

Analysis of Privacy Hierarchies in Traditional Houses of Iran Based on The Plan Structure Through Space Syntax Approach *

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ABSTRACT

The traditional architecture of Iran, particularly its houses, is influenced by the identity and cultural values of the people of that time. Observation of privacy and its hierarchy in the structure of traditional houses is among the principles of traditional houses in Iran. Analysis and investigation of spatial relations in these buildings regarding privacy help us preserve and create privacy in modern housing. One can employ the space syntax theory to identify spatial ties and use them as an appropriate pattern. This theory allows us to know and analyze the social relationships in a building. To do data analysis in this study, some samples are chosen from among traditional houses of the Qajar Period with different and various plan structures using the quantitative cognition method through space syntax techniques and DepthMap Software. This study employed Visibility Graph Analysis to assess the spatial relations in the building. This analysis has been used to examine the depth index and two visual integrity and connectivity for eight case studies. Furthermore, privacy hierarchy has been analyzed in the structure of case studies by comparing these two indices. The results show that houses having one courtyard or the plan structure is designed in a way that most spaces of the house are arranged around one of the courtyards provide a more regular pattern of privacy hierarchy from public to private spaces rather than the samples having many courtyards that are similar in dimensions and shape. The mentioned case makes it easy for us to comprehend space, so the legibility of the spaces is higher in these case studies. However, privacy in houses with several courtyards is more observed than in houses with one courtyard.

Keywords: Space Syntax, Traditional Houses, Hierarchy.

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1. INTRODUCTION AND PROBLEM STATEMENT

Architecture is the human life container in all individual and social aspects and is matched with the living conditions of existence. Therefore, the realization of architecture, not only requires paying attention to tangible and physical aspects but also needs studying human scopes either in consideration of individual or social realities (Dosti 2018, 116). Among architectural spaces where man attends, a house is a secure space that people influence and are daily influenced by. House construction is different in each area, and various interactions exist between people regarding the culture ruling the social and customary system (Ibid, 113). One of the principles and regulations of traditional housing in Iran is to respect the privacy of occupants. Also, privacy protection is a main function of traditional houses in Iran (Haeri Mazandarani 2016, 57). Organization of architectural spaces in Iranian houses is done based on privacy defined and determined according to the Iranian cultural characteristics (Vafapour 2015, 5). According to the mentioned point and overview of architecture of modern residential units, architectural arrangement of most plans does not meet the principle of privacy and dominance, and this is contrary to the process that has been done for thousands of years in architecture of Iran until Qajar period. Therefore, analysis and discovery of relationships between spaces existing in a traditional house based on its hierarchy of privacy would pave the way for using its outcomes to create and retain privacy and its hierarchies in the zoning and design of modern housing. Analysis of shape and understanding of the relationships between spaces available in a spatial configuration is a science considered in architectural discussions that is called the Space Syntax Technique (Mousavi Nesab, Taghvaei, and Mazhari 2022, 377). This technique can be used to identify spatial relations, applying it as an appropriate pattern. This theory helps to understand social relationships and analyze them, and these relationships can be used to improve the quality of house spaces in terms of privacy.

1.1. Necessity of Study

Analysis of spatial relations in traditional houses regarding the observation of privacy hierarchies and their plan structure would lead to some results that can be useful for designing contemporary houses in terms of compliance with privacy hierarchy. Thus, this study aims to answer the following questions:

- 1) How the relationships between spaces available in the houses constructed during the Qajar Period in Iran's cities are analyzed and discovered in terms of privacy hierarchy, and what variables are used in this case?
- 2) What is the relationship between the plan structure

of these houses and the privacy hierarchies' model in them?

2. BACKGROUND AND THEORETICAL FOUNDATIONS

Some studies have been mainly done on privacy and hierarchy and their position in traditional architecture, as well as their relationship with the Space Syntax Approach. The mentioned studies are presented and published in the form of papers in academic conferences and specialized art and architecture journals. There are some Iranian studies in the field of content background: privacy hierarchy in traditional houses of Iran (2014) by Mohammad Mahdi Goodarzi Soroush et al. is a paper that considers the effects of privacy on personal life of individuals, formation of indoor and outdoor spaces, spatial hierarchy design, designing a space called vestibule in entrance gate of houses and lack of dominance over indoor spaces of house when entering the house as the architectural effects in which, privacy hierarchy is observed. Reza Barazandeh and colleagues carried out a study on the utilization of privacy principles and spatial hierarchy in improving the quality of contemporary houses and residential complexes (2022). Regarding the necessity and importance of privacy and spatial hierarchy, this study examined how privacy principles and spatial hierarchy are used to improve the quality of contemporary houses and residential complexes. Faezej Taheri Sarmad et al. conducted a study on spatial hierarchy in creating privacy of houses with a historical typology approach (2022). Regarding the hierarchy of entrance gates in historical houses, this study concludes that the creation of hierarchies in the entrance gate of contemporary houses would create privacy and definition of private and semi-private spaces, and also prevent disturbance in the use and identity of spaces. The following study can be mentioned in the field of procedural background: "Analysis of courtyard's role in the spatial structure of Iranian houses by using Space Syntax Method" which was done in 2018 by Mojtaba Mazaheri et al. By investigating the spatial structure of case studies through the space syntax method, this study examined the connection between the courtyard and other spaces, the role, type, and methods of integrating it with other spaces. Seyyed Hadi Ghoddusifar and colleagues conducted a study titled "Measurement of privacy based on space layout in historic houses in the Port of Kong." To analyze the spatial structure of the case study, the Space Syntax technique and DepthMap Software were used in this study, and data obtained from the software were used through Isovist in the quantitative analysis section to extract findings. In general, the results obtained from the analysis of houses indicate that as an inseparable principle in addition to climate issues, privacy has received attention as a cultural principle. Moreover, the study

titled “The Use of the Spatial Arrangement Method for the Hierarchy of Entry in the Houses of Tehran Over the Late Qajar and the First Pahlavi Eras with Emphasis on Privacy” was done in 2023 by Javaher Kooti et al. They investigate and analyze the spatial structure of entry in traditional houses of the late Qajar and First Pahlavi periods by using the space syntax technique. The results of their study show that the structure of traditional houses provides better solutions for entering privacy hierarchies.

There are also some foreign studies conducted in this field. Bushra Obeidat et al. carried out a study titled “Privacy as a Motivating Factor for spatial layout transformation in Jordanian Public Housing” to investigate the role of privacy as a motivating factor in reforming the spatial layout of residential units in Jordan. Also, Ruşen Ergün et al. (2022) conducted a study titled “A Comparative Study of Space Syntax Analysis between Traditional Antakya Houses and Social Housing Complexes by TOKI” to analyze the spatial arrangement of traditional atria by using the space syntax method and to reveal the socio-cultural effect of atria.

In the extant study, the case studies differ from the studies mentioned above in terms of indices and analysis (VGA), and analysis of samples is done based on the structure of the plan (size, number of yards, and arrangement of spaces around them).

2.1. Privacy

In architectural space and urban planning, privacy means creating a body for the spaces in a way that space has privacy in terms of two physical and semantic aspects. Having privacy in the spatial body field is more concentrated on some principles than space security. In the semantic field, privacy means some characteristics that bring privacy and value to the architectural space so that individuals feel comfortable in it (Shirvani, Bazafekon, and Nasser 2015, 3). Regarding terminology of privacy, a private space is defined as a place that physically provides privacy, safety, and security for the user, and spatial quality of that space provides peace and comfort for the person. Privacy is one of the most substantial principles used in the traditional architecture of Iran, especially after Islam. Privacy has been used in the best way in all buildings ranging from huge and public buildings to residential houses and from public urban spaces to semipublic and more private spaces (Seifian and Mahmoudi 2008, 4). As a principle ruling all life aspects, of privacy principle has been beautifully embodied in the traditional architecture of Iran, providing profound effects and results for spatial organization and deployment of various functions (Shirvani, Bazafekon, and Nasser 2015, 1).

The main performance of traditional Iranian houses has been protecting the privacy of the family. Houses with central yards traditionally show diverse grades of privacy and realm (Haeri Mazandarani 2016, 57). The

criterion of space formation in Iranian houses is based on privacy protection. Privacy that itself reflects the private space would regulate the relationships between a person and society. Privacy is the criterion shaping the spatial hierarchies of the house as in-between and consecutive spaces through the interval between the most private privacy existing in the house and the most public space for relatives and family members to gather together (Haeri Mazandarani 2016, 116). It is not possible to see Iranian houses all at once; the organized spaces in these houses cannot be observed within one picture. One must enter the house, get around it, and have access to its different and diverse space successively. The realm of the Iranian house begins from the outside; it means that public privacy is gradually converted to private privacy (Haeri Mazandarani 2016, 139).

2.2. Hierarchy

The presence of spatial hierarchy is among the principles that leave the most effect on the formation of spatial privacy in the structure of traditional urban planning and architecture. According to the geography encyclopedia, hierarchy means any order composed of complications and phenomena mentioned as a classification or ranking. This concept is known as the hierarchy of attendance and privacy in the architecture of a house and is shaped due to observing this principle in the spatial spheres and realms from public to private spaces (public, semipublic, semi-private, and private) in the living environment (Sheikh Bahaei 2019, 67).

In the formation of an architectural building, this is the hierarchy principle that shapes spatial realms with various functions and spatial zonings. When elements of a building are divided into different realms with distinguishable bodies and functions, the transition from one to another realm occurs immediately without creating required conditions, including undesired mental and physical conditions, so it can be stated that non-observation of privacies and improper integration of realms, and or employing similar physical and spatial features for two territories with different functions would diminish the qualitative utility of space. In the mentioned case, the distinctive role of hierarchies becomes more highlighted in zoning and creating an interface between two realms. One can investigate the hierarchy of spatial systems at a smaller scale in the spatial structure of buildings' architecture. Hierarchical deployment of pre-entry (Jolokhan), entry, vestibule (Hashti), corridor, and courtyard followed by other functional spaces linked to the courtyard is a pattern that is more or less the same in all traditional buildings. The outstanding point is that the application of the hierarchy principle in spatial urban and architectural systems has played a significant role in improving privacy in spatial structure by separating public privacies from private ones and creating ranking in the accesses. It can be

confirmed that privacy is one of the most important physical manifests indicating the observation of hierarchies in the mansions and cities of the Islamic period. These principles have been used to create some values such as security, peace, and privacy in traditional buildings (Seifian and Mahmoudi 2008, 8-9).

2.3. Space Syntax

As an analytical tool of this study, space syntax is a set of techniques to demonstrate and quantify the spatial patterns of buildings (El-Agouri and KarKale 2018). In a simple explanation, space syntax is a collection of methods and theories that study space configuration at the architectural and urban scale to describe the mutual effect of space configuration, social organization, and social behaviors (Mazaheri, Dezhdar, and Mousavi 2018, 99). In other words, space syntax is an attempt to find how special configuration status expresses a social or cultural meaning (Dursun 2007).

3. METHOD

The quantitative cognition method has been used through space syntax techniques and DepthMap Software to analyze data in this study.

3.1. Analysis Process

In this research, VGA analyses have been used as the main analysis for examining the social relations of the complex. VGA analysis indicates visual connectivity in the complex. Visual integrity means several visual steps required to go from one point to another in a system; therefore, visual integrity analysis indicates the rate of individuals' interaction with space. In general mode, VGA analyses can describe the complicated spatial relations, but are confined to two dimensions, and the initial idea for the 2D nature of DepthMap is related to man's nature that does not fly in space.

VGA analysis is indeed a two-step process in that a set of suitable points are highlighted on the plan that form the graph's nodes at the first step. In the second step, edges or lines of the graph are created between those points that are directly in visual connection with each other. It can be explicitly explained about these relations or connections that when point A has dominance or view over point B, point B also has a view over point A.

VGA analysis measures the depth of all points generally and indicates that the depth of each area is less or more than other areas. In this analysis, those points that are well-connected to other spaces are highlighted in red; it can be stated that these spaces have less depth. Those points with fewer connections with other areas in the space appear in the spectrum of cool colors- from green to dark blue.

Overall, it can be explained that those points or areas

that are more visible with better connections to other areas appear in the spectrum of warm colors, while those areas that are less visible with few connections to other areas appear in the spectrum of cooler colors. VGA analysis (analysis of visual connectivity) has been done on eight houses with different types in this research. This analysis has assessed three indices of visual integrity, connectivity, and visual depth.

To have houses with higher privacy, indoor spaces of a house must be less visible as much as possible, and the spatial structure of the house should be also a combination of visible spaces, and hidden accesses and spaces. The most important factor is the visibility and accessibility rate of spaces, and the measurement of this index indicates the coherence and integrity level of spaces, privacy, and physical and visual accessibility. This index is in direct relationship with legibility and hierarchy of spaces. Therefore, visual field graph analysis provides the best response for these indices. The analysis has been done at global and local scales in this study. VGA at a global scale is based on the shortest path from each point to other points of the space, while the local scale of this analysis indicates the connection between each point and the point that is directly connected to it. The most significant indices of local scale include Mean Depth, Node Count, Integration, and Entropy.

The most important indices of global scale include Clustering Coefficient, Control, and Controllability.



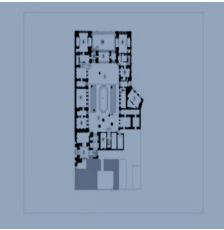
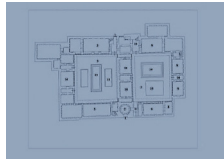
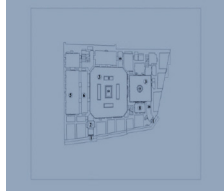

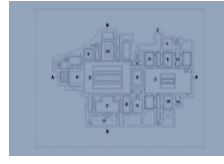

The clustering coefficient refers to the number of intersections in the space and how this information will change throughout the space. The control measure selects those points that are visually dominant, and controllability chooses those points that probably be dominant visually.

4. INVESTIGATION OF CASE STUDIES

To examine the hierarchy of the privacy using space syntax technique, those spaces must be selected as case studies that are highly influenced by the dominant culture of society. To do so, house architecture has been selected. In the selection of case studies, houses constructed during the Qajar era in different areas of Iran privacy principles are observed based on the structure of the plan (number and size of courtyards and arrangement of spaces around it) (Table 1). Some of these houses are mentioned herein:

Akbari House in Kermanshah, Kahkesahn in Isfahan, Vakil in Sanandaj, Gerami in Yazd, Sabbar in Shiraz, Entekhab Al-Soltan in Natanz, Foroogh Al-Molk in Shiraz, and Tabatabaeeha in Kashan that are selected for spatial analysis of privacy hierarchy in them. The selected samples were all constructed during the Qajar Period and have some spaces in common, such as the entry and vestibule, central courtyard, hall, and some rooms, such as Se-Dari (room with three doors) and Panj-Dari (room with five doors) and many closed and indoor spaces.

Table 1. Profile of Case Studies

Name of House	Construction Period	Plan	Structural Features of the Plan	Number of Courtyards	The relative Size of the Central (Main) Courtyard	The Relative Size of the Secondary Courtyard(s)
Entekhab Al-Soltan in Natanz	Qajar		Having one central courtyard that organizes the spaces, spaces in the entry area through a direct line	1	Large	-
Kahkesahm in Isfahan	Qajar		Large central courtyard and arrangement of spaces around the central courtyard, spaces in the entry area through an indirect line	1	Large	-
(Eastern) Mansion of Wakil in Sanandaj	Qajar		Having an arranger central courtyard and columned porch	1	Large	-
Sabbar in Shiraz	Qajar		Having courtyards of the same size and shape	2	Large	Large
Akbari in Kermanshah	Qajar		Having a larger central courtyard and arranging spaces around it	2	Large	Medium
Forough Al-Molk in Shiraz	Qajar		Having a relatively large courtyard and a relatively small secondary courtyard	2	Large	Small
Gerami in Yazd	Qajar		Having courtyards with relatively the same size	2(±)	Medium	Almost Medium
Tabatabaeeha in Kashan	Qajar		Having a large central courtyard and secondary courtyards of different sizes	4	Large	Medium (one Courtyard) and Small (two Courtyards)

5. DISCUSSION AND FINDINGS

5.1. Analysis of Visual Integrity

According to the analysis of visual integrity (Table 2), courtyards of the houses and spaces that are directly connected to them are more visible than other areas. In these areas, individuals have longer horizontal views and thus create more connections with other areas. This area has appeared in a spectrum of red, orange, and yellow colors through the analysis. This index indicates different values in each house. Moreover, the spread of warm and cool colors in the graph of each cell indicates its privacy rate and the border between that space and other areas. The central courtyard appears in warm colors (color spectrum from yellow to red) and surrounding rooms appear in bright-to-dark blue colors in the Akbari House, for instance. This explicitly indicates the accessibility rate of each space and spatial hierarchy. Also, the space of Se-Dari room in this space has less integrity than other rooms and provides privacy. The space of the hall has average visual integrity and relative privacy.

Moreover, the graph (Fig. 1) depicts that the highest visual integrity is seen in Kahkeshan House in which, a large central courtyard is located in the middle and other spaces are distributed around this courtyard homogeneously; therefore, the courtyard's spaces are highly visible and accessible through all areas of the house. Nevertheless, residential spaces of rooms and corridors show a hierarchy of entry. The role of corridors is detectable in all houses as spaces that have

created borders and alleviated the view and access. Se-Dari and Do-Dari rooms in Kahkeshan House also indicate more visual integrity than other rooms. Panj-Dari and Hall provide an average visual connection and relatively good privacy. In addition, the space of the warehouse and kitchen had low visual integrity and less visual connection with surrounding spaces. The space of the vestibule provides a relatively low visual integrity and greater separation.

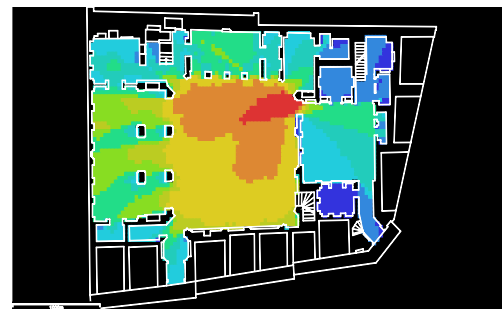
This analysis also shows that despite the full visibility of the central courtyard in this house, the privacy of surrounding space is high and there is a limited view and access over them. According to the graph, the maximum rate of visual integrity is seen in Akbari House in Kermanshah at the second rank after the Kahkeshan House. The structure of this house is highly similar to the planned structure of Kahkeshan House. This indicates that in those houses where only one central courtyard exists as the central organizer space or most spaces are arranged around the main courtyard, the highest visual integrity is seen in the courtyard of the complex, and spaces around the courtyard are deployed in a structure that is completely integrated with central space.

In Sabbar House of Shiraz, spaces have almost monotone visual integrity and provide an almost average rate of integrity index without any considerable difference in terms of visual integrity due to a similar arrangement of spaces around two courtyards with the same size and shape, except for entry space of the building.

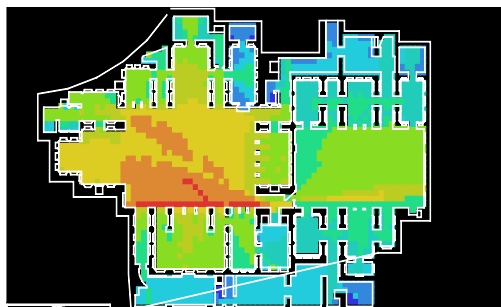
Table 2. Analysis of Visual Integrity



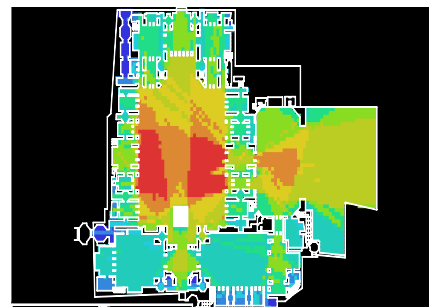
Entekhab Al-Soltan House in Natanz



Akbari House in Kermanshah



Gerami House in Yazd



Tabatabaeeha House in Kashan

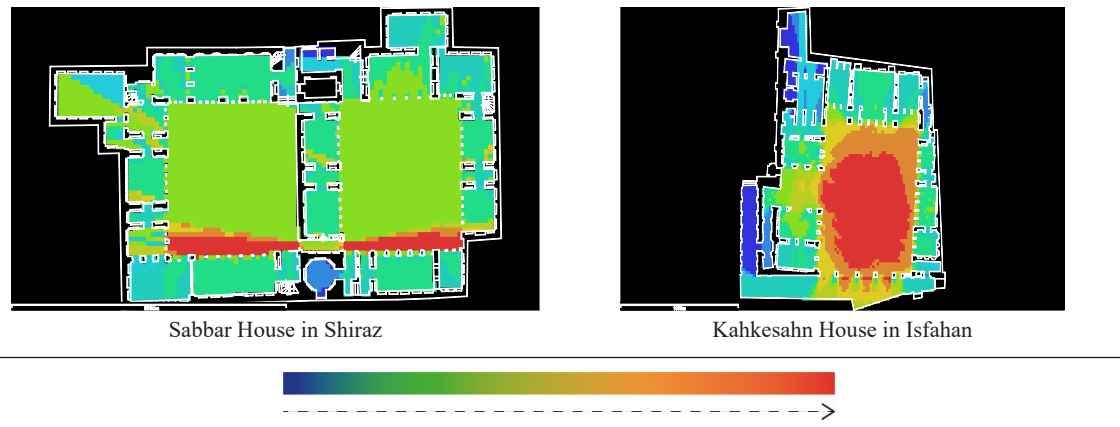


Table 3. Visual Integrity Index

House	Min	Max	Mean	SD ¹
Akbari House	3.76	21.32	12.79	4.34
Entekhab House	3.81	16.04	9.65	2.32
Gerami House	2.47	10.22	6.5	1.57
Kahkeshan House	3.8	22.26	14.64	5.26
Sabbar House	3	13.11	8.2	1.46
Tabatabaee House	3.11	14.72	9.63	2.46

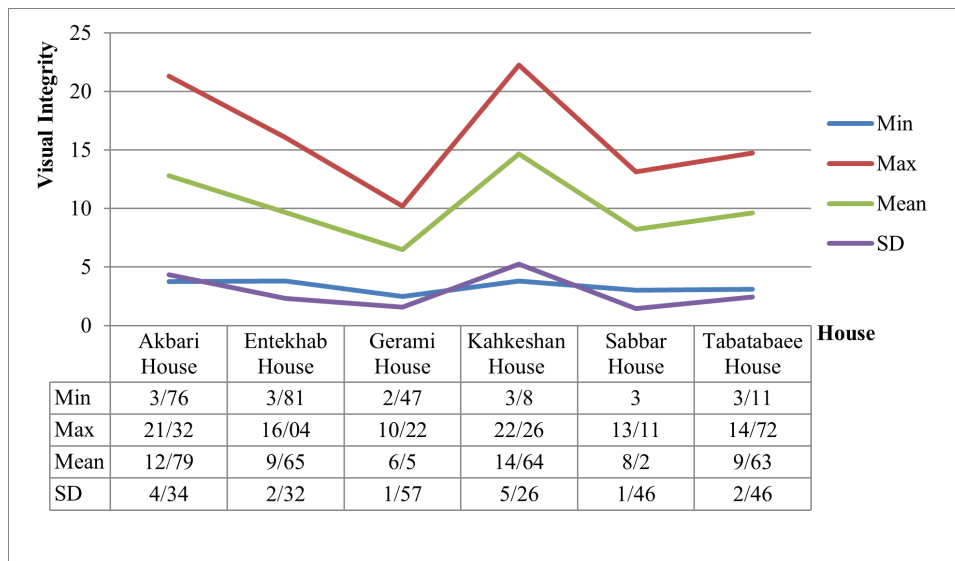


Fig. 1. Visual Integrity Index

5.2. Connectivity Analysis

Connectivity analysis concerns the rate of spatial integrity and coherence. The results of this analysis confirm the previous analyses (Table 4), indicating that the connectivity index has the highest rate in public spaces and courtyards of traditional houses. The maximum rate of this index is seen in Kahkeshan

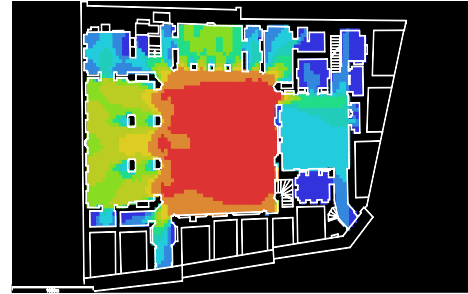
and Entekhab houses according to the graphs (Fig. 2). The presence of a central courtyard in Kahkeshan House has led to a high rate of connectivity index in the courtyard of this house. The entry area usually shows lower connectivity, which reveals its proper performance in bordering and creating entry hierarchies. Furthermore, the space of the central hall is effective in increasing the connectivity of this

complex. A space deployed immediately after the entrance gate appears in dark blue in Akbari House, for example. Pause space is the next space that provides higher connectivity than the first corridor, and creates a hierarchy of entry to the complex.

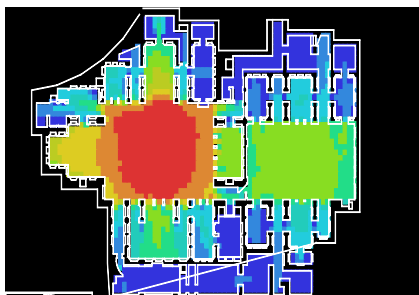
Table 4. Connectivity Analysis



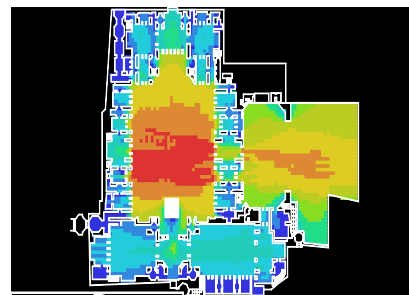
Entekhab Al-Soltan House in Natanz



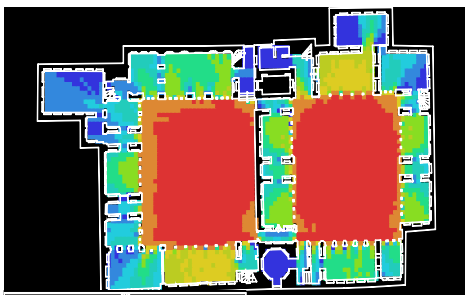
Akbari House in Kermanshah



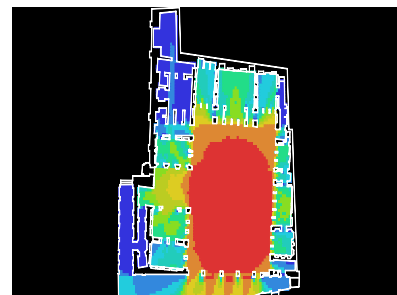
Gerami House in Yazd



Tabatabaeeha House in Kashan



Sabbar House in Shiraz



Kahkesahn House in Isfahan

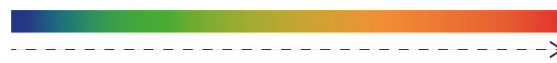


Table 5. Connectivity Index

House	Min	Max	Mean	SD
Akbari House	7	2240	1269.5	726.07
Entekhab House	16	2491	1490.39	781.26
Gerami House	5	821	354.86	256.77
Kahkeshan House	10	3349	1950.33	1141.23
Sabbar House	6	1439	923.22	452.97
Tabatabaee House	2	1854	932.35	533.73

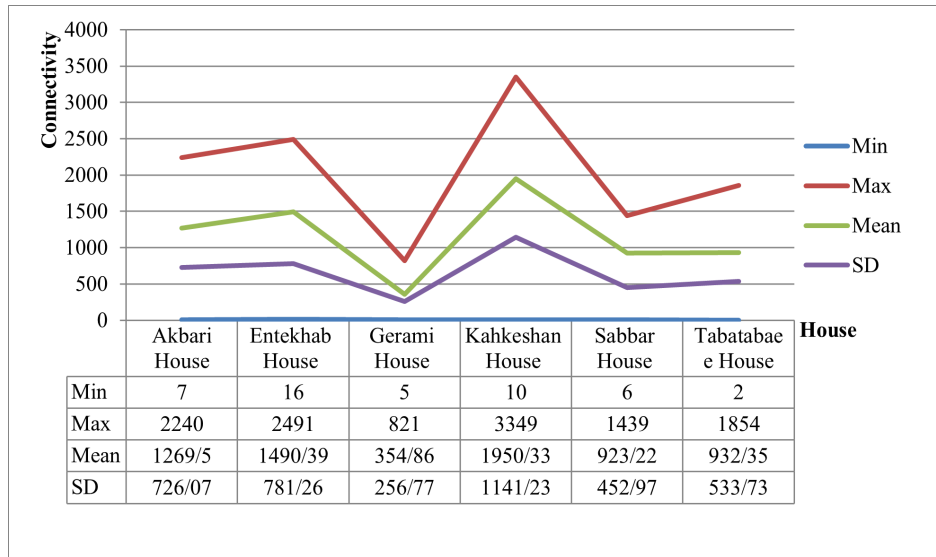


Fig. 2. Connectivity Index

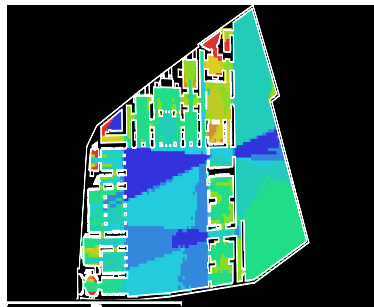
5.3. Analysis of Depth

Depth is the opposite of permeability, so the lower the depth, the higher the permeability of space will be. As seen in the analysis (Table 6), dark blue colors are more seen in the courtyards and central spaces through this analysis. It indicates the less relative depth of these spaces and better access to them. Those spaces with the highest depth in the analyzed houses present higher privacy.

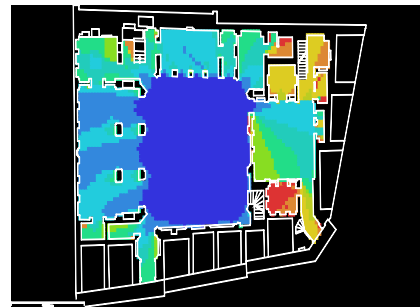
Also, graphs of houses show that relative depth in pre-entry space is higher than other areas in all houses. For instance, the entrance corridor appears in

red in Tabatabae House, which shows the highest rate of visual depth. Entry hierarchy has been depicted with changing colors in the graph of analysis. Depth is less in the secondary courtyards of this house than in rooms, and depth is generally higher in the halls and rooms with several doors rather than the rooms deployed in corners and corridors. Also, the depth of Hall and Panj-Dari spaces that are used for guest and dining rooms in traditional houses of Iran is less than the depth of spaces with three doors that provide private function. These results confirm the privacy hierarchy in spaces of traditional houses.

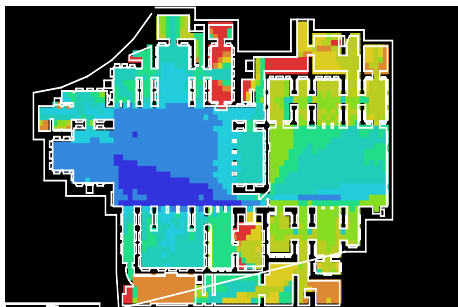
Table 6. Analysis of Depth



Entekhab Al-Soltan House in Natanz



Akbari House in Kermanshah



Gerami House in Yazd



Tabatabaee House in Kashan

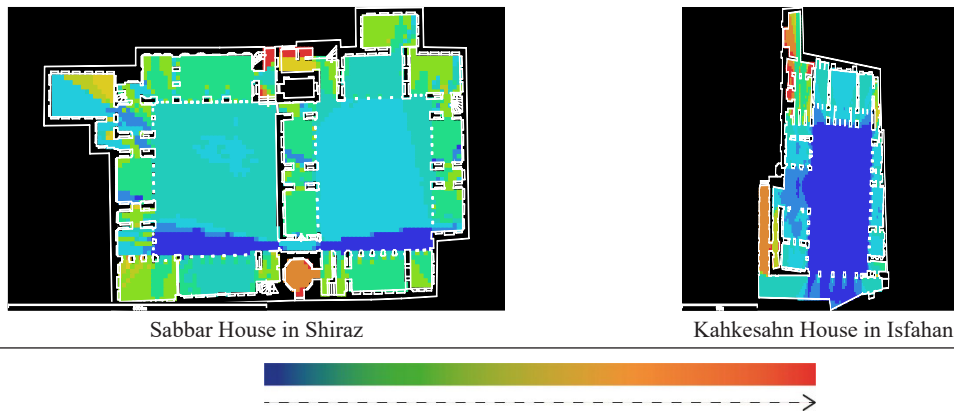


Table 7. Visual Depth Index

House	Min	Max	Mean	SD
Akbari House	1.43	2.89	1.83	0.34
Entekhab House	1.61	2.93	2.06	0.24
Gerami House	1.89	2.91	2.28	0.25
Kahkeshan House	1.43	2.92	1.78	0.36
Sabbar House	1.71	2.91	2.14	0.18
Tabatabaee House	1.65	2.95	2.05	0.28

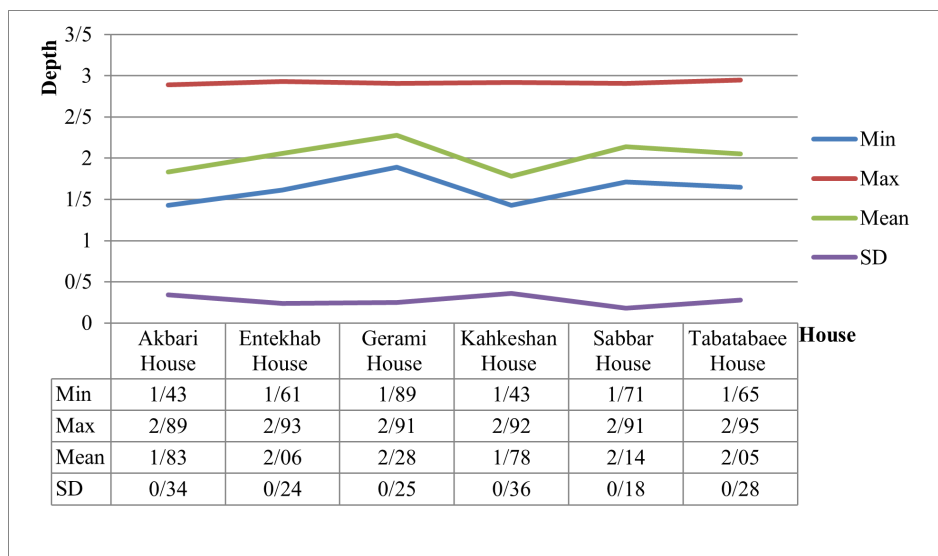


Fig. 3. Visual Depth Index

5.4. Comparison between Connectivity Index and Visual Integrity

In addition to conducting analyses, examination of the relationship between connectivity index and visual integrity indicates the rate of space comprehensibility for the occupants. The closer the graph is to the linear mode, the greater the R2, the stronger the

relationship between these two variables, and the higher the space comprehensibility for occupants will be. The following table reports these two indices within comparative graphs derived from DepthMap Software.

Figure 4 indicates the R2 value for different houses:

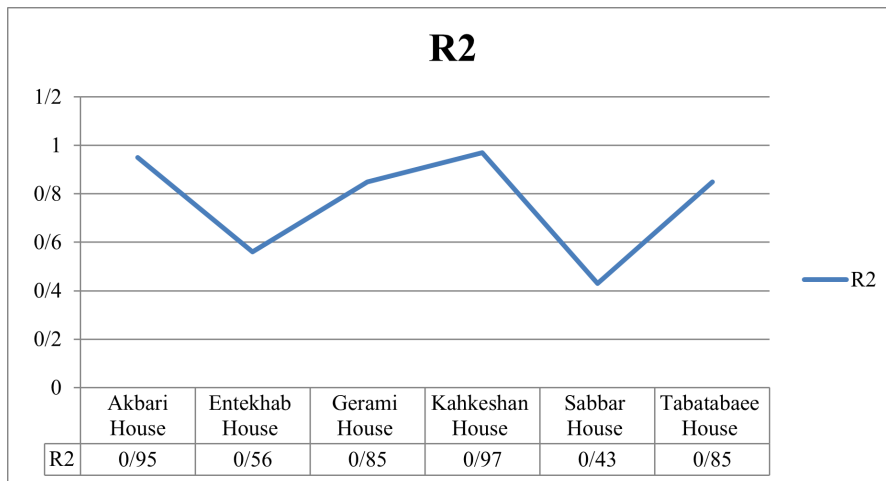


Fig. 4. Index of Comparison between Connectivity and Visual Integrity

According to this analysis, the most linear graphs are related to Kahkeshan and Akbari Houses. It seems that the plan of the mentioned houses has created a more regular pattern of hierarchy for spaces from public to private, which makes it simpler for users to perceive these spaces. The lowest value is reported for Sabbar House with two similar courtyards, which this issue seems to have made space hardly comprehensible for the user.

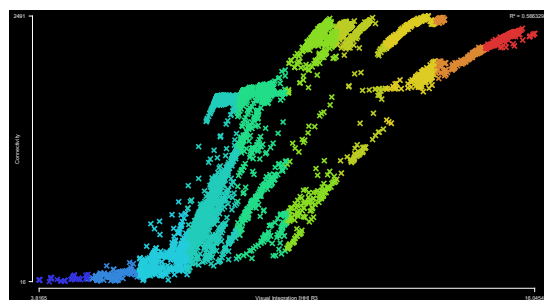
In terms of access and visual hierarchy in the conducted analysis, public spaces and courtyards have the lowest average visual depth, implying the higher permeability of these spaces than other accessible spaces. Further, the realm of various activities and the hierarchy of them from public to private is observable regarding the graphs of average depth.

The results of visual integrity analysis can be cited in the case of the view field of spaces. In an analysis of visual integrity, those spaces with higher integrity

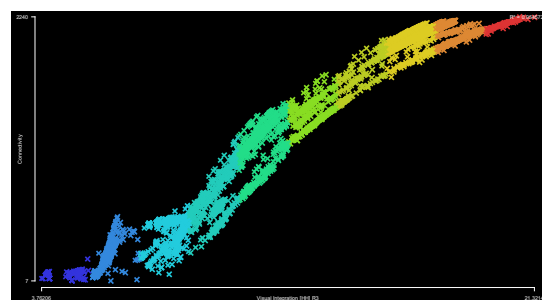
and better view and access than other spaces appear in warm colors. These spaces comprise residential courtyards and their connection paths. As seen in the visual integrity graph, the visual integrity index is higher in the Akbari and Kahkeshan Houses where a large central organized courtyard is placed at the center.

The second courtyard added to the Gerami and Sabbar Houses dramatically reduced the visual integrity of the plans of these houses. The connectivity index can be used in the field of the connection between spaces and complex or space connectivity or disconnectivity. According to the connectivity graph, the connectivity rate is highest in Kahkeshan House. Previous analyses indicate the house structure with one central courtyard would create a maximum connectivity rate. In other words, it can be confirmed that there is a higher connection between spaces with the complex in this house than in other studied houses.

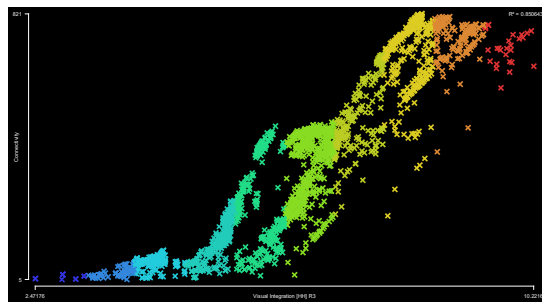
Table 8. Comparison between Connectivity Index and Visual Integrity



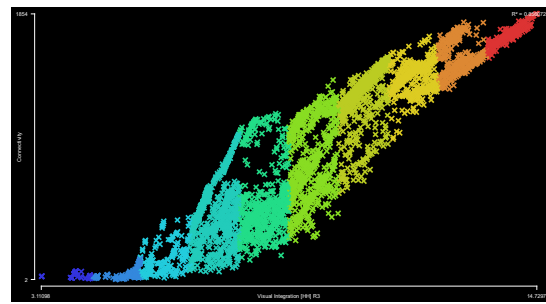
Entekhab Al-Soltan House in Natanz



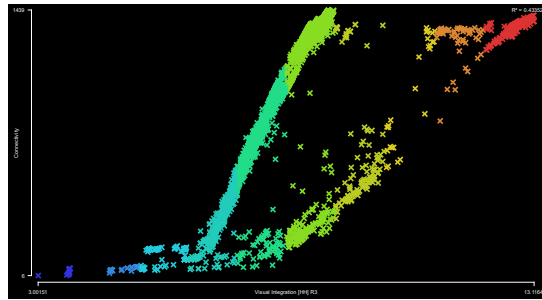
Akbari House in Kermanshah



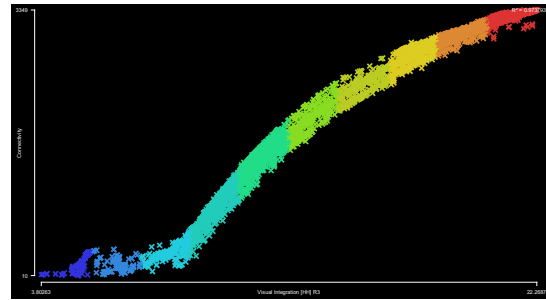
Gerami House in Yazd



Tabatabaeeha House in Kashan



Sabbar House in Shiraz



Kahkesahn House in Isfahan

6. CONCLUSION

Eight houses with different plan structures have been selected in this research to examine the role of privacy hierarchies in traditional houses. In general, research summarization indicates that view and access indices have a direct nexus with the spatial structure of residential plan and courtyard's form; central courtyards provide a relatively good view and access and have dominance over the surrounding spaces and can control them, but the surrounding rooms are designed in a way to have less view and access and most privacy rate. Entry in each house plays a significant role in controlling the direct visual access to other spaces of the house. The courtyard's form and size have a considerable effect on increasing the view and access to the house, and subsequently the privacy of residential space. Also, examination of plan structures of case studies reveals that the existence of a columned porch, central hall, and rooms with three and five doors have improved the considered indices in the whole plan, creating a hierarchy of organizer spaces and increasing privacy.

In general, the visual integrity index in samples of traditional houses of Iran indicates that in all of them, the space of vestibule and entry has low visual integrity, so the a higher spatial segregation. A diverse range of visual integrity is seen in other spaces of traditional houses, which its rate is high in main courtyards, average in the secondary and private yards, as well as hall and Panj-Dari spaces, while its rate is almost low or less than average in Se-Dari rooms. This finding confirms the existence

of a hierarchy of integration, connection, access, and privacy in the spaces of Iran's traditional houses.

Moreover, the connectivity index was assessed in traditional houses and showed that the main courtyard in all samples offers the highest connectivity rate, while the hall and Panj-Dari spaces provide medium connectivity rates and lower than average in some cases, and Se-Dari space has a low connectivity rate. Furthermore, secondary and private courtyards indicate a relatively low connectivity index in all houses except for Sabbar House in Shiraz. The entry and vestibule spaces in all samples provide low connectivity, and in Akbari and Entekhab Al-Soltan Houses that have an entry with direct elongation composed of several spaces, connectivity space varies within a spectrum from the low rate in the building's entry to a higher value in courtyard side. All of the mentioned points imply the existence of a privacy hierarchy that is increased from public spaces towards private spaces and the building's entry space with low connectivity performs as a space segregating outside and inside spaces of the building.

According to the comparison between connectivity and visual integrity indices, those houses having one courtyard or plan structure in which most spaces of the house are arranged around one of the courtyards provide a more regular pattern of hierarchy from public to private spaces, making it simpler for user to understand these spaces. In other words, the legibility of spaces is higher in these samples although privacy is more observed in the houses having several courtyards rather than those with one courtyard. Deployment and arrangement of various spaces of hose with different

uses around the multiple courtyards make it difficult for users to comprehend space through the detection of spaces or zones. This result reveals the importance

of paying attention to the type of space arrangement to observe privacy hierarchy.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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The authors state that they have directly participated in the stages of conducting research and writing the article.

ENDNOTE

1. Standard Deviation

REFERENCES

- Došti, Shahrzad. 2018. Privacy in traditional houses. *Iranian People's Culture Quarterly* (53&54): 116. <http://noo.rs/pFD2u>. [in Persian]
- Dursun, Pelin. 2007. SpaceSyntax In Architectural Design. *Proceedings, 6th International Spacesyntax Symposium*. Faculty of Architecture. İstanbul Technical University, İstanbul. https://www.researchgate.net/publication/228646158_Space_Syntax_in_Architectural_Design
- El-Agouri, Farag A., and Vail Karakale. 2018. Privacy Regulation, Spatial Culture, and Communities in a Communally Diverse City:Ghadames. Libya. *Journal of World Architecture* 1(2): 16-25. <https://ojs.bbwpublisher.com/index.php/JWA/article/view/516>
- Haeri Mazandarani, Mohamad Reza. 2016. *House, culture, nature in Iranian architecture researching the architecture of historical and contemporary houses in order to formulate the process and criteria of house design*. Tehran: Publications of the Urban Planning and Architecture Study Center. <https://noandishaan.com/39861/home-culture-nature-architecture/>. [in Persian]
- Seifian, Mohamad Kazem, and Mohamad Reza Mahmoudi. 2008. Privacy in traditional Iranian architecture. *Hoviatshahr* 1(1): 3-14. https://hoviatsahr.srbiau.ac.ir/article_1073.html. [in Persian]
- Sheikh Bahaei, Amir Reza. 2019. Investigating the principle of introversion in Iranian housing based on the theory of space syntax (case study: traditional houses in hot and dry climates). *Journal of urban management* (54): 63-78. <http://noo.rs/SLojV>. [in Persian]
- Shirvani, Maryam, Behnam Bazafekon, and Afrooz Nasser. 2015. How to maintain privacy in the contemporary residential architecture of Iran according to the traditional architecture of Iran, a case example: old houses in Shiraz during the Qajar era. *The first national conference of residential architecture, Malair*. <https://civilica.com/doc/346679/>. [in Persian]
- Mazaheri, Mojtaba, Omid Dezhdar, and Jalil Mousavi Sayed. 2018 . Analyzing the role of the yard in the spatial structure of Iranian houses using the Synta Space method. *Hoviatshahr* 12(34): 97-108. https://hoviatsahr.srbiau.ac.ir/article_12991.html. [in Persian]
- Mousavi Nasab, Mahrokh, Vida Taghvaei, and Mohammad Ibrahim Mazhari. 2022. Analysis of the interior-exterior pattern as a hidden spatial Order using the method of space syntax in last Ghajar and early Pahlavi Behbahan houses. *Karafan Quarterly Research Journal* 18(4): 375-393. https://karafan.tvu.ac.ir/article_140919.html. [in Persian]
- Vafapour, Ali. 2015. Investigating the principle of privacy and the concept of privacy and its developments in contemporary Iranian residential architecture. *The first national conference of residential architecture, Sama Technical and Vocational School, Malair Branch*. <https://civilica.com/doc/346571/>. [in Persian]

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