

Space Syntax Strategies: A Lesson from Iranian Traditional City, Case Study is Kashan



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Abstract: *This study aims to overcome particularly some of the new urban problems shaping the urban form in Iranian traditional cities, or in other words, to present conceivable applications on the appearance of Iranian traditional city problems like in Kashan. This article aims to focus on presenting some perspective of the traditional city of Iran which has the capacity to be used in raising the quality of life in modern cities of the country. The important part of this study is upon enhancing the stability rather than the developments based on street network and urban developments based upon space syntax theory. Study tried to show how there is little equilibrium between availability and stability in the historical cities. Interactions of the built environment and urban topic such as environment, transportation and the social human relations arise from such strategies. Sense of place and community, environment and sustainable transportation are an important subjects for space syntax. More human oriented planning is needed to make an equilibrium between accessibility and sustainability. New strategies need to be developed to progress on this topic. Analysis results of the traditional area of Kashan city can also be suggested for the medium-sized cities of the center, east, south of Iran. In the last part of study, it was determined space syntax strategies from the analysis of Darb-e-Yallan and Darb-Esfahan.*

Keywords: *Traditional urbanism, Kashan, urban developments, Space Syntax theory, environment, Darb-e-Yallan, Darb-Esfahan.*

Space Syntax Stratejileri: İran'ın Geleneksel Şehirlerinden izlenimler, Kashan örneği

Özet: *Mevcut araştırma İran geleneksel şehirlerindeki özellikle kent formunu şekillendiren yeni şehir problemlerinden bazıları ile başa çıkabilmeyi yada diğer bir deyişle Kashan şehrinde olduğu gibi İran geleneksel şehri problemleri görünümüleri üzerine muhtemel uygulamaları göstermeyi amaçlamıştır. Bu çalışmanın önemli kısmı space syntax teorisine dayalı kentsel gelişmelerin ve cadde ağı tabanlı gelişmelerden çok istikrarı artırma üzerinedir. Tarihsel şehirlerde kullanılabilirlik ve istikrar arasındaki nasıl bazı dengelerin olduğunun gösterilmesine çalışılmıştır. Yapılı çevre ve şehir arasındaki ilişkiler çevre, ulaşım, sosyal ilişkiler gibi ilkelerden yayılmaktadır. Mekan hissi ve topluluk, çevre ve sürdürülebilir ulaşım space syntax'ın önemli konularındandır. Ulaşım ve sürdürülebilirlik arasında dengeli bir tasarım için daha insan odaklı bir planlamaya ihtiyaç vardır. Bu konuda ilerleyebilmek için yeni stratejiler geliştirilmelidir. Bu çalışmadaki Kashan şehri analiz sonuçları, İran'ın merkezi, doğu ve güneyinin orta ölçekli şehirleri için önerilebilir. Çalışmanın son bölümünde Darb-e-Yallan and Darb-Esfahan'ın analizlerinden space syntax ilkeleri belirlenmiştir.*

Anahtar Kelimeler: *Geleneksel şehircilik, Kashan, kentsel gelişmeler, Space Syntax teorisi, çevre, Darb-e-Yallan, Darb-Esfahan.*

1. INTRODUCTION

Space syntax was first developed by Hillier and Hanson [1, 2] who have presented a considerable communication with how people move through and use urban spaces and buildings and how they have achieved some set of measures for space configuration.

Space syntax is best defined as a research program that inquire the relationship between space and human societies from the prospect of a general theorization of the organization of dwell space in all its various forms; settlements, buildings, cities, or even landscapes [3]. The basic concept of the theory is that the built environment has an undeniable result on the social behavior of the people [4]. The space syntax theory is one of the best idea to help planners and architects who have further perception of the interaction between the human behaviors and built environment.

Consistent statistical relationship between configurationally properties of people and space layouts was presented in studies of space syntax and cognition, meaning that spatial cognition is the ability to remember and form a map of space. Relations between spaces means spatial “configuration”. In the form of building floor plans or plans of the urban fabric in general, the initial object of studies within space syntax is studied in the configured space [5,6,7,8].

“The Social Logic of Space” was published in 1984 [1]. After the book title became familiar on space syntax subject during the past 25 years, this theory has been prosperous to bring many architects and planners from all around the world together in an association and great amount of literature. Space syntax theory has been used to specify the effects of the space properties on social activities, such as pedestrian traffic or way finding [9, 10, 11].

How the automobile streets affected the organic texture of Kashan is the first aim to use Space Syntax theory in this article., space syntax theory survey is made in traditional Kashan city since the historical core of Kashan city is one of the great examples of the traditional Iranian cities that can be found in big cities. It is possible to claim that Kashan is unique; the askew, dead-end allies and thin routes with short doorways which have reduced to the level of yards still remind the passenger of the traditional life style and urbanism. Of course there are valuable urban textures in some smaller cities but less than in comparison to the larger cities like Esfahan, Kerman and Shiraz. The main reason for selecting this city as case study is that pure historical traditional urban has still remained through the centuries.

2. RESEARCH METHODS

The research methods used three above-mentioned sorties are relying on the literature revision and straight witnessing, and application of space syntax theory that has been applied to present some more witness are describing in regularity to investigate space syntax in Kashan historical and traditional city.

Literature revision: goal of solving modern problems on re-presentation of traditional urbanism is the mean of idea on the basis of this issue. For having a better understanding about what has happened on the neo traditional expansion of modern world and also what the Iran traditional urbanism has looked like, the literature revision and library are giving an intense study on the issue. Their nature and history are base core of the presented concept.

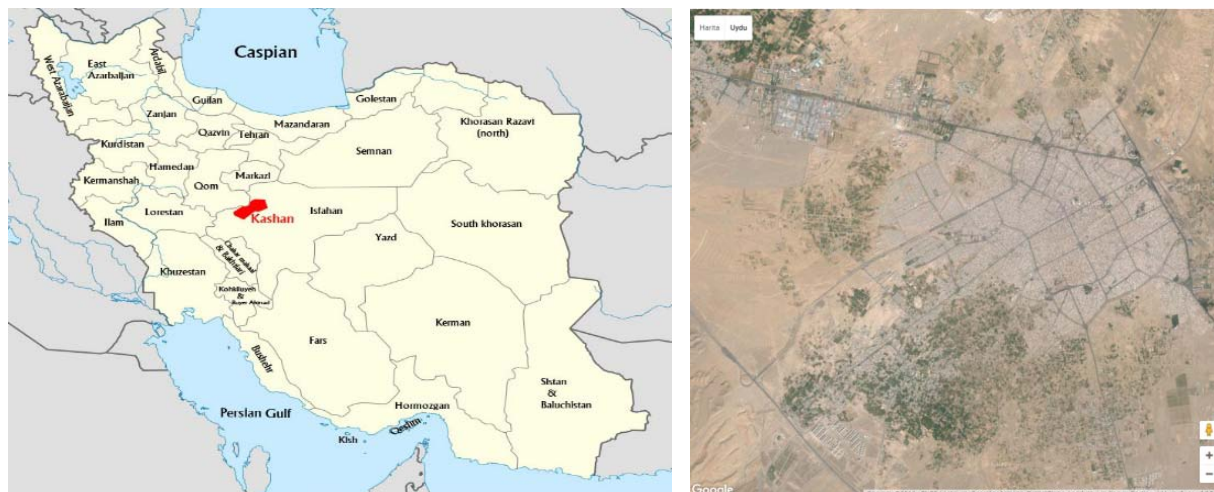
Straight witnessing: is the main idea to review the case study area, and it’s essential to be straight witnessing. In result of witnessing, the new urban environment and traditional elected area are related to the case study city, so in this situation, the author needs to have common conception of clue problems and life style in traditional area of the city. Having been in connection wth the settlement of the historical neighborhood is a good indicator of traditional life style for the author. This concept of method received

from the residents has influence on this research. Thus, this method of contiguity is the observation by specifying the boundary of the neighborhood units of the city.

Application of space syntax: using such tools that can produce numerical data for analysis can be helpful on research. Part of Iran has always suffered fatality from the little or invalid raw information. This application has been feasible to demonstrate the change in the social behavior and the customs of the settlement on the city, affected by the built environment. More explanation on this theory is necessary for quick introduction on previous research methods.

2.1. Sample Area

One of the oldest city at central Iran is Kashan. Sialk Hills or tape sialk is the oldest point of Kashan that has been one of the biggest urban civilization of Iran. The estimate research of sialk civilization has been active since the sixth millennium B.C. to the first millennium B.C. City is located in northern part of Esfahan province (Figure 1). Currently, approximately 270000 settlements are living in the city. Thus after Esfahan city, it is one of the biggest cities of Esfahan province [12].



Location of Kashan city in the center of Iran; Kashan city satellite view from google map and Iranshenasi Publishing co., the Urban/Tourism Map of Kashan, 1/15000, Tehran. [13]

According to Iranian urban planning the other same traditional cities of Iran form the core separation into some major neighborhoods that each of them is a part of the neighborhood unit. According to the map in Kashan, Sultan Mir-Ahamd has been the largest neighborhood unit as Soltan-Mir-Ahmad was located in southwest of the city and attached to the city castle (Arg), and Meidan-e- Amir Neighborhood unit was the second large unit in Kashan otherwise the smallest neighborhood unit is Arabha.

In the historical core of Kashan 7 main neighborhoods were recognized out of 44 neighborhood units, however; only two of the neighborhood unit characteristics of Kashan are briefly reviewed in this article (Figure 2).

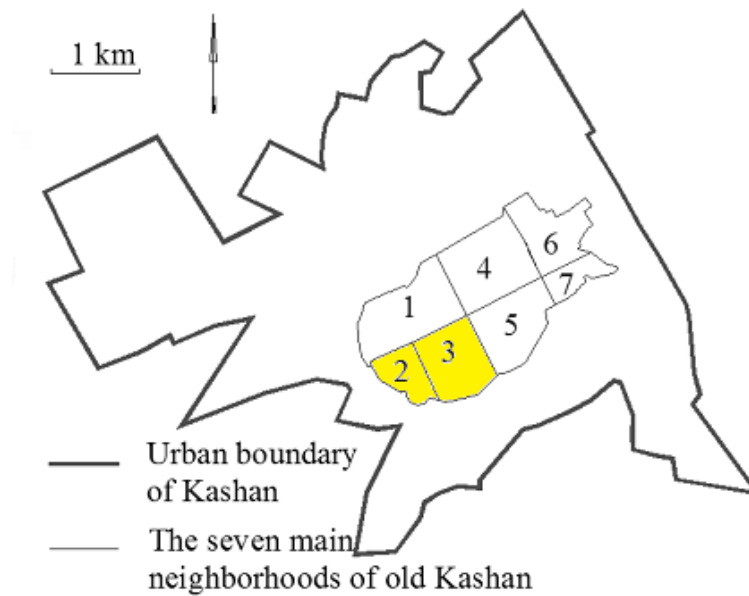


Figure 2. The main neighborhoods of the core of Kashan, Kheirabadi, M. (1993), *Iranian Cities: Formation and Development*, University of Texas Press. [14]

Darb-e-Yallan is called the first neighborhood that is observed. Two centers are defined for the unit on basis of the unit Darb-e-Yalan (Figure 3). A social center is the first one that consists of Darb-e-Yalan Mosque which had been the social central of the unit. The second center was located in the geometric center of the unit including the shops that joined the place on the other way and everyone could easily reach them. According to Google, the longest route from one of the houses to the shops was 185 meters and the longest way to the mosque was 285 meters, therefore such places were used by the residents to meet and socialize with each other [15].

Darb-Esfahan is called the second neighborhood that contains two units, first of which is Kushk-e-Safi and the second Taghi-Khan. Both are attached together and inter-relations could be shown (Figure 4). Neighboring units of the residents of each unit had accessibility to each other's centers. Ab Anbar and some small shops are located on the center of this unit. All residents of the unit had easy access to the center.

This part of the city is considered as one of the good examples of the Iranian urban form, Darb-e-Yallan and Darb-Esfahan are now located in the south of all other historical neighborhoods. The attention to the neighborhoods and the neighborhood units of Kashan gives good conception of how small communities were shaped by limited number of households. Although not all of the neighborhood units had all the gentleness and facilities otherwise units were located so close, it was actually not needed for them to have all the facilities. Walking distances in the neighborhood units is another opinion of sustainable urbanism in Kashan.

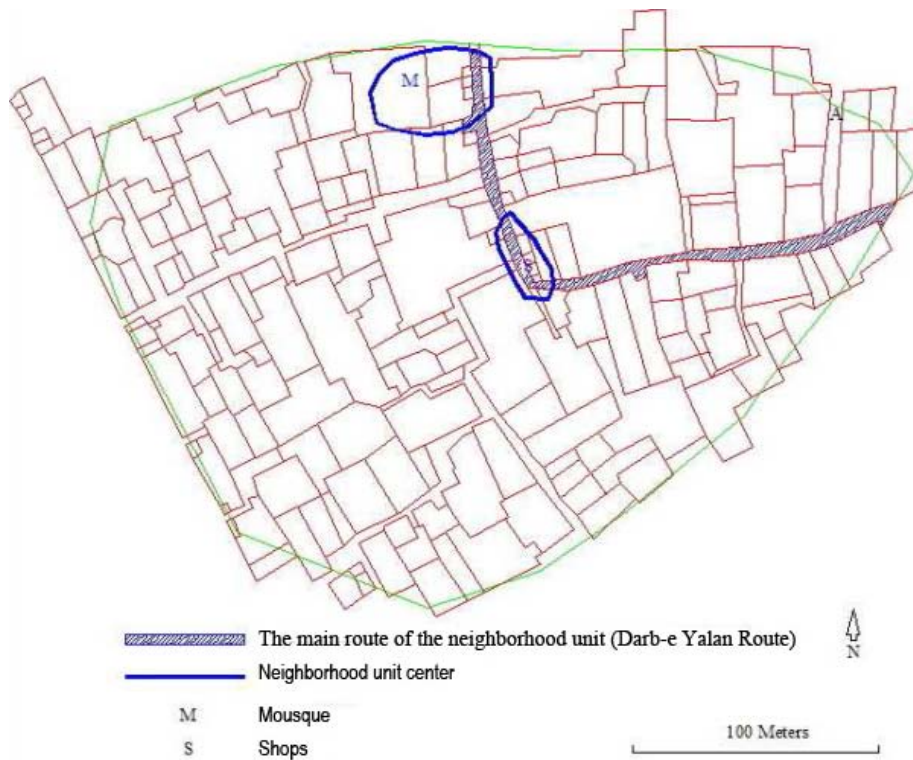


Figure 3. Illustration of urban texture of Darb-e-Yalan neighborhood unit and its centers. Map adopted and developed by the author from one of the maps of Tarh-o-Manzar Consulting Engineers Co. [16]

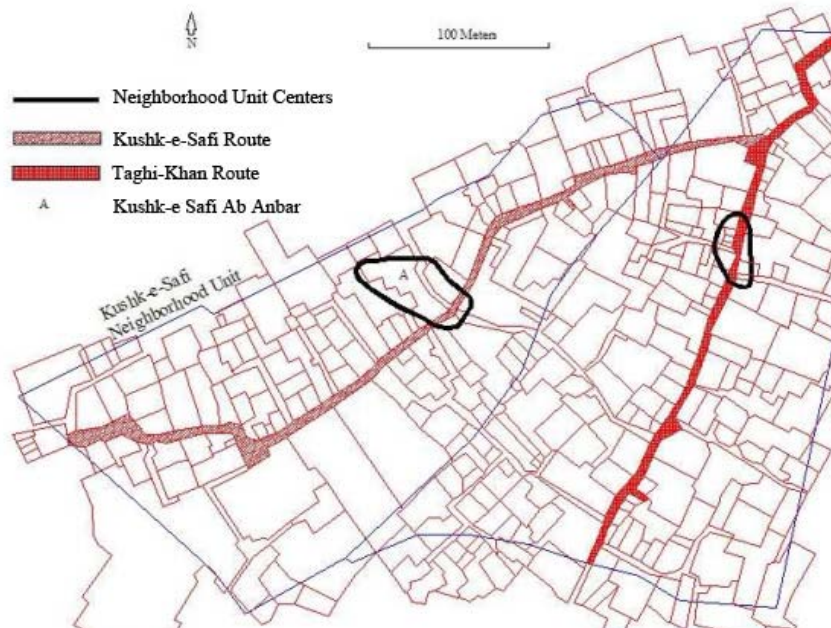


Figure 4. Illustration of the urban texture of Kushk-e-Safi and Taghi-Khan neighborhood units in Darb-Esfahan neighbourhood. Map adopted and developed by the author from one of the maps of Tarh-o-Manzar Consulting Engineers Co. [16]

3. ANALYZE OF SPACE SYNTAX IN THE CORE OF KASHAN AND (DARB-E-YALLAN, DARB-ESFAHAN)

As mentioned about two neighborhoods of Kashan, unit centers could consist of all of some social amenities and living. They could provide the people of each neighborhood unit the needed living materials from the next door centers or within their unit. Indeed in part of the areas is small of the unit thus the distance between the centers was quite short so people could increase the necessary that they could provide from their unit center.

In this research study, measured is the first type of accessibility, that accessibility from one point to any part of the city. Space syntax theory is applied in case of Kashan Depth map was used. For attending the accessibility of Kashan, WebMapatHome, which is also a software developed by UCL is applied on texture. The axial maps with all the new streets on the core of the city were exported to the environment of WebMapatHome. In Auto Cad and the Drawing Exchange Format file.

Map was made of 1738 lines, five indexes of the space syntax theory including connection, integration, total depth, mean depth, and Relative asymmetry were measured for each of the maps.

The outcome of the analysis of the mean integration shows that the whole city was increased after the neighborhoods were built through the streets. The same happened to the connection. The total depth and mean depth were reduce in the latter city of Kashan. The result of the Space Syntax analysis in Kahan, Figures 5 show the differences in connection, integration and mean depth of the city after construction of the new streets.



Figure 5. Integration of Kashan's routes before and after the construction of the automobile streets Obviously increased integration on the city after the streets were built and the connection was promoted slightly. Before and after the construction of the streets can be seen in Table 1,2,3 The major values for the five indexes of the core of the city. Mashhadizadeh Dehaghani, N. (1994), spatial Analysis of Space Syntax Symposium On Urban Planning in Iran. [17]

Table 1. The Space Syntax indicators for the historical core of Kashan, before and after the construction of the automobile streets.

	Number of lines	Integration	Connectivity	Mean depth	Total depth	RRA
The core of Kashan- <i>before</i> constructions of streets	1738	0.394	2.321	21.220	38475	0.0235
<i>After</i> constructions of streets	1794	0.743	2.449	12.478	22386	0.0117

Outcome of the space syntax analysis is that the mobility through the city streets became easier on physical meaning of the integration and connectivity on Table 1,2,3 Thus, mobility includes both non-motorized and motorized movement because people could easily access the narrow allies of the city center. The analysed neighborhood units Kushk-e-Safi and Taghi-Khan in Darb-Esfahan and Darb-e-Yalan show the change in mobility after the new wide streets were built in Kashan.

Table 2. Comparison of the Space Syntax indicators of Taghi-Khan neighborhood unit of Darb-Esfahan, before and after the construction of the new streets.

	Area (hectares)	Number of lines	Integration	Connectivity	Mean depth	Total depth	RRA
Taghi-Khan neighborhood unit <i>before</i> constructions of streets	4.6	22	0.456	2.32	21.220	38475	0.0235
Taghi-Khan neighborhood unit <i>after</i> constructions of streets	4.6	22	0.665	2.88	12.478	22386	0.0117

Table 3. Comparison of the Space Syntax indicators of Darb-e-Yalan neighborhood unit before and after the construction of the new streets.

	Area (hectares)	Number of lines	Integration	Connectivity	Mean depth	Total depth	RRA
Darb-e-Yalan neighborhood unit <i>before</i> constructions of streets	4.7	21	0.451	2.5	19.128	33075	0.0215
Darb-e-Yalan neighborhood unit <i>after</i> Constructions of streets	4.7	21	0.730	2.5	12.478	22486	0.0129

In Kashan, the mobility of the people was promoted by the streets and response of the old texture of Kashan against street building differed slightly from another desire cities in center of Iran. Meantime is not possible to emphasis that the neighborhoods of Kashan became more vibrant and livable. The reason for the sign of such results in the above tables is that the neighborhood centers lost significance to the streets.

According to the map of integration of the new Kashan indicate that are local old streets less than integration values of the main streets that are also used by car drivers. This includes both car use and pedestrian use. In fact for the social activities and for the residents any more the neighborhood centers are

not a vibrant axis and rush of people from neighborhoods to the streets are related to high values for the integration of the new texture.

Using space syntax theory on this part of the city tell us that integration and connectivity of the city as a whole, the city center and many other parts of the city has been improved and accessibility of the city is now higher than before and this is absolutely a good quality that promotes mobility otherwise in center of areas sustainable mobility modes can be promoted within reasonable walking distances.

4. CONCLUSION

In this study on the first section, it is indicated that space syntax provides facility to investigate the communication between various human activities and space attributes on the basis of computational and mathematical measurements. In this study and reviewed of space syntax theory, some of the areas in Kashan and core of the city tells us that it has relation with spatial cognition. They propose that there is a specimen underlying this communication and there is an important correlation among the syntactic property on the real space and property.

The conformity are the mean finding on the study of Kashan:

- The latter witnessing was continued in the figure of literature revision space syntax analysis.
- The unit are based on the neighborhood that are available to formal part of the unit the neighborhood have inward-looking and self-contained and also independent identities, the historical core of Kashan organized on the base of the neighborhood units and neighborhoods.
- Also traditional residents had used amenities and living with sense of belonging to their place this sense origin of enhanced by the unique identity of the urban amenities.
- Now accessibility on the core of city is higher than before and this situation is evidently showed of good quality that promotes mobility.

In this study, researchers believe that measurement of space configuration by space syntax and connection between the properties built an area. The outcome for the recommended medium-sized cities of the center, south, east of Iran to create better quality of life in the Iranian cities.

REFERENCES

- [1] Hillier, B. & Hanson, J., 1984. The Social Logic of Space. Cambridge : Cambridge University Press.
- [2] Hillier, B. and Vaughan, L. , 2007. The city as one thing. Progress in Planning, 67 (3), 205-230
- [3] Bafna, S., 2003. "Space Syntax: A brief Introduction to its Logic and Analytical Techniques", Environment and Behavior 35, pp.17-29, available at <http://eab.sagepub.com/cgi/reprint/35/1/17>
- [4] Penn, A., 2003, "Space Syntax and Spatial Cognition or Why the Axial Line?" Environment and Behavior, 35, 1, 30-65.
- [5] Timmermans, H., 2005. Decision Support Systems in Urban Planning, Routledge Press.
- [6] Hillier, B., 1999. Space is the Machine: A Configurational Theory of Architecture Cambridge University Press
- [7] Al_Sayed, K., Turner, A., Hillier, B., Iida, S., Penn, A., 2014. "Space Syntax Methodology", Bartlett School of Architecture, UCL, London.
- [8] Carmona, M., 2014. Explorations in Urban Design: An Urban Design Research Primer Routledge press.
- [9] Schmitt, G., Hovestast, L. ECAADe, 2010. Conference: Future Cities: Proceedings of the 28th Conference on Education in Computer Aided Architectural Design in Europe
- [10] Raford, N., Ragland, D., 2003. Space Syntax: An Innovative Pedestrian Volume Modeling Tool for Pedestrian Safety, Paper 04-2977, Annual Meeting of the Transportation Review Board.

[11] **Emo, B., 2012.** Wayfinding in Real Cities: Experiments at Street Corners, International Conference, Spatial Cognition 2012, Kloster Seeon, Germany, August 31 – September 3, 2012, Proceedings

[12] **Cram101 Textbook Reviews, 2012.** E-Study Guide for: World History of Architecture by Michael Fazio

[13] **Iranshenasi Publishing co., the Urban/Tourism Map of Kashan, 1/15000, Tehran.**

[14] **Kheirabadi, M. (1993),** Iranian Cities: Formation and Development, University of Texas Press.

[15] **Mashhadizadeh Dehaghani, N., 1994.** An Analysis of the Specifications of the Urban Planning in Iran, Iran Science and Technology University Press.

[16] **Tarh-o-Manzar Consulting Engineers co., 2003.** The Strategic Plan for Conservation, Gentrification, and Revitalization of the Historical Core of Kashan

[17] **Mashhadizadeh Dehaghani, N. (1994),** spatial Analysis of Space Syntax Symposium On Urban Planning in Iran, Iran Science and Technology University Press, Tehran.

Abbreviations

RRA Real Relative Asymmetry, **SS** Space Syntax, **UCL** University College London

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