated in non-linguistic and non- iconic formats such as images, shapes and drawings (Tipaldo, 2014).

Therefore, this research aims to study the morphological aspects of urban fabric with respect to form and subsequently proposes a framework of to-be-investigated indices. For this purpose, this study has adopted a conceptual-comparative approach, placing more emphasis on the parameter of 'form', and explores the framework consisting of urban paths and blocks, then provides detailed information based on different dimensions, indices and items.

REVIEW OF LITERATURE

To prepare the ground for research, in this part we provide definitions of the key words to present an insight of what is going to happen. In the next step, the literature on the topic will be reviewed in brief.

The Concept of Urban Morphology

Throughout history, many heuristic approaches have been used to maintain an efficient development in urban planning. One of these approaches is "urban morphology" (Hazar and Kubat, 2015). Alvarez and Ritchey (2015) believed that the term "morphology" is used in a number of scientific disciplines to refer to the study of the structural relationships between different parts or aspects of the



object of study. For example, in biology, morphology is the study of the form and structure of organisms and their specific structural features; in linguistics, it is the branch of grammar that studies the structure of forms of words, mainly through the use of the morpheme construct; in geology, geomorphology is the study of landforms and the processes that shape them; urban morphology is the study of the form of human settlements and the process of their formation. Zafer Comert (2014) believes that urban morphology is a system comprising many disciplines, and it falls within the interests of different professions such as architecture, geography, philosophy, archeology, anthropology, history and ethnography.

In a classical urban morphology manner, the study represents the tale of an urbanization process that sees modest residential forms of rural origin gradually transform into denser multifamily structures once transplanted in an urban context (Gauthier, 2014). Urbanization is linked to economic growth and dynamic form of urban pattern in transforming the urban morphology (environment, social, economic and physical aspects) of a specific area (Khawairakpam et al., 2015). Therefore, urban morphology is the study of the form of human settlements at different scales in order to understand the spatial structure and character of these as well as the process of their developments (Schirmer & Axhausen, 2015).

The Oxford Dictionary of Geography (Vettorato, 2011) defines Urban Morphology as “the form, function, and layout of the city, and the study of these features, including their development over time”. Tayebi and Ghaffari (2012) defined the “urban morphology” as systematic examination of form, shape, map, structure and functions of the built fabric of the cities, origin and the evolution of these fabrics over time. However, Mirmoqtadaei et al., (2006) believed it makes a link between spatial and material elements of social and economic forces that shape them.

As urban fabrics are significant in the study of the morphology, we may conclude that morphology is the grading and intertwining of spaces and urban elements, which due to the characteristics of natural environment, specially topography and climate, are tightly or intensively placed together in an specific order in the urban areas i.e., blocks and urban neighborhoods (Jahanian and Pazhuhan, 2011). The specific order is based on the arrangement of masses and spaces –which constitute the form of blocks, paths and public open spaces such as squares. Accordingly, urban blocks are regular or irregular geometric areas whose main components are structures and buildings which are restricted to their surrounding

paths. In terms of physical aspects, Arsiya and Mazloomi (2014) consider a city made of blocks and paths which interactively shape the city form.

In this text, by “path” in urban spaces, we mean all passages including streets, alleyways, roads, etc., which constitute the location of streets in urban blocks, which also give a way for creating public spaces, transportation routes and network of public spaces. Blocks can define the spaces, or spaces can define the blocks too (Behzadfar and Sanei, 2012). Therefore, it could be concluded that urban morphology represents forms (geometry) of urban settlements and their patterns (Kaveckis and Bechtel, 2014).

Background

Since the development of cities, the urban morphology has attracted many scholars. Despite the fact that Germany and the UK have historically conducted the most influential studies in this subject (Khalaj and Lashkari, 2012), we can trace back morphology in many fields of science. In the field of urban transport Liu and his colleagues have simulated the impacts of 3D urban morphologies on urban transportation under the Digital Earth framework. Consequently, they studied their effects on flat urban areas. Yu et al., (2009) exploited high-resolution LIDAR data to quantify three-dimensional urban morphology and its impacts on the spatio-temporal variability of solar radiation in downtown Houston, Texas. In another study, Boukhabla et al., (2013) assessed the impact of urban morphology upon the air temperature variation of urban condition in hot and dry climate of Biskra city in the south east of Algeria. Amongst academics and practitioners working in the fields of urban planning and design, there has been an on-going discussion regarding the relationships between urban morphology and environmental sustainability (Sarralde et al., 2015). Martins et al., (2014) believe that the urban morphology comprises a large set of factors that plays an important role on modifying urban climate and, consequently, the potential energy demand and supply in cities. Mazloomi et al., (2010) showed that urban forms, particularly the proportion of outdoor and indoor spaces and placement of paths, have a significant impact on energy absorption; therefore, they are very effective on the temperature the urban environment. Morphology could also be seen from the perspective of tourism, Gospodini (2001) explored the relationships between the physical form of the urban environment and leisure activities. He showed how urban space morphology, i.e. spatial patterns and formal patterns may have an impact on tourists’ attraction and preferences in the contemporary cultural context of urban



tourism.

Allan et al., (2013) examined the relationship between the community's adaptive behavior and the spaces of Concepción city after its earthquake in 2010. They concluded that the role of the urban designer in earthquake-prone cities is perhaps more critical before an earthquake happens and there are more ideas of a resilient urban morphology embedded as part of daily life. Morphology is not limited to urban planning and design, as Tennekes et al., (2015) suggests that urban morphology is not only linked to planning systems, but also to housing cultures and property regimes.

With a general look at the urban morphology, we found that this field of science has three main schools which are: English, Italian and French (Pour-Mohammadi et al., 2011). The importance of these schools depends on the extent and the way they deal with different aspects and components of this field of study. Therefore, the English school, thanks to its more extensive studies enjoys a higher position and richness which due to the efforts made by M.R.G. Conzen who is known as the "native geographical tradition of Great Britain" (Xiao, 2012).

Conzen was much influenced by pioneers in the field, such as Otto Schlüter that gave rise to a Conzenian school. Conzenian thinking has in recent years begun to influence urban landscape management and has been one of the principal stimuli in the origin and growth of an international, inter-disciplinary group of urban morphologists, the International Seminar on Urban Form (Whitehand, 2007). The Seminar showed that the scope of urban morphology is beyond its main borders in geography, and it has been expanding particularly in the field of architecture and planning. It became apparent that the most basic level of analysis of morphology is based on three principles:

1- Urban form is defined by three fundamental physical elements: streets, plots of land and buildings and open spaces.

2- Urban form could be understood at different levels with different resolution which is usually recognized with four modes: buildings/plots, street blocks, cities and regions.

3- Since the elements of urban form, are subject to continuous changes and are even replaced, they could only be understood from a historical perspective.

Thus, form, resolution, and time constitute the three fundamental components of urban morphological research. These are present in all studies, whether by geographers or architects, and whether they focus on a medieval, baroque, or contemporary city (Moudon, 1997).

Therefore, we can infer that the urban form is resulting from the coming together of numerous concepts and elements of the urban structure such as street pattern, size and form of the blocks, street design, form of plots, parks and public spaces, etc. (Saifuddini, et al., 2012); however, because of physical connection with urban sustainability, it is one of the critical aspect of morphological studies in the 21st century (Azizi and Arasteh, 2011).

A FRAMEWORK BASED ON THE COMPONENT OF FORM IN URBAN MORPHOLOGY

Gideon Golany (1995) believes that urban design with climatic consideration deals with the holistic morphology of the city, as well as with urban details, such as street width, form, configuration and orientation, building heights, city compactness, or dispersion, urban open space, integration or segregation of land uses, and other related physical issues. We need to have a better understanding and a clearer classification. As this research puts more emphasis on the form, we will study the paths and blocks from the perspective of morphology so that the result could be presented within a framework. Therefore, with respect to what was mentioned in the above lines, this study is intended to evaluate the improvement of these parameters. Therefore, other things that must be taken into account in dealing with morphology will be added to the above list to develop a framework.

Morphology of Paths

A variety of network patterns strongly influences the designs of today's cities and agglomerations (Janis Vitins, 2014). An important component of cities is their streets and road networks. These networks can be thought of as a simplified schematic view of cities, which captures a large part of their structure and organization, and contains a large amount of information about underlying and universal mechanisms at play in their formation and evolution (Louf and Barthelemy, 2014). Street depicts the morphological network of cities in an integrated form. However, topographical factors of earth in a city such as plains, foothills, slope, and river flow are somehow effective in development level of streets and quality of their networking and in building the form and shape of the cities (Shah Ali and Sanai, 2010).

Therefore, paths are one of the main aspects of morphology, and a component of the blocks and urban form which have been divided into seven indices which are as follows:



1-The Number of Paths per Block: the number of paths into the blocks that are counted in numbers. The important point is that branching of paths is not taken as a base in the study, as in Fig.1, seven paths enter into the block. (Arsiya and Mazloomi, 2014)

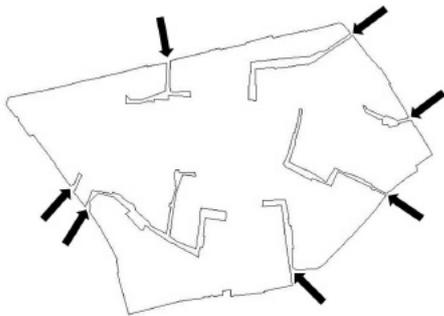


Fig. 1. The Number of Paths in Each Block

Average Length: the total length of all paths in a block, divided by their number. (Fig. 2) (Arsiya and Mazloomi, 2014).

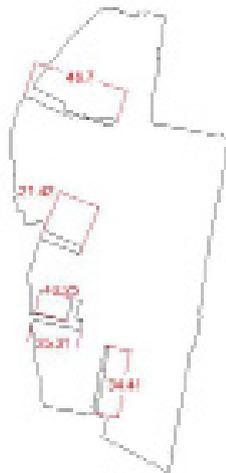


Fig. 2. Average length

For example, in the figure above, the average length is equal to 28.42 meters, which can be obtained as follows:
 $48.7+21.42+12.25+25.31+34.41=142.09/5=28.42$

Average Width: the total of the average width of all the paths in the block, divided by their number. (Fig. 3) (Arsiya and Mazloomi, 2014).

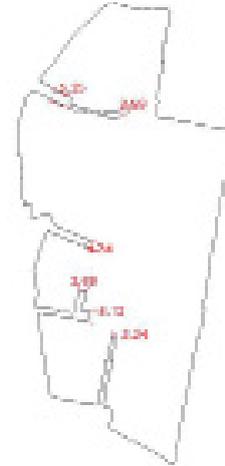


Fig. 3. Average width

The average width for the above figure is calculated as follows:

$$5.35+ 2.69+ 4.34 + 3.79 + 2.24 = 23.54/6 = 3.92$$

Permeability: blocks are more than 50% of width of their paths which is less than 6 meters (Mahdavinejad et al., 2012), in other words, when access to the fabric is low, and the width of local passages is less than 6 meters, they are regarded as “impermeable” fabrics (Jahanian and Pazhuhan, 2011). Thus, accordingly, when the width of paths is greater than 6 meters, they are described as “permeable”.

Orientation: suggests a feature of the paths that based on which the paths are built according to geographical directions. In this respect, the paths are divided into two main categories “North-South” and “East-West”. (Fig. 4) (Arsiya and Mazloomi, 2014).

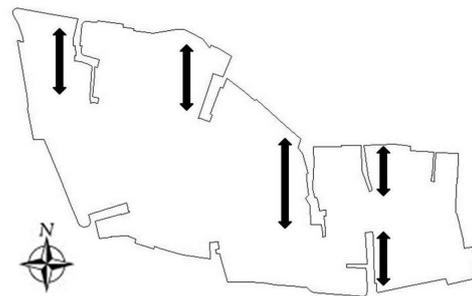


Fig 4. Orientation

In this figure, the paths are primarily of North-South type.



Slop of Paths: the average slope of all paths in the block in the direction of the length. It should be noted that the stretch of the slopes has no effect on this component.

Distribution of Paths: It is a feature used to define various forms of paths that enter into each block. There are three main types of distribution: linear, tree and network whose definitions are as follows:

- Linear distribution: it stands for when the path directly enters into the block, and has some branches, but on the whole maintains its straight line. In this case, generally the stretch of each path is on one axis and does not change. (Fig. 5)

- Tree distribution: it is a type of distribution in which the paths are organically divided to the right and left and cover the block, due to their similarity to a tree, they are called tree distribution. (Fig. 6)

- Network distribution: it is a type of distribution in which the paths are branched in parallel lines in one direction of the main path and are divided in the block, they associate all or part of a network. (Fig. 7) (Arsiya and Mazloomi, 2014)



Fig. 5. Linear Distribution



Fig. 6. Tree Distribution

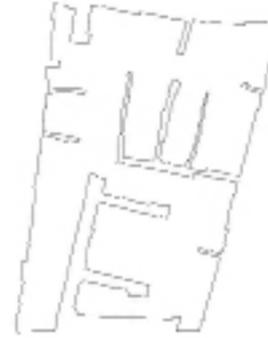


Fig. 7. Network Distribution

Morphology of Blocks

Changes in the form and structure of a city occur when blocks and urban parts are compact and interdependent, and make changes concurrent with the urban growth process and the relationship between various parts of the city (Azizi and Arasteh, 2011). Therefore, blocks could be regarded as key elements of form in the discussion of urban morphology that are divided into 13 indices which are as follows:

1-Occupancy Coefficient: (Occupation level) refers to the total area of a block divided by the area of land occupied by buildings on a block (Zaker haqiqi et al., 2010)

2-Density: the ratio between the area of a site building and the area of the plot of the land (Ismaili, 2010)

3-Number of Building Sites in a Block: it is the number of building sites in a block which are counted by numbers.

4-The Average Number of Floors of Buildings on a Block: it is the average number of floors in a block.

5-Block Area: blocks of a city are among the important factors affecting the shape of urban structures and forms. The area of blocks depends on various economic, social and cultural factors. The presence of these factors together, plays a major role in building compaction and can affect the compactness or density of an urban block (Azizi and Arasteh, 2011). Therefore, the area of a block is the area of blocks in square meters.

6- The Overall Form of Building Sites on a Block: the building sites on blocks are usually rectangular, which are regular or irregular according to environmental conditions and requirements. Sometimes they form a (organic) polygon. Therefore, in general, they are divided into three categories, "regular rectangle", "irregular rectangle" and "polygon". The definition of each is as follows:



- Regular Rectangle: it refers to the overall shape of building sites in which form and prevailing direction have similar order, and order is their major feature. (Fig. 8)

- Irregular Rectangle: it refers to the overall shape of building sites in which form and prevailing direction compared to regular rectangle has less order and sameness. (Fig. 9)

- Polygon: it refers to the overall shape of building sites which are in polygon form and without any specific orientation. (Fig. 10).

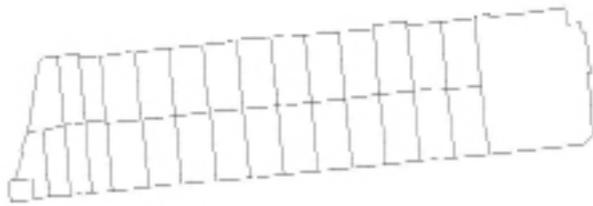


Fig. 8. Regular Rectangular



Fig. 9. Irregular Rectangular



Fig. 10. Polygonal

7-Placement of Adjacent Building Sites on a Block: in general, building sites in a block are either in the vicinity of each other, or they are dispersed on the block. Therefore, three categories could be defined for placement of building sites: “continuous linear form”, “continuous central form” and “scattered”. The definition of each is as follows:

- Continuous Linear Form: if the building sites are arranged in continuous row from each other, they are known as “linear continuous”. (Fig. 11)

- Continuous Central Form: if the building sites have a non-directional stretch which forms a polygon, they are categorized as central continuous. (Fig. 12)

- Scattered: If the building sites are not adjacent to each other, and usually there is no path into the block, or there are large building sites between them which cut off other blocks, they are known as “scattered”. (Fig. 13)



Fig. 11. Continuous Linear Form



Fig. 12. Continuous Central Form



Fig. 13. Scattered

8-Overall Direction of Building Sites on a Block: it refers to the general direction of building sites in a block which is formed based on the geographical directions. Building sites on a block are generally in two types: “North-South” and “East-West”. However, in some blocks, the building sites are of organic kind, and have various forms. Therefore, no overall direction could be attributed to them, which are called none-directional building sites. (Fig. 14)

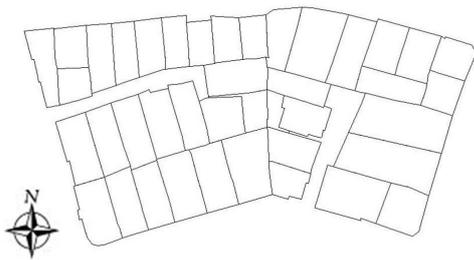


Fig. 14. Overall Direction of Building Sites

9- The Overall Form of Yards: Some ancient texts have noted how a house and its rooms should be designed in harmony with the climate of a region. The term “yard” is used refers to describe both an enclosed area next to a building or open spaces of some public or administrative buildings (Sultan-zadeh, 2011). Therefore, in this study, the general form of a yard is defined as the placement of outdoor space dedicated to the building and it is mostly divided into three categories: yard in the middle, yard in one side, yard in two sides. Their definitions are as follows:

-Yard in the Middle: The outdoor space is located in the middle, and building is constructed around the yard. (Fig. 15)

- Yard in One Side: Outdoor space is located in one side, and the building is constructed in the other side. (Fig. 16)

- Yard in Two Sides: The outdoor space is around the building, and the building is located in the center. (Fig. 17)

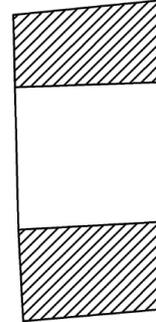


Fig. 15. Yard in the Middle

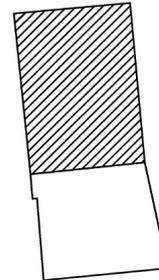


Fig. 16. Yard in One Side

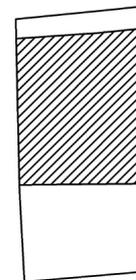


Fig. 17. Yard in Two

10- Size: Blocks in which the area of more than 50% of their plots are less than 200 square meters are regarded as small size (Mahdavinejad et al., 2012) . Similarly, if the area of building sites on a block is between 200 to 500 square meters, it is regarded as medium size. If the area of building sites in a block is more than 500 square meters, it is known as large size.

11- Distribution of Different Sizes: It includes the order, harmony and arrangement of building sites with respect to their size which are divided into two categories, “homogeneous” and “heterogeneous”. The definition of



each is as follows:

- Homogeneous: The building sites which are arranged in a regular basis, and are similar and proportional to one another, are called “homogeneous”. (Fig. 18)
- Heterogeneous: The building sites which are arranged irregularly, and have small and large forms lacking geometrical shape, are called “heterogeneous”. (Fig. 19)

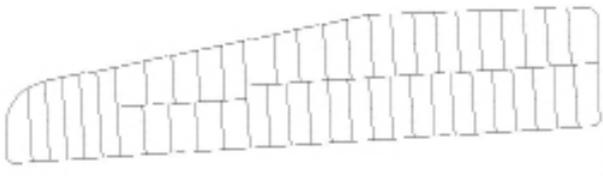


Fig. 18. Homogeneous Distribution



Fig. 19. Heterogeneous Distribution

12- Orientation of Blocks: The orientation of block is based on the greater length of blocks, and it is divided into two categories, “North-South” and “East-West”; their definition is the same as the definition provided for orientation of paths. (Fig. 20)

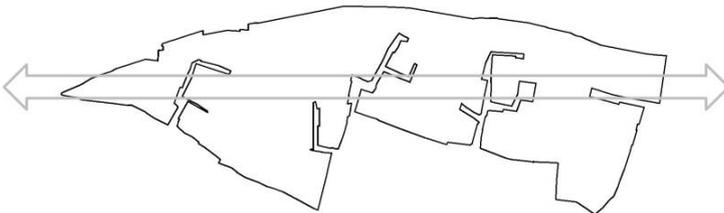


Fig. 20. Orientation of a Block

In the above figure, given that the stretch and the larger axis are horizontal, the orientation of the block is East-West.

13- The Overall Form of the Blocks: Blocks are made of building sites arranged together which eventually constitute the general form of blocks. Forms of blocks are generally divided into three categories: “triangular”, “square” and “polygon”. The block which has the greatest overlap with any of the following forms, would be chosen as the general form of the block.

- Triangular: These types of blocks have the greatest overlap with the triangular forms. (Fig. 21)
- Quadrangular: The square-shaped blocks have the greatest overlap with the square forms. (Fig. 22)
- Polygonal: These types of the block have the greatest overlap with polygon forms. (Fig. 23)



Fig. 21. Triangular Form

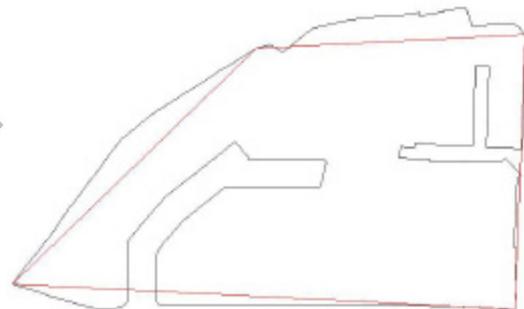


Fig. 22. Quadrangular Form

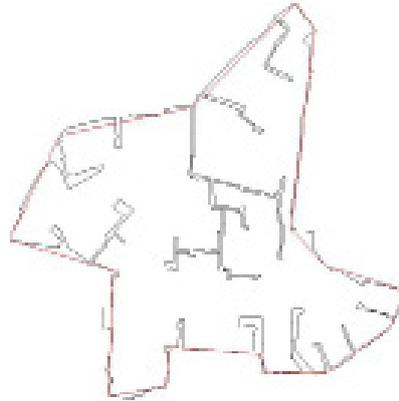


Fig. 23. Polygonal

FRAMEWORK

Given the subjects discussed in this study, we have developed the indices of the morphological study

especially with regard to blocks and urban paths, the indices were presented in the following framework and in a table which includes all previous points, and provides a summary of them:

Table 1. Morphological Indices

Form			
Paths		Blocks	
Dimension	Index	Dimension	Index
Morphology of Paths	The Number of Paths per Block	Morphology of Blocks	Occupancy Factor
	Average Length		Building Compactness
	Average Width		Number of Building Sites in a Block
	Permeability		The Average Number of Floors of Buildings on a Block
	Orientation		The Area of a Block
	Slop		The Distance between the Blocks and the River
	Distribution Method		The Overall Form of Building Sites in the Blocks
			Placement of Building Sites adjacent to each other, on a Block
	The overall Direction of Building Sites on the Blocks		
	The overall Form of the Yard		
	Size		
	Distribution of Size		
	Orientation of Blocks		
	The General Form of Blocks		



CONCLUSIONS

Since morphology includes a wide range of studies, the morphological investigation of urban fabric is among the most important subjects in urban planning and design, especially for future urban development of cities whose importance lies in the application of such studies. The form of a city is the physical manifestation of its identity, and it is the identity that leads to a better understanding of the location, the consistency of empirical sense and participation. On the other hands, the absence of these factors in turn make people lose their sense of belonging and responsibility to the urban environment, and this lack of engagement, makes way for a variety of issues, including the lack of security and vitality, and eventually leads to abandoning the urban areas. This highlighted the need to scrutinize the form, which will be discussed under urban morphology. This study was centered on urban morphology, and with an emphasis on morphology evaluated two key components of “paths” and “blocks”. We introduced seven indices for “paths”, and thirteen indices for “blocks”. Seven indices of paths included the number of paths per block, the average length, average width, permeability, orientation, the slope of the paths and distribution method. Through assessment of these indices one can obtain a great amount of information on paths. Thirteen indices of blocks included, the occupancy factor, building compaction, number building sites on a block, the average number of floors in a buildings on the block, the area of a block, the overall form of building sites in the blocks, placement of building sites adjacent to each other on a block, the overall orientation of building sites on the blocks, the overall form of the yards, size, distribution of plot sizes, orientation of blocks, the general form of blocks whose investigation would greatly help to understand the urban morphology.

On the other hand, the need for studies of this kind is due to the fact that the evaluation of urban fabric would be possible in the temporal and local context of development, in which constant changes are natural. This could prevent possible splits, and facilitate achieving balance in urban open spaces, so that it can restore and regeneration cities.

Given that Iranian cities in development process are at the same time dealing with the issues of globalization, there are inconsistent changes between historical and modern fabric, in which the underlying factors should receive more attention with regard to both physical and non-physical characteristics. In line with this study, we recommended conducting more researches benefiting from typology and study of urban forms, and developing a framework for evaluation of each of them for future researches.



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