The Social Logic of Persian Houses, in Search of the Introverted Houses Genotype

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Abstract: Introverted houses are the most common types of Persian traditional houses. Besides the climatic condition, the social and cultural patterns of life in various historical periods have been affected on existence of introversion pattern in houses. Research about introverted houses based on Space Syntax theory and trying to discover their genotype is an effective step to understanding the complexities of the socio-spatial model of these types of traditional houses. Three Persian introverted houses were selected by authors as case study. The cases are from the types with one, two and three courtyard called Boroujerdiha, Rasoolian and Forough-o-almalek. The houses are located in the central Iran cities including Kashan, Yazd and Shiraz. Visual Graph and convex map analysis was applied by Depthmap software and obtained data were analyzed for discussion about genotypes of houses. To prove numerical results; inferential statistical methods such as Pearson correlation tests by Spss software were used. In conclusion, visual graph analysis shows all studied houses follow specific patterns. Core integration and control spaces are similar. Also step depths of spaces with same functions are very close to each other. There are direct statistical correlation between integration, control connectivity and step depth of common spaces in all houses. The above mentioned relations can be defined as genotypes in introverted houses.

Key words: Space syntax • Introverted houses • Genotype • Spatial configuration • Persian houses

INTRODUCTION

Houses are places for life and rest of human being and have been the first spaces constructed and used by human during history. Hence the social patterns that existed in architecture of houses, perhaps more than any other spaces reflect the cultural characteristics and life style and attitudes of their inhabitants. Different architectural patterns have been used in different geographical regions in Iran. One of the most important and commonly used patterns is introversion, especially in arid climates. Research into socio-spatial characteristics of historical houses can be exploring common architectural patterns, simultaneously can clarify life style of people in a particular historical period. In spite of this fact that the researchers have studied various aspects of Iran's historic houses, researching about social patterns used in Persian traditional houses and especially introverted houses are rare. The paper aims at identifying patterns that structure the spatial configuration of introverted houses, i.e. their genotypes. The main question of research is that is there any significant correlation between socio-spatial parameters between different introverted houses.

What motivated the author to carry out this study was this fact that by a look at many introverted houses it can be considered that the architectural patterns is repeated in different houses. The goal is understanding a relationship, similarity or correlation between socio-spatial patterns of introverted houses by a scientific approach and using numerical data.

In order to use the idea of building type comprehensively as a method in the design process, the socio-spatial knowledge of the architectural artifact has to be retrieved [1]. Each building type is a unique socio-spatial configuration that requires different methods to unpack its relationships. This paper aims at analyzing the socio-spatial organization of the introverted houses in Iran.
As case studies three samples of introverted houses including Boroujerdiha house in Kashan city, Rasoolian house in Yazd city and Forough-o-almalek house in Shiraz city were selected. For analyzing and comparing houses from point of view of space syntax, Depthmap software, developed by Alasdair Turner at UCL was used.

Space syntax theory [1] proposes principles relating to the social dimension of space. This spatial theory argues that the distributional structure of architectural space, by the logic of their configurations, interacts with the ordering of society in which it is constructed, as one of their social systems. Architectural environments, thus, not just generate built forms but also organize patterns of interaction among people by the way their spaces are distributed [2].

In particular, space syntax analysis is aimed to make explicit the rules governing the spatial configurationally organization, the genotype, by examining specific instances of architectural artifacts, phenotypes. The genotypes can be defined as abstract relational models governing the arrangement, the underlying organizing principle of phenotypes; and phenotypes are actual realization of genotypes in physical milieu, i.e. architectural artifacts. By examining the syntactical aspects of phenotypes it is expected to reveal the underlying genotype that is shared by the phenotypes examined [3].

As Pelin Dursun argued, space syntax appears as an effective tool for architects to explore their design ideas and understand possible effects of their proposals since it offers suitable techniques for representing and analyzing space [4].

Research in housing studies applying space syntax theory can be classified as following:

- Changes of socio-spatial patterns over time and also their correlation with social patterns and behaviors.
- Socio-spatial patterns in different geographical places.
- Correlation between genotypes and formal configuration of spaces.
- Using space syntax for discovering special historical and archeological facts.
- Using space syntax in design

Furthermore possible future researches can be stated:

- Investigation of evolutionary patterns of genotypes in houses of a region or country and using them for new designs.
- Combination of space syntax and evidence based design, surveys from house or apartments users to measure correlation between space satisfaction indicators and spatial indicators such as integration and choice and so on.

Space syntax theory has also been applied in the study of Iranian traditional houses by some researchers. Memarby by using access graph has investigated about a group of introverted and extroverted houses in Masooleh, Gilan and Yazd and Shiraz regions. He insists that access graphs in these types of houses should be investigated separately in terms of summer living and winter living spaces [5]. Kamalipoor also by using Depthmap software has studied about Kerman city (Iran) houses. Considering formal classification of houses based on their location in site (L shape, U shape..), his main hypothesis is correlation between configuration of guest space and formal classification of houses, that in conclusion this hypothesis has been rejected [6]. Kharazminezhad also investigated about common socio-spatial aspects of historical houses in Ardabil city (Iran) [7]. Omar Khattab has studied about socio-spatial analysis of traditional Kuwaiti houses. He has underlined on mean depth of spaces and has measured their relation with social characteristics of spaces [8]. Faris Ali Mustafa has investigated about privacy of traditional and modern house layouts in Erbil City (Iraq) using Space Syntax analysis [9]. Some other researchers have investigated by means of Space Syntax theory the social logic of housing layouts in other places, which show similarities with Iranian examples. Yasemin İnce Güney presents the results of visibility analysis conducted on a sample of 108 Turkish apartment plans that had previously been examined in terms of permeability to understand the transformation of Turkish housing over the 20th century. The analysis has shown that spatially and visually the most integrated spaces coincide with each other for all three groups [10]. Suzan Sanlı in her study attempts to analyses the spatial characteristics in the housing projects of a leading Turkish architect (Yılmaz Sanlı) by means of space syntax techniques [11]. Suzan Sanlı has analyzed Family structure and spatial configuration in Turkish house form in Anatolia in a historical period, from late nineteenth century to late twentieth century. Her findings revealed that the transformations in spatial configuration were parallel to shifts in family structure.
[12]. TaharBellal has studied about spatial configuration of houses of M’zab (Algeria) by using access graphs of space syntax. The study also asserts the significance of entrances in regulating the interior organization of the M’zabite house in terms of depth properties [13].

Moreover, Ruth Conroy Dalton studied the genotypic houses and introduced a new method based on graph isomorphism, known as small graph matching. She has demonstrated how it may be used to determine the genotype signature of a sample of buildings [14]. Viviane Cunha has studied about changeability of genotype patterns over time by investigating on apartment plans in Brazil from the 1930s until the end of the 20th century. to investigate if and how different apartment plans could express numerous social changes occurring during that period of time in this context [2].

MATERIALS AND METHODS

Research method in this study is mixed method. For spatial analysis of introverted houses visual graph analysis and convex map analysis methods were used. Beside this method, for statistical analysis, inferential statistical analysis method including Pearson correlation test by SPSS software were used.

Parameters including visual graph analysis, integration, choice and control in each house were investigated and compared with other houses. Also main functional spaces from each house that are common in all houses were selected and compared with each other. Statistical correlations of socio-spatial parameters of houses were measured. The similarities of case studies in this study were that all houses are introverted and are a located in central cities of Iran. Differences of case studies were difference in located city, the number of courtyards and entrances and spaces.

Introversion in Persian Architecture:

Almost all traditional Persian houses were designed in order to satisfy the following essential features [15]:

- Hashti and Dalan-e-vorudi: Entering the doorway one steps into a small enclosed transitional space called Hashti. Here one is forced to redirect one’s steps away from the street and into the hallway, called Dalan e Vorudi.
- Convenient access to all parts of the house.
- A central pool with surrounding gardens containing trees of figs, pomegranates and grape vines.
- Important partitioning’s such as the Biruni (exterior) and the Andaruni (interior).
- Specific orientation facing toward and away from Mecca.

Before considering the word introversion in architecture, it’s better to have a clear understanding of it from the moral point of view including meanings that have a tendency to inner feelings and avoid from showing them. Facades have been presented in Iranian Islamic architecture at very modest level, however the interior has been decorated in an elegance way [16]. Here, this can be called as introvert architecture. These types of architecture have applied in many residential houses where there isn’t any direct connection or openings between interior and exterior spaces. By creating some openings in interior spaces, it opens the spaces into a private environment (central yard).

Introduction of Spaces

Winter Living Spaces: Winter living is a name given to all spaces that is built in northern side of house. This cause to winter sun shines with angle inside the spaces. In addition to a specified collection of spaces with special connectivity can form winter living parts. These spaces include 3door rooms, 5 door rooms and corridors.

Summer Living Spaces: Summer living spaces are located in southern side of house that protect spaces from direct sun shining in summer season and on its main axis normally semi-open spaces and Talar is built.

Hashti (Vestibule): Mostly, Hashti has a octagon or semi octagon shape. vestibule has a Short ceiling and generally a hole for light in domed ceiling and some platforms was designed to sit on it.vestibule is for access to different parts of house and sometimes is for access to several houses.

Dalan (Corridor): Was narrow corridor with maze that connects Hashti to courtyard. Maze of corridors was for respect to the privacy of the home, thus pedestrians cannot found immediately, current activities at the courtyard.

Courtyard: In Old houses was the center and heart of the building. Central courtyard with porch on each side was the features that were seen in past Iranian architecture. Also the courtyard was a space for various ceremonies such as religious rituals, weddings and family gatherings. Courtyard is usually rectangular. Its dimensions normally
were determined by the number and type of surrounding spaces. Usually, there were a pool and a garden in every courtyard that their geometry was different depending on local conditions such as climate and cultural factors.

**Talar (Hall):** Was a space with beautiful and elaborated decoration and ornaments. Talars were decorated by stucco work, mirror work, painting on plaster, painting on wood and Mogharnas (a type of traditional 3D decoration).

**Living Rooms:** That was less important than the Talar and more important than small rooms. Living rooms were a gathering place for family and very close guests. The rooms were very simple decorations.

**Kitchens:** Are usually square or rectangular and were constructed near to the water storage and water wells. In the kitchen, a place for cooking, baking bread and wood storage and shelves inside walls has been built to put food and cooking tools.

Toilet and bathroom were usually located in the lower level. This is due to its ease of use and heating and drainage. Bathroom was divided into two parts; one for changing clothes and another for washing.

**Analysis**

**Visual Graph Analysis (VGA):** Depthmap classifies spaces based on VGA by colors. The spaces that have the most visibility from other spaces are red. The less visible spaces color is blue. According to Figure 1 in all houses main central courtyard is the reddest space. Also in Table 1 spaces have been classified based on their color in visual graph analysis. In all houses Hashti, kitchen and service spaces are in blue spectrum and after central courtyard there are Talar and summer spaces in color spectrum. 3 door rooms, porches and winter rooms are cyan.

Figure 1 and Table 1 demonstrates that winter living spaces in comparison with summer living spaces are less exposed. Overall by comparison of graphical analysis spaces of three houses following formula can be formulated.

Entrance and service spaces ≤ porches and rooms and winter living spaces ≤ Talar and summer living spaces ≤ main courtyard.

**Integration:** Integration is a static global measure. It describes the average depth of a space to all otherspaces in the system. The spaces of a system can be ranked from the most integrated to the most segregated [17].

Integration of spaces in all three houses is close to each other. Spaces integrations are between 0.5 and 1.5. In Forough house the most integration belongs to spaces such as main central courtyard and other courtyards and Hashhti and rooms of main courtyard. Bathroom and then winter rooms have the least integration. 78 percent of spaces have integration less than one and always integration of main courtyard is more than other courtyards. Summer rooms are also more integrated than winter living rooms.

In Rasoolian house also central courtyard and Hashhti and porches are high integrated and service spaces such as kitchen and stores are the least integration. 65 percent of spaces have integration less than one. In this house too central courtyards are more integrated but summer living rooms are not always more integrated than winter living rooms.

In Boroujerdiha house central courtyard have the most integration and also 3 doors rooms have the least integration. Also the more rooms the more integrated (Figure 3, Figure 4).

**Boroujerdiha:** Core is the set of the most integrating (controlling, etc.) spaces of a system. For example, the 10% most integrated spaces are normally referred as the integration core. The configuration of that core, whether it is fully connected or split, whether it assumes a shape of a spine or a wheel, whether it penetrates into all parts or remains clustered in one area, is an important property of layouts [17]. In Forough house core list spaces are to-dar-to room, central room and central courtyard and Hashiti. In Rasoolian house also central courtyard, Hashti and one of the rooms and in Boroujerdiha house, central court yard and large living room and Dalan (corridor) are in core list.

**Step Depth:** Depth between two spaces is defined as the least number of syntactic steps in a graph that are needed to reach one from the other [17]. About step depth of spaces it can be said that in average all three houses, spaces have step depth between 1 and 6. After Hashiti and Dalan, central courtyard has more step depth. Service spaces such as kitchen have step depth equal to 4 or 5. Meanwhile winter living rooms in comparison with summer living rooms have more step depth. About step depth of Talar there is no similar rule in three houses and step depth of Talars are different.
Fig. 1: Visual graph analysis of 3 houses (Forougholmalek, Rasoolian, Boroujerdiha)

Table 1: Classification of houses spaces in graph analysis

<table>
<thead>
<tr>
<th></th>
<th>Red</th>
<th>Brown Yellow</th>
<th>Cyan</th>
<th>Blue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forougholmalek</td>
<td>Central courtyard</td>
<td>Talar, Summer room</td>
<td>Rooms, Winter room</td>
<td>Bathroom, Kitchen, Hashti</td>
</tr>
<tr>
<td>Rasoolian</td>
<td>Central courtyard</td>
<td>Main Talar, Summer room</td>
<td>Rooms, Ivan, Winter room</td>
<td>Hashti, Store, Kitchen</td>
</tr>
<tr>
<td>Boroujerdiha</td>
<td>Central courtyard</td>
<td>Talar</td>
<td>Winter room</td>
<td>Rooms, Kitchen, Hashti</td>
</tr>
</tbody>
</table>

Table 2: Step depth of different spaces based on color

<table>
<thead>
<tr>
<th>Step depth</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forough</td>
<td>Corridor</td>
<td>Corridor</td>
<td>Courtyard, Summer room</td>
<td>Kitchen</td>
<td>Bathroom ivan</td>
<td>Winter room</td>
<td>Corridor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rasoolian</td>
<td>Corridor</td>
<td>Talar</td>
<td>Ivan Mahtabi</td>
<td>Summer</td>
<td>Winter rooms</td>
<td>Kitchen Bathroom</td>
<td>Store room</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boroujerdiha</td>
<td>Dalan</td>
<td>Dalan</td>
<td>Courtyard mahtabi</td>
<td>Kitchen Store</td>
<td>Rooms, ivan</td>
<td>Talar</td>
<td>Shahneshin</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2: Charts of integration of houses
Control: Control value is a dynamic local measure. It measures the degree to which a space controls access to its immediate neighbors taking into account the number of alternative connections that each of these neighbors has [17].

In Forough house control of 61 percent of spaces is less than one. Central courtyards have the most control and the least control belong to summer rooms and porches of second courtyard. The minimum control is 0.13 and the maximum control is 5.08. In Rasoolian house the most control belong to central courtyard and Hashti and porches have the least control. Control numbers for spaces are between 0.13 and 4.12.

In Boroujerdiha house 3 doors rooms have the least and central courtyard and Talar have the most control (Figure 5).

Statistical Analysis: In order to study of presence or absence of correlation between three houses spaces, Pearson correlation test using Spss software was used. Common spaces from three houses including open spaces and semi-open spaces and service spaces and guest and living rooms were extracted. Parameters of integration, connectivity step depth and choice were examined by Pearson correlation test.

Integration Correlation: Table 4 demonstrates that mean integration of spaces in 3 houses are close to each other specifically between Forough house and Boroujerdiha these means are almost equal. Scattering of data in Rasoolian houses is more than Forough and Boroujerdiha house. But overall scattering of integrations among 3 houses do not have a big difference. Also Table 8 shows correlation of houses integrations. The Pearson test has been done with 95% significant level. It means if Sig value is less than 0.05, there is a significant relationship between data. Even more in Table 8 correlations that are
Table 7: Integration Correlations in 3 houses

<table>
<thead>
<tr>
<th></th>
<th>Forough</th>
<th>Rasoolian</th>
<th>Boroujerdiha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forough</td>
<td>Pearson Correlation</td>
<td>.598*</td>
<td>.507</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.031</td>
<td>.077</td>
</tr>
<tr>
<td>Rasoolian</td>
<td>Pearson Correlation</td>
<td>.598</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.031</td>
<td>.022</td>
</tr>
<tr>
<td>Boroujerdiha</td>
<td>Pearson Correlation</td>
<td>.507</td>
<td>.628*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.077</td>
<td>.022</td>
</tr>
</tbody>
</table>

Table 8: Correlations between connectivity of spaces in 3 houses

<table>
<thead>
<tr>
<th></th>
<th>Forough</th>
<th>Rasoolian</th>
<th>Boroujerdiha</th>
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</thead>
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<tr>
<td>Forough</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.840**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
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<tr>
<td>Rasoolian</td>
<td>Pearson Correlation</td>
<td>.840**</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.007</td>
</tr>
<tr>
<td>Boroujerdiha</td>
<td>Pearson Correlation</td>
<td>.899**</td>
<td>.706**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.007</td>
</tr>
</tbody>
</table>

Table 9: Correlations between control of spaces

<table>
<thead>
<tr>
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<th>Rasoolian</th>
<th>Boroujerdiha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forough</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.825**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.001</td>
<td>.000</td>
</tr>
<tr>
<td>Rasoolian</td>
<td>Pearson Correlation</td>
<td>.825**</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.001</td>
<td>.009</td>
</tr>
<tr>
<td>Boroujerdiha</td>
<td>Pearson Correlation</td>
<td>.911**</td>
<td>.688**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.009</td>
</tr>
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Table 10: Correlations of step depth

<table>
<thead>
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<th>Forough</th>
<th>Rasoolian</th>
<th>Boroujerdiha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forough</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.727**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.005</td>
<td>.000</td>
</tr>
<tr>
<td>Rasoolian</td>
<td>Pearson Correlation</td>
<td>.727**</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.005</td>
<td>.022</td>
</tr>
<tr>
<td>Boroujerdiha</td>
<td>Pearson Correlation</td>
<td>.892**</td>
<td>.627*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.022</td>
</tr>
</tbody>
</table>

more significant have been starred. Based on Table correlation of integration of Forough with Rasoolian house is significant but with Boroujerdiha house is not significant and correlation of Rasoolian house is significant with Boroujerdiha house. As we know Forough house has three courtyards and Rasoolian house has two and Boroujerdiha has one courtyard. Figure 5 shows apparently houses that the numbers of courtyards are closer, there is more correlation between integration of their spaces and however this is just an unproven hypothesis.

**Correlation of Connectivity:** As Table 4 presents Mean connectivity in Forough and Rasoolian houses are very close numbers. But Boroujerdiha house is somewhat different, about scattering of data situation is different, with decreasing the number of courtyards scattering of connectivity increases. But for more precise comparison we should notice the results of correlation Table 8. The correlation test about connectivity has been done with 99% significant level that shows correlation is significant if Sig value is less than 0.01. Sig value related to correlation between Forough and Rasoolian houses is 0 and between Forough with Boroujerdiha houses is 0 too that their relations are significant. Meanwhile between Rasoolian and Boroujerdiha houses is 0.007 that this relationship is significant too. It seems that connectivity patterns of similar spaces in 3 houses are strictly similar to each other. And differences of these houses have no impact on this relationship.

**Correlation Between Controls of Spaces:** Based on Table 5 Mean control of spaces between Forough and Rasoolian houses are very close but Mean control of spaces of Boroujerdiha house is almost two times bigger than both. Scattering of data in Boroujerdiha house is
Correlation of spaces control has been calculated with 99% confidence, if the sig value is less than 0.01 correlations is significant. As can be seen in Table 9, the sig of correlation between Forough and Boroujerdiha 0 and between Forough and Rasooolian is 0.001 it means the relationship is significant, also the sig value of correlation between Rasooolian and Boroujerdiha house is 0.009 that in this case correlation is significant too.

**Correlations of Step Depth:** As Table 6 represents scattering of data related to step depth of spaces in Forough and Rasooolian are almost close to each other but in Boroujerdiha house scattering of data is more. The sig related to correlation of step depth of pairs of Frough-Rasooolian and Forough-Boroujerdiha and Rasooolian-Boroujerdiha respectively are 0.005, 0 and 0.02 (Table 10) that all of them are less than 0.05; in result all 3 correlations are significant. It seems that in different houses step depth of similar spaces are directly related to each other.

**RESULTS AND DISCUSSION**

- In result of visual graph analysis of spaces, in all 3 houses visual patterns of spaces are similar. So that we can formulated it as below.

  Entrance and service spaces ≤ porches and rooms and winter living spaces ≤ Talar and summer living spaces ≤ main courtyard

  This inequality is almost justified. Because service spaces and Hashti due to privacy in this type of architecture are less visible, while central courtyard that in some times is used for ceremonies or religious rituals need to be visible from the most number of spaces. Also beauties of green nature and garden and pool should be seen.

- In terms of integration, in all 3 houses integration of spaces range between 0.4 to 1.6, that in all of them main courtyard has the most integration. However we cannot formulate a general rule as was for visual graph analysis.

- In terms of control of spaces, main courtyards have the most control and the range of control of spaces in all 3 houses are close to each other but again general formula cannot be extracted. Namely there are no significant relationships between the controls of winter living spaces with summer living spaces [18].

- In terms of step depth the spaces of houses have a good relationship and closeness. In all houses step depth of spaces from main entrance are between 1 to 6. In all houses the step depth of kitchens and service spaces are 4 or 5 and step depth of winter living spaces are more than summer living spaces. About the more step depth of winter living spaces it can be said, it is not just related to privacy of spaces, it seems it is climatic issue.it means that winter living spaces by bigger step depth are survived from cold more [19].

- Pearson correlation test about relationship between connectivity, step depth integration and control of spaces in houses showed a significant relationship between all pairs of mentioned houses [20].

**CONCLUSION**

The purpose of this study was to examine the significant relationship between socio-spatial configuration parameters of spaces of different introverted Persian houses.in other words which kind of genotype is there in architecture of introverted houses and are these parameters independent from form, location of houses and the number of spaces in houses and house area or construction time.

The importance of subject is that introverted houses are one of the most common types and patterns of Persian traditional houses that has been applied in different cities with minor difference. Investigation and finding of genotypes in this type of houses can enlighten patterns of socio-spatial patterns of houses by traditional architects.

The importance of findings of this study is due to formal difference in studied houses and also difference in their location in different cities in Iran, existence of relationship and similarity among socio-spatial patterns presents a kind of genotype in architecture of these houses. Direct statistical correlation between data indicates such patterns more.

Main limitation in this study absence of proper archives and rich researches about this kind of houses. The factors that may affect the study but were not considered in this study precisely were the number of entrance and courtyards and form of houses [20].

For future researches it is proposed more case studies from different cities. Meanwhile formal classification of houses, the number of courtyards, the number of floors and entrances should be considered. Moreover the comparison of socio-spatial patterns between introverted
and extroverted houses is suggested. Likewise research about the effect of socio-spatial patterns of traditional houses in modern houses is proposed. In addition to, study about absence or presence of any significant correlation between the size of spaces and their socio-spatial parameters is suggested.

REFERENCES

6. Kamalipoor, h.m.g., 2011. Composition of form and spatial configuration of vernacular housing: the adjustment comparison of guest room in Kerman traditional houses, in Housing and Rural Environment. pp: 3-16.