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Analyzing the Homogenous Nature of Central Courtyard structure in Formation of Iranian Traditional Houses.

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Abstract

In historical cities and especially traditional houses in 17-19 century A.D in Iran, vacuum model (central courtyard) as one of the most fundamental concepts, has always played a key role in organizing Iranian cities at large scale and consequently houses at a micro scale. In the spatial organization of traditional houses, the central courtyard, among other spatial elements, has consistently played the role of a homogenizer and organizer rather than a neutral factor. Generally in the vast range of Iranian central cities including Isfahan, Shiraz and Yazd, courtyard has had a homogeneous and fluid nature, and has acted as a link between different spaces and contributed to the continuity of space in the traditional houses.

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Keywords: Iranian traditional houses, homogeneous space, vacuum space, central courtyard, spatial continuity.

1. Introduction

By a comprehensive look, the whole body of research on Iranian traditional houses can be categorized into five different approaches including dictionary-based, interpretative, typological and historical and single category (Golijani, 2005). In this context, although the relevant studies have investigated a wide range of architectural

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monuments of Iran, among the existing research methodologies, structural-spatial analysis of central courtyard (vacuum) has been less addressed as an effective and organizing model.

Notably, the research on structural-spatial structure of courtyards has been limited to a typological level and a purely interpretative approach as presented in the physical space of the courtyard. Similarly, a wide range of studies have examined the central courtyard from the perspective of climate and geography of the area. Unfortunately, in this field, the area of spatial and structural analysis of the courtyard as an effective component of traditional houses has been neglected.

Therefore, considering the importance of the issue of the spatial and conceptual analysis of Iranian architecture as a successful model of urban development, and courtyard as an effective and organizing component of Iranian traditional houses, it is possible to cite a number of structural and infrastructure studies performed in this regard. A carried out research by Nader Ardalan “Sense of Unity” can be considered as one of the most effective resources in the evaluation of Iranian architecture. By avoiding a merely interpretive and even structural-spatial approach, Ardalan has shed light on the hidden and esoteric layers of Iranian architecture including traditions and philosophical ideas associated with Iranian architecture (Ardalan & Bakhtiar, 2005). In a research performed by L.B entitled “the role of in-between spaces in shaping the identity of the spatial extent of Iranian historical contexts”, the nature of in-between spaces and their roles in Iranian architecture are specifically investigated. Utilizing an interpretative and phenomenological approach, the article addresses some concepts including organization, spatial hierarchy, field packing, neighbourliness, thresholds and spatial in traditional houses, and also analyzes the concept of courtyard in traditional houses playing a critical role in the progression of the current article.

(Balilan, Etesam, Eslami, 2011).

The present paper mainly intends to examine the homogeneous nature of courtyard in traditional houses as a vacuum model, and at the same time, an organizing component among other elements of the house. It must be noted that the recognition of the homogeneous nature of the courtyard is of the utmost significance not only to be informed of the spatial structure of the courtyard, but also to understand its nature in the formation of a spatial continuity and surge in the whole organization of the house and to understand the process of how to develop a range of functional areas in different places in the houses as a sustainable and systematic pattern in the range of Iranian architecture.

Basically, understanding each phenomenon and recognizing its historical process and development is important due to the fact that by utilizing it, it is possible to find a solution to the problems and bottlenecks and the questions posed in the status quo or the main causes of the current situation (Habibi, 1996).

Therefore, to do a comprehensive analysis of the homogeneous nature of the courtyard, the current paper first examines the history of central courtyard as a sustainable model, and then on the basis of library and field studies and by using an interpretive and case study approach, the paper investigates the development of the central courtyard. Then the various functions of the courtyard in the traditional houses of the Iran’s central cities including Isfahan, Shiraz and Yazd are described. Comprehensive typology of courtyard in the above mentioned cities during 17-19 century AD are evaluated as the third step of the current article. In this context, the basis for the final analysis was homogeneous vacuum nature (central courtyard) as the most fundamental pattern in the spatial organization of courtyard in Iran’s traditional houses, which is discussed in the present paper by an interpretative, historical and phenomenological approach and also a structural-spatial method in the final section.

2. The definition and history of the central courtyard

Courtyard or *mian sara* refers to an open space that is constructed generally to provide light and exchange heat with the outside world in the form of a square or rectangle. In Persian into Persian Dehkhoda Dictionary, courtyard means a surrounded area and every place enclosed by a wall (Kiani, 2004). In terms of history, the history of the courtyard in Iran dates back to the late tenth century BC, in *Khaneh E Soukhteh* or IV floor, located in *Tappe Hasanlu* in *Shahr E Soukhteh* (Mirlatifi, 2004). According to some carried out research, the primary structure of the central courtyard has rooted from the basic model of *charsofeh*, which it could be regarded as the most ancient model of house construction in Iran (Pirnia, 2008). In the *charsofeh* model, Fig. 1, the middle cross-shaped space of the house is encircled by four peripheral rooms in the corners and in a square or rectangular plan, and the only way to access to open area is through front courtyard or circular space located on the *mian khaneh* it is a rectangular space located in the middle of the *charfoeh* houses roof (Memarian, 1994). Likewise, based on some scholars, the model of the houses with a central courtyard, from a small circular opening in the ceiling was devoted into a

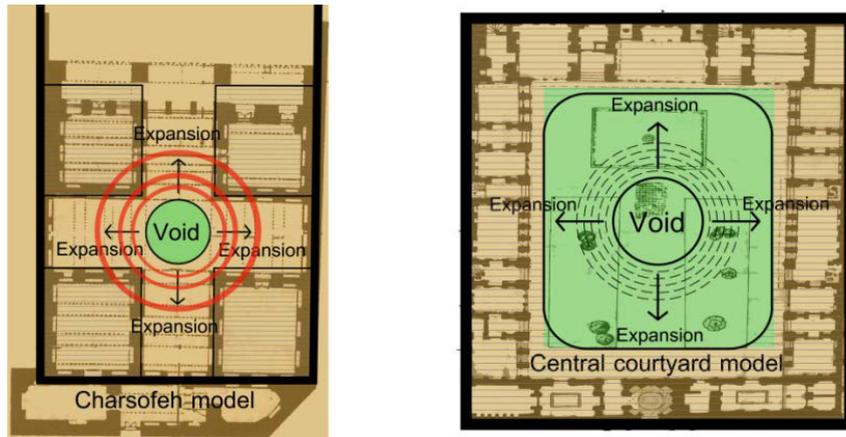


Fig. 1. Deformation of charsofeh model into central courtyard house.

spacious courtyard model through the development of a circular void space situated on top of the mian khaneh. Fig.1.

In this restructuring, cross-shaped central space that is limited by four-corner rooms, is located around a central courtyard in a new structure and has received an open space in new and wider dimensions. Indeed, based on a number of researchers, this model can be a strategy for shaping central courtyard in Iranian traditional houses, as mian khaneh has been transformed into mian sara over the years, leading to the shaping of the central courtyard model. In Iranian houses mian sara means central courtyard and as a focal point has a central role (Kiani, 1995). What is more, mian sara acts as a small garden in some cities such as Isfahan, Yazd and Shiraz (Pirnia, 2004). With the development of construction techniques in Iran, the concept of the central courtyard, from just a physical subject has converted into an inseparable and spatial concept in the spatial organization of traditional houses in Iran due to climatic causes. Accordingly, by a more comprehensive look, it is possible to liken the concept of the central courtyard to a space by a vacuum nature; one that without it, the configuration of traditional houses in Iran is impaired. Hence, the vacuum as an organizer element leads to the integrity of the spatial system of traditional houses.

3. Different courtyard functions

Various functions of courtyard include the 7 following criteria (Memarian, 1994):

- As a sign of private ownership: the central courtyard serves as an open environment and maintains privacy by different applications.
- Unifier of the different elements of a house: in fact, the yard as a pervasive component, connects the different spatial elements of a house including porches, rooms, closets and corridors.
- As a connector of a number of spaces: by creating a continuous and vast environment in the centre of the house, courtyard connects all the physical elements and the plays as a connector role.
- As a lush and lively environment: in addition to planting floral trees in the courtyards, sometimes citrus and fruit trees were planted, which are called narenjestani.
- As a safe and calm place to comfort families: people generally perform daily activities in the courtyard and it is a completely private place for the family.
- As an artificial ventilator for the movement of favorable winds: the climatic performance of courtyard is one of the main features of the courtyards in the central Iran. Godal baghcheh was one of the effective

ways to control unbearable heat of summer. In fact, by lowering courtyard level down than alley, Iranian architects have utilized the cool temperature saved at night to create comfort during the day.

- As an important element in the organization of the different spaces.

4. The typology of the houses with courtyard in the cities of Isfahan, Shiraz and Yazd

Generally, the houses in the central cities of Iran are of an introverted type. Introverted house refers to those homes that have formed in various spaces around a central courtyard. Introversion tends to inner states, and it is a way to avoid showing external conditions (Memarian, 1994). In other words, a central courtyard with introversion pattern plays an integral role in establishing environmental and thermal comfort in hot seasons of a year, and has been widely used by architects.

4.1. In general, a central courtyard in the central region of Iran can be classified in diverse forms.

4.1.1. In terms of spiritual and physical requirements, the central courtyard is classified into three groups as follows:

A) Narenjstani: this courtyard is used in a small dimension for planting citrus.

B) Biruni (men courtyard): This courtyard was semi-private and was dedicated to guests and strangers and usually in a square or rectangular form.

C) Andaruni: this courtyard with square and rectangular shapes is a private place for the family. Fig.2. (Haji-Qassemi, 2004)

4.2. The composition of courtyard could be divided based on typology in the traditional cities of Iran such as Isfahan, Shiraz and Yazd during 17-19 centuries AD into some groups as follows:

A) The typology of courtyard in the houses with a courtyard. Fig. 3. (Memarian, 1994).

B) The typology of courtyard in the houses with two courtyards. Fig. 4. (Memarian, 1994)

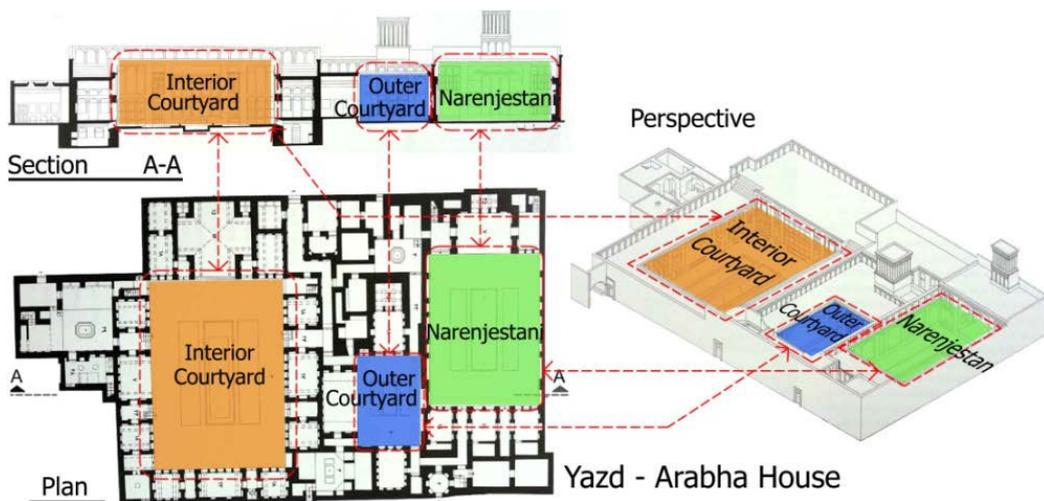


Fig. 2. Organization of interior, outer and narenjestani courtyards in a three courtyard house.

C) Courtyard hubs are in parallel and adjacent to each other.

- Courtyard hubs are in a parallel form but not contiguous.

- Courtyard hubs are in line with each other.

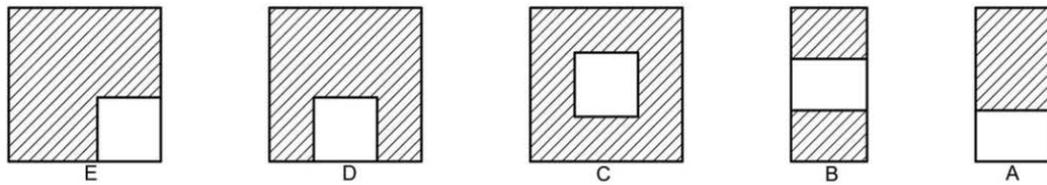


Fig. 3. The typology of houses with a courtyard.

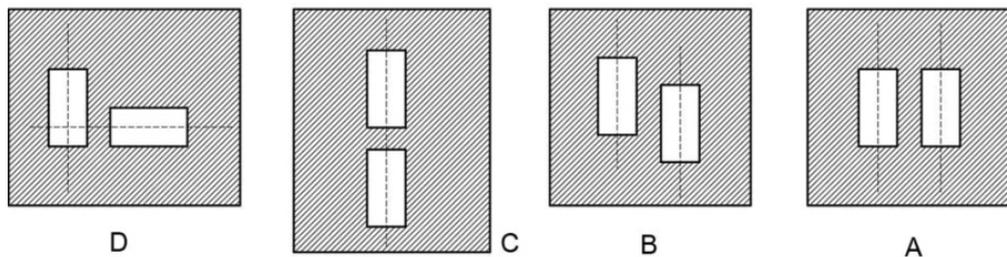


Fig. 4. The typology of two-courtyard houses.

- Courtyard hubs are perpendicular to each other.

D) Typology of the courtyard in the houses with more than two courtyards:

Basically, in the houses with more than two courtyards, the organization pattern of vacuum is a combination of above four-fold models of double courtyard houses and it is possible to generalize this pattern to the cities studied.

5. The nature of vacuum space

Basically, vacuum space (central courtyard) as a continuous and organizing entity, has homogeneity in the spatial hierarchy of the traditional houses in the central region of Iran. In other words, the central courtyard as an inseparable element has had a fundamental and structural role in macro, middle and micro scales in cities, sectors and buildings respectively, in the cities of Isfahan, Shiraz and Yazd, and similarly as a recurring element has introduced the vacuum concept as a fundamental part of an urban development comprehensive system. Fig. 5.

The central courtyards in the traditional large scale urban planning system in Iran act as a network of vacuum grids; city has led to the demarcation of semantic and functional areas and ultimately the readability of physical structure of the city. Thus, this vacuum spatial grid act as an organizer in the micro system of buildings and in particular small traditional houses in Iran, and all the spatial elements of the house are formed around the vacuum (i.e. central courtyard) and in case of the elimination of the courtyard, the spatial organization of the house is disturbed.

5.1. Vacuum relationship as a homogeneous component in the comprehensive house organization system

In the structure of house, the courtyard as a component of an integrated whole, has a homogeneous structure and will enhance and complement spatial organization. To understand the relationship between components in the organization system of Iranian houses, it is necessary to recognize the relationship among components. So, basically the relationship between the parts and the whole in each spatial organization system is subject to various, factors such as shape, material, size, colour, function and content (Grutter,2004). Essentially, in the relationship between components and a unified whole, if one component is different from other components in one or more aspects, it

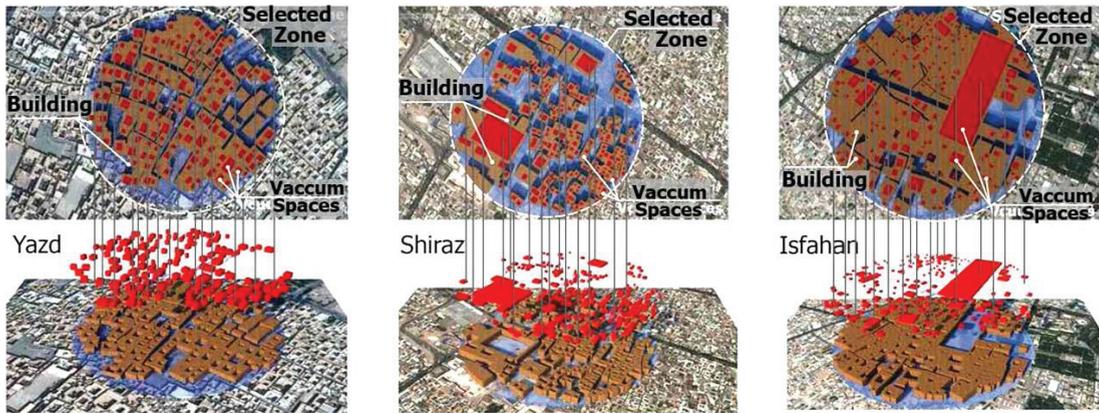


Fig. 5. Relationship between vacuum spaces and urban plans in Yazd, Shiraz and Isfahan.

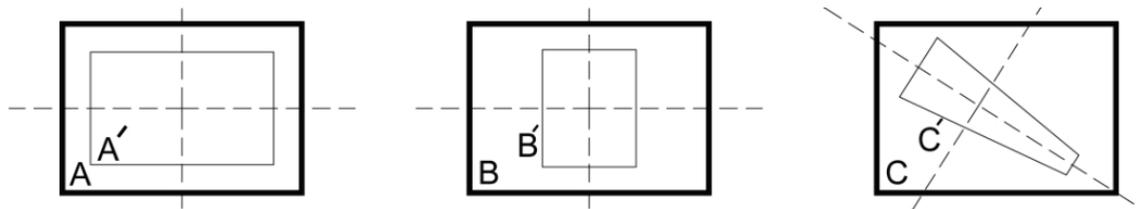


Fig. 6. Relationship among components and a unified whole

becomes a special component, and so will be distinct from the whole, and acts as an independent part in an organization system (Grutter,2004). Among the factors that could cause a mutual relationship between the whole and the part, the shape is the most important determinant, and by a relative change of form, formal similarities between the components and the whole become weak (BB'), and by a substantive change in their structure, this similarity disappears completely (CC').Fig. 6. (Grutter,2004).

Thus, the relationship between the part and the whole, from AA' to CC' of an integrated and homogeneous component, tends toward an independence component with a different nature. Given the concept “similarity in shape”, uniformity between components (in any combination) causes that a component appears independent earlier in a whole. In contrast, whatever the component itself is more complete organization becomes a series of disparate elements and will be more distanced from a homogeneous whole. In fact, whatever the form is more incomplete and non-independent it will be integrated easier in a whole (Grutter, 2004). In these circumstances, if a component is complete and independent, it still tends to maintain its wholeness in a series as well, and its integration in a group of similar components will be more difficult. In general, unfinished elements forsake their independence for the benefit of the whole. Thus, AA' as the common structure of the traditional houses in Iran strengthens the homogeneous relationship between the vacuum (central courtyard) as a non-independent and incomplete part in the comprehensive organization system of the Iranian traditional houses. Fig. 7. (Haji-Qassemi, 2004).

5.2. How to connect the components in an organization

How to locate and establish the courtyard in traditional houses of Iran represents a continuous and homogeneous relationship between vacuum as a homogeneous component in a homogenous whole. Therefore, in general, in system of the combination of two spatial elements, connectivity of components ranging from independent to dependent and homogeneous forms follows one of the following modes. Fig. 8. (Grutter, 2004).

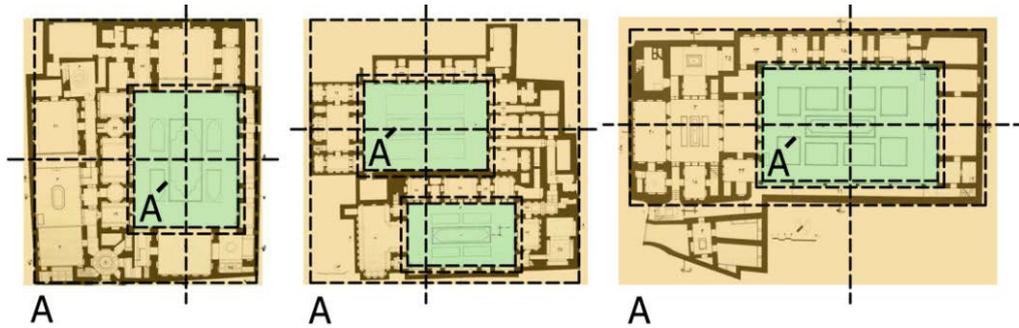


Fig. 7. Relationship between vacuum as a homogeneous component and whole in Arab Kermani, Ardakanian and Thahami houses in Yazd.

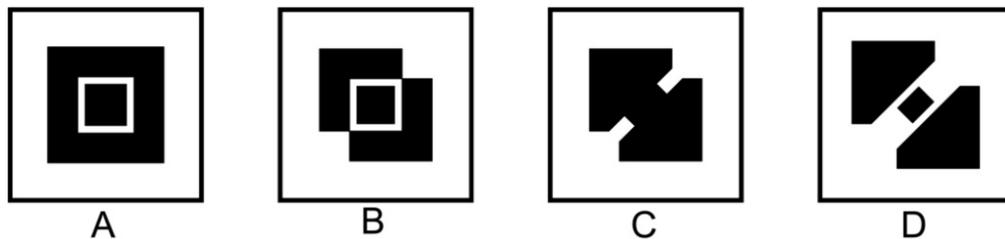


Fig. 8. Different connections among components in an organisation.

- A. The components are linked together in a concentric way and create a formal homogeneity.
- B. The components are linked together in an overlapping and cross-section way and by a limited and common ratio
- C. The components are linked together with a common neighbourhood.
- D. The relationship between components is achieved through a third space.

In the above four-fold patterns, further separation between components, more independence between components (Grutter, 2004). In this situation, that particular part of a homogenous spatial space achieves more distance. Therefore, courtyard as a spatial element (a component) is in a direct and bilateral communication with other home elements such as porch, talar(a closed space used for warm seasons), she-dari (bed room), panj-dari (living room), and other areas follows the below relationships in Figure 9. Having physical characteristics as a vacuum concept, central courtyard has some semantic features as well, and in a comprehensive system, with the development of a functional-semantic relationship with other areas as an internal relationship, the courtyard can create spatial integration in the continuity of other spatial elements in entire organization system. Fig. 9. (Haji-Qassemi, 2004). In fact, in the hierarchy of the house space, the courtyard is in a reciprocating relationship with other elements and creates a continuous spatial continuum. In the other words, by creating a central vacuum in the body of house and midst of all the spatial elements, the courtyard as a component in the spatial organization of the house is the beginning and end of all activities in a functional and semantic sense.

6. Open, semi-open and closed space

Understanding homogenous nature of courtyard without analysing the characteristics of the spatial structure of the surrounding elements cannot be achieved. It should also be noted that within the space of traditional houses, there is a continuous and collaborative relationship among the spatial elements that leads to the formation of a homogeneous and continuous relationship in the hierarchy of the home environment. This continuous relationship is the result of the link between a triple spatial pattern including open, semi-open and closed spaces. In this spatial pattern, for-

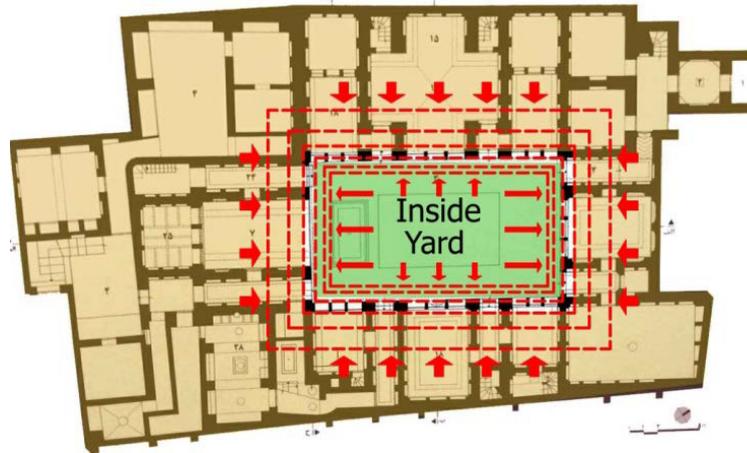


Fig. 9. Relationship between central courtyard with side spaces.

example, open spaces include courtyards, semi-open spaces include porch and talar and closed spaces include seh-dari and panjdari, kitchen and closets. It should be noted that homogeneous feature of courtyard is formed in a continuous communication in the continuation of open and closed spaces, and this homogeneity creates an integrated spatial space. In the body of the house, open, semi-open and closed patterns constantly in an effective process, spread their performance into another space, and the nature of all places creates a real emotion of transition (movement) and reception (pause) in the audience. Fig.10. (Haji-Qassemi, 1996). In Iranian houses, crossing from an enclosed space to another one is continuously repeated without any spatial interruption, because the building is combined in a continuous and dense warp and woof (Stierlin, 1982). Iranian architects have tried to pass the man from a borderless space rather than a solid mass (Ardalan & Bakhtiar, 2001). In Iranian traditional architecture, man continuously moves forward in a vast and wavy space which is steadily unique (Ardalan & Bakhtiar, 2001). Indeed, open, semi-open and closed spaces have a dual function, i.e. "they both create process and are the product of the process" (Balilan, Etesam, Eslami, 2011). In this continuous relation between the courtyard and the other elements of the house, the spatial continuity is never disrupted, and spatial flux continues ever and ever. On the other hand, the relationship between the spaces in the traditional houses, from a small hole to provide access, has been converted into a spatial opening, and this has led to a functional spatial transparency between the different spaces. Porch is the first form of spatial openness in Iran architecture (Memarian, 2010). The half-open structure of Ivan space in a mutual cooperative relationship continues to maintain the spatial-functional nature of courtyard and to become a part of courtyard.

All the components of Iranian house including the courtyard, as a participative elements, take part in a two-way and continuous relationship in the construction of an integrated whole. Therefore, basically, the important factor in a traditional house in terms of semantic-functional participation is the relationship between the parts rather than the nature or wholeness of components.

This is because the relationship between the shapes and elements in a comprehensive (spatial) system is distinct from the essence of components and is achieved through their reciprocal relationship. Therefore, it can be argued that in spatial structures, the final equation of the components does not only result from adjacency and proximity of components, but also from spatial rules (Hillier & Hanson, 1982).

Based on such an approach, the relationship between the elements of an Iranian household can be better analysed on the basis of topological order rather than geometric order. Based on this principle, the primary organization in such organization system contributes to create centres or places (based on proximity), direction (based on continuity) and regions or areas (based on confinement), which all three items are the result of a typological order and relation. (Shultz, 2009).

To explain the spatial proximity, Iranian architect Nader Ardalan utilizes "spatial connectivity" to express the relationship between spatial elements in Iranian traditional architecture, and believes that spatial connectivity in Iranian architecture follows the basic semantic pattern of connection, transmission and reception (Ardalan &

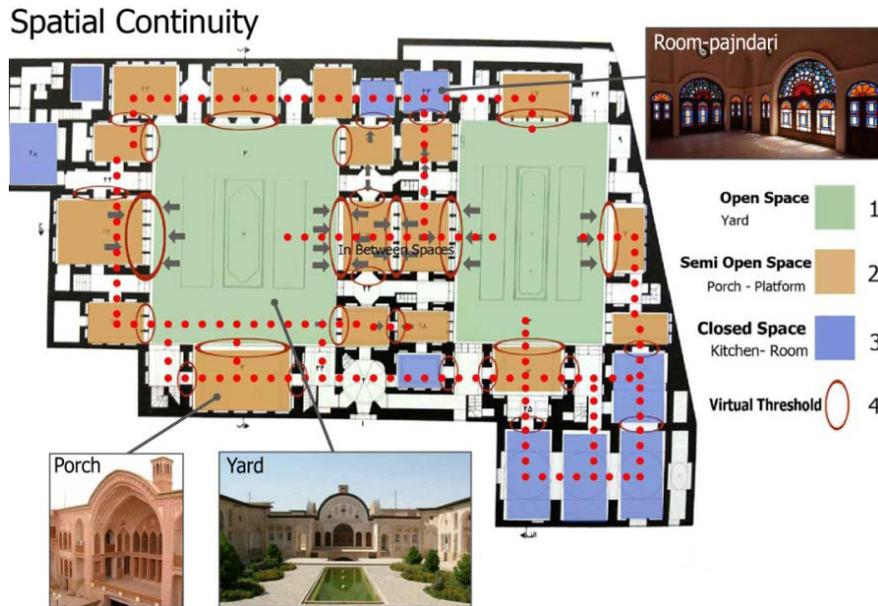


Fig. 10. Spatial flux between various spaces.

Bakhtiar, 2005). With regard to the above principles of topological order, it should be noted that courtyards as open spaces, have become a homogeneous and non-cross connectivity by using a number of half-open and closed proximities in a continuous link. Through the connectivity of open, semi-open and closed spaces, these relations have led to the development of the spatial integration in the whole spatial system of traditional houses in Iran.

As described, the courtyard is an element that its nature is formed in a reciprocal relationship with its peripheral elements, and as a vacuum element is part of the homogenous hierarchical system of the house. This homogeneous and vacuum space as a centre-oriented spatial cell acts at the heart of the house as a serious and effective centre. Meanwhile, each centre behaves as a structural base of field of forces (Alexander, 2011). Thus, in the spatial structure of the house, courtyard as the same role of a spatial square, leads to a gravitational interaction in the areas. In Iranian traditional houses, internal borders have always acted as a link and basically are of the type of virtual boundaries. These borders have unique physical and semantic features that have no absolute and complete limit; and in another sense it can be considered as a third area, flexible or soft thresholds. The threshold acts between two identical and non-identical architectural spaces as a transition area, and by providing a flexible model would lead to combination, continuity and separation of the spaces (Balilan, Etessam, Eslami, 2011). Along with determining and controlling the ownership territory, threshold has the task of receiving and interpreting information, and acts as a separator and connector and as a transitional area in the spatial organization of the houses. By indefinite thresholds, the spatial realms of courtyard enter other functional realms such as porch, and the courtyard will be partially occupied by other functional realms.

This relationship is extended and transferred to other spaces including rooms in a transitional and continuous way and finally to other courtyards, and all spatial elements in a homogenous structure act in a systematic way with the centrality of central courtyards. Generally, spatial thresholds like borders can be divided into two various types, real and virtual thresholds (Pierre von, 2004).

Real thresholds in architectural spaces create definite and unchangeable spatial areas and cause relational confinements between two different spatial realms. However, eliminating physical constraints and create virtual and relative borders lead to the mutual participation of spaces.

The vacuum space in Iranian houses as a spatial realm with virtual thresholds leads to penetrating of its functional realm into other spaces and extends its influence into other areas. Fig. 12. (Haji-Qassemi, 1996).

In fact, in such spatial system, the courtyard is of a two-sided nature. From one hand, it has maintained its semantic-functional nature in the role of a courtyard, and on the other hand, by penetrating into peripheral functional realms

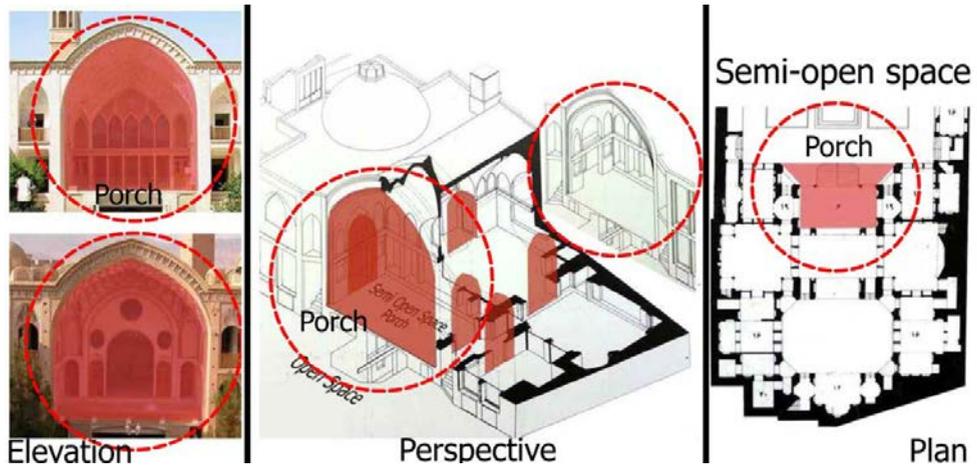


Fig. 11. Virtual boarder-porch.

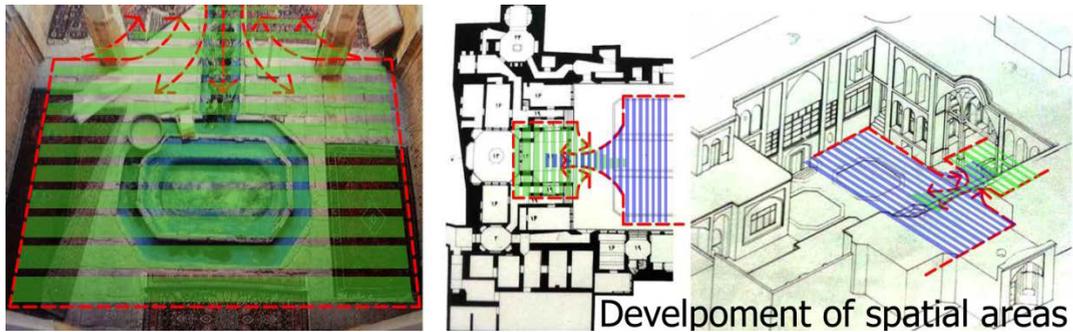


Fig. 12. Development of spatial functions.

has led to the developed bilateral cooperation of other spatial realms and caused shaping a comprehensive and uniform system in spatial organization.

7. Conclusion

The formation and development of homogeneous feature of courtyard in the spatial organization system of the house is the result of a series of structural and spatial features, in a fashion that the homogeneous components including courtyard, have become a part of the whole in an integrated whole and in an incomplete form, and despite the continuous relationship of open, semi-open and closed spaces through topological relations and virtual thresholds, the relationship between all spaces and also courtyards are facilitated.

Overall, despite the structural centrality in the house and having unified relationships with their peripheral elements, courtyard develops spatial homogeneity through virtual borders and creates a comprehensive and continuous pattern in the system of traditional houses in centre of Iran. In fact, the house as the smallest unit of the comprehensive urban planning system of Iran is a part of the integrated and homogeneous urban model which develops spatial flux pattern from urban organization system to the smallest urban unit. This pattern could be extended to all urban physical elements and represents a comprehensive pattern in the whole system of traditional Iranian architecture.

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