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Spatial Configuration as a Method to Measure the Actual and Potential Ability of Spaces Used by Indoor and Outdoor Users

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Abstract

Paying attention to native architecture and at the same time new approaches to its reading has always been one of the topics of interest in architecture. A better understanding of the native architecture of each region leads to better design and greater adaptability of the design to its context. Therefore, in this research, we have investigated and analyzed the native housing of Iran with a case study of Yazd to design a residential complex with the indicators of native houses in the past. Due to the ever-increasing growth of technology and the evolution of attitudes toward understanding architecture, the method of reading native architecture in this research is a relatively new technique called spatial syntax and spatial configuration. In this study, a mixed research method was used. In this way, descriptive and analytical methods have been used to understand the reading of data and finally, logical reasoning has been used to provide design solutions. Different tools have been used to achieve the goal, such as library search and specialized software, and collecting questionnaires and analytical information are some of the things that have been used in this research. This research is based on the information collected with two main methods, quantitative and qualitative, from the basis of the plan of collecting readings of native architecture using new techniques and attitudes of architecture such as the theory of space syntax. Identification of socio-cultural indicators, such as workforce, culture and jobs of the future, the future of cyber security and related careers, care economy, opportunities and jobs, the future of digital currencies and related businesses, future cities, a platform for the emergence of future jobs, the role and place of higher education in the future of jobs and future jobs, etc. was done.

Keywords: Social Relations, Spatial Configuration, Space Syntax, Depth Map Software.

Introduction

Perhaps the most important difference in the socio-cultural attitude towards the reading of architecture is to focus on the meanings and desires of the users from the purely physical dimension. To achieve the desired results, socio-cultural researchers use research methods available in social sciences, and the correct reconstruction of social behaviors and relationships is done with field and library studies. The roots of the cultural-social attitude in its current form in architecture should be sought in the sciences of sociology and cultural studies (Gheitarani et al., 2024). The events that oc-

curred in the 18th and 19th centuries in various sciences and continued in the 20th century led to a kind of "scientism" in, among other things, culture and society.

Current sociology is indebted to Islamic scholars, including Ibn Khaldoun, a scientist of the 8th century Hijri, and his work is known as Ibn Khaldoun's Introduction (Dehghan & Naghibi Iravani, 2022; Gheitarani et al., 2024).

The main components of a society are its people. In the primitive or expanded society, each person is not isolated from others and communicates with other members of the society for reasons including need. Every social relationship needs a place. The scale of these dishes is different. Since about thirty years ago, famous researchers such as Amos Rappaport and Paul Oliver have addressed the subject of architecture, culture, and society with their special cultural-social approach. The result of the work of these authors and their followers has been the publication of hundreds of articles and books on this topic.

These researchers have introduced their spatial container with the name of native architecture, popular architecture, or folk architecture, which is placed in front of memorial architecture or official architecture.

The result of this demarcation of human creations was to pay attention to a large part of the architecture of the past, which was ignored until then, and since then many of them have been preserved and recorded as a place and an important cultural witness of people's lives in the past. Activities occur in any place, the cultural researcher tries to reconstruct these activities (Gheitarani et al., 2024). The set of activities has its expression in the architectural space. In other words, each space can represent the type of activity that is carried out in it. Every public activity requires its place, and they believe that the shape of the place is a consequence of the culture of that society.

According to the socio-cultural attitude, a building is a product that is formed about nature, ideology, worldview, way of life, social and psychological needs, material needs, individual and group needs, economic resources, and available techniques. Experts of the culture-oriented approach divide the forces influencing the formation of the building into two groups of material and non-material determining factors. The motivation for this theory goes back to the socio-cultural conditions of the 1980s and early 1970s. The equality of science with pure empiricism, which began seriously in the 17th century, presented its products in the 18th and 19th centuries. Rappaport, a cultural theorist, presented the book "Culture and House Form" against the materialistic view of architecture.

He believes that a building expresses the interaction of complex and numerous factors and their mutual actions and reactions. Choosing a single factor ends up limiting the definition of the subject. From his point of view, culture is the primary non-material determining factor, and climate, technology, site, etc. are secondary factors in determining the shape of the house. The theory of spatial configuration believes that space is the primary and main core of how social and cultural events occur. Although space itself is formed during social, cultural, and economic processes, it is usually considered a platform for social and cultural activities, so its form is usually not considered and assumed to be invisible. The emphasis of this theory is that in the deep understanding of urban spaces, the role of each urban space individually and the individual characteristics of that space in comparison to its role in combination with other elements of the city and its characteristics in the macro scale and the entire urban system are of less importance.

In this regard, the main idea addressed by this theory is the concept of spatial configuration, in which the relationship of each element with other elements of the whole system becomes important (Dehghan & Naghibi Iravani, 2022; Gheitarani et al., 2024). that you can have the same geno-

type in these different forms. Therefore, the number of genotypes can be less than the phenotype. It is not possible to assign a time and place limit to the genotype because it is possible to see one type of genotype in one or more buildings in two different places and at different times.

Syntax of space is a theory and a tool for analysis in architecture and urban planning. The beginning of this attitude was started in the late 70s and early 80s by Stedman. It is based in London. This attitude expresses the fact that the architectural space is affected by the social framework. Syntax of space is an attempt at how the state of spatial configuration expresses a social or cultural meaning. The purpose of spatial syntax is to describe how built places, such as buildings and urban street networks, are formed, especially how they are articulated and connected. Therefore, the organization of the space is related to a logical process, because at least it should meet the functional goals. In general, the word syntax in literature means the order of words in a sentence, which we have already talked about.

The main goal of the researchers involved in this issue is to understand the social relations in the space, such as the creation of privacy and the degree of privacy and publicness of the spaces, especially the house. To achieve these goals, an explanatory diagram is used. The space syntax method is relatively new, and although it has been around twenty years since its formation, it has expanded greatly in the last decade. At the beginning of the seventies, just when Krayer's shape method was presented to the world of architecture, the space syntax method was introduced by several English experts and scientists. From this group, Stedman, Hillier, and Hansen are more prominent than others.

Stedman is the creator of the book Morphology of Architecture and two other people have presented numerous books and articles on the subject. The social logic of space and space as a machine can be considered the most important books of this theory. The second stage of expanding the space syntax method happened in the eighties. To achieve their goal, they presented a drawing technique called explanatory diagrams. This drawing method allowed them to simulate different spatial patterns. At this stage, the methodology was expanding and popularizing a lot (Iravani & Ahd, 2021). The third stage is the globalization of this method. This method became popular in different parts of the world in two ways: first, it reached Jap through his works and the formation of internal seminars, and then by a large number of foreign graduates from one of the British universities named Bartlett, who published the book Social Logic of Space. The creators of this method have a social view of works of art in general and architectural buildings in particular. They believe that the builder of the building, although he creates a single shape, has organized spaces together to achieve this single shape (Maleki et al, 2024).

Building is like the creation of spaces by components and elements. These spaces are formed for specific functions for people or consumers. Each space creates a special relationship between the consumer and the desired space. Here, the arrangement of spaces means the internal communication of the spaces that are used by its consumers. Therefore, it is possible to know the social relations of the people who consume them by knowing the spatial connections. In the syntax of space, these activities and relationships are more important than the general form or shape of the space.

Genotype and Phenotype. Here we will refer to the use of some special terms such as species or hidden biological pattern (genotype) and phenotype or physical type. The use of two suffixes type (type) or species is seen for both words, which means the commonalities that each of these words provide as a representative of a group of patterns or forms. Hillier and Hansen introduce basic definitions and implementation tools to achieve their goal, which is the analysis of spatial relationships.

Basic definitions include syntax, genotype, and phenotype. Genotype, which may be called a biological pattern, is referred to as the abstract rules hidden in a spatial form. This is a word that is used in biology. Its general meaning is the set of information that exists within an existing type or "species" and this is the internal information that governs the form of the object. Through the genotype of the species, it is connected with the organisms of its group in the past and the future (Dehghan & Naghibi Iravani, 2022; Gheitarani et al., 2024; Iravani & Ahd, 2021). The guarantee of life and its survival and its similarity with others depends on this genetic information and makes its evolution and strength and the continuation of its life possible. The biological species or the biological pattern hidden in architecture is the same internal information that can be recognized in the architectural space of social relations that arise from the behavior of the residents or their consumers. The appearance or existing body of the phenotype in architecture is the body of a building that shows itself in the form of a species.

For a better understanding, the two mentioned words can be introduced with the examples given by Hillier and Hansen. The army camp, which consists of several components such as tents, kitchens, warehouses, and other spaces, is considered. These components are arranged according to relationships in a site. The placement of these components is a function of security issues, easy access between some components, and other factors that should be considered in the military site package (Maleki et al, 2024). The relationships between spaces, which are formed based on the relationships of their users, show themselves in the form of a pattern or plan that can be used and repeated in other sites. Here, the site or area and other physical components are the phenotypes, and those repeating hidden patterns are the genotypes. If, for example, this camp is set up in the heart of the desert and at the foot of a hill or a forest area, the same hidden pattern of space relations is used.

In other words, although the phenotype changes, the genotype does not change. Understanding one's genotype means knowing the social structure, the relationship between parts, the pattern of systematic activities, and their social burden (Gheitarani et al., 2024; Maleki et al, 2024). Phenotype, which is the same body type in different shapes of the frame. It is a change, while it is possible to have the same genotype in these different forms. Therefore, the number of genotypes can be less than the phenotype. It is not possible to assign a time and place limit to the genotype because it is possible to see one type of genotype in one or more buildings in two different places and at different times.

Features of genotype and phenotype

Table 1. Phenotypes and Genotypes

Phenotypes	Genotypes
Flexible	Fixed and unchangeable
It has different shapes	Has a specific and single relationship
It has time and space	without time and place
Genotypes can be considered the cause of different phenotypes.	

Source: Authors, 2024.

The main indicators examined. In the perspective of space syntax, four indicators are used to examine the social characteristics of the samples, which are:

- Connection: It is defined as the number of points where one point is directly connected with other points. For example, the degree of connection of a room that has two entrances to its adjacent spaces is two.

Ci=K

where K is the number of points that are directly connected to the desired point.

- ***Connection***: The connection of a point indicates the connection or separation of a point from the general system or the lower system, second degree. A space has a lot of interconnection that has more integration with other spaces, this index has a linear relationship with the "connection" index, so more interconnection is equal to more connection.
- ***Control***: It is a parameter that determines the degree of authority of a point from other points that are connected to it. In other words, the lower a point has a degree of selection about a specific point, the lower the amount of control over it .
- ***Selection***: It is a general measure of the amount of "flow in a space." A space has a high degree of selection when a large number of shortest connecting paths pass through that space. The basic idea of depth is defined as the number of steps that must be taken to pass from one point to another. A point is called deep if there are many steps between that point and other points. Depth is not one of the main parameters in space syntax, but it is an important variable for calculating the connection of a point. If Di, j is the shortest distance between two points i, j in graph G, the total depth of point i is the sum of the distances and based on the average depth, it is defined as the equation:

where N is the number of graph points.

Types of spaces and analyses. There are three main concepts to define the analyzed space in the attitude and approach of space syntax, which are:

- ***Convex space***" is a space in which no line between two points cuts the perimeter of the space. Hence, a "concave space" should be divided into the least possible number of convex spaces.
- ***Axial space***" or an axial line is a straight line of sight that can be understood on foot.
- ***Visible space***" includes all areas that can be seen from one point. Accordingly, the three types of analysis systems in space syntax are:

Axial: In this system, a connection graph is defined based on how each line interacts with the surrounding lines, and it is usually used for textures in the city, village, or neighborhood unit.

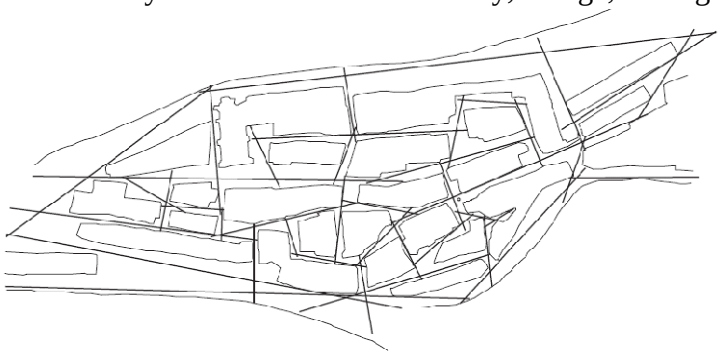


Figure 1. Axial map of the French city of Gassin
Source: Authors, 2024.

- ***Convex***: In a convex space, no part of the line that connects two points located inside the space should be outside the space. In other words, a convex space is a space where the connecting line between two points of the space does not cut the surrounding environment of the space. The "convex map" analytical method is mostly used in environments where there is free space in a non-

linear form. An example is the interior of the building where most of the rooms are expanded in two directions; Although most corridors may have linear features (Iravani & Ahd, 2021; Maleki et al, 2024). Therefore, in this method, the free space is divided into a certain number of convex spaces, which are shown as a convex polyhedron in two-dimensional maps (Gheitarani et al., 2024).

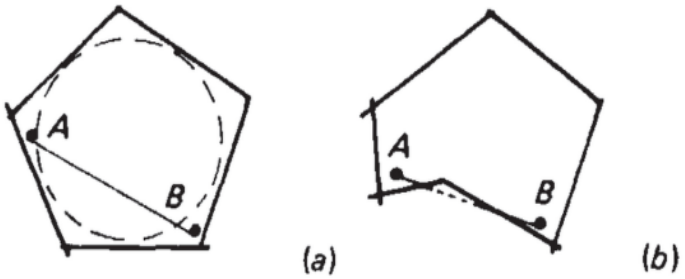


Figure 2. Left convex and right concave space
Source: Authors, 2024.

- ***Field of view***: The initial idea of this mode was created from the fields of view that were visible from a certain point. Therefore, the basis of the formation of this pattern is the way it reflects light, which determines the movement behavior patterns of people in the environment.

The approach of visual graph analysis. The representational graph analysis approach examines the main indicators of space syntax attitude using representational analysis. The output of this analysis is a map in which each index is in the color spectrum from red to blue, which expresses the range of the highest to the lowest amount of the desired index. In this research, the amount of communication index has been investigated.

Explanatory charts and specialized software. To read the genotype and social relations in the spaces (which is like a text), a graphic tool called an explanatory diagram is used. This diagram shows the internal communication features of the plan and is a means to achieve the goals of the inventors of this method. The structure of this chart is very simple. Its constituent parts are circle and line. The circle is shown in several ways.

- Empty and filled circle: diagram of all spaces
- Circle with a cross or plus: diagram of the origin of movement or outside
- Vertical line: depth chart and hierarchical relationship of spaces.
- Horizontal line: diagram of the connection of spaces of the same category.
- Oblique lines and in some cases curved lines: indicate the connection between spaces (these lines connect two circles).
- Numbers: they indicate the depth of the ranks, in other words, they indicate the depth of each space compared to the outer space.

Both filled and empty circles are used to show spaces. If communication spaces such as courtyards, corridors, and stairs are marked with empty circles and other spaces with solid circles, the diagram will be more readable for the audience. The circulation diagram of a building is drawn with explanatory diagrams. The components of the diagram shown above are each an interpretation of the spatial relationships of the building. The graph starts from zero, root, or origin. This means spaces outside the building. A public space that can be accessed by any member of the community (Maleki et al, 2024). This circle is connected to an interior space by a vertical line. In this case, the space has become a level deeper. The depth has a social meaning. When the resident or consumer

has come inside from outer space or the origin of a depth, it means the separation of public and private privacy. That is, if a stranger wants to enter the building, he must pass through the origin of one space. Then we are one step closer to creating a more private space. It is introduced to mean social hierarchy or a social function.

The connection between the components of the diagram, or circles, each of which is a diagram of a space, can be seen in different forms. One type is a linear alcove and the other is a rotational pattern. A linear pattern from one circle is connected to another circle with a vertical line. This means placing several nested spaces. In other words, you have to go through one space to reach another space. Rotational pattern means the interaction of at least three spaces with each other. In other words, if two spaces can be accessed at the same time, these two spaces are placed in a deeper category than the previous space. If two rooms or spaces that are placed next to each other are connected by a door, a horizontal line is shown in the diagram. Linear and rotating patterns also have their social meanings (Maleki et al, 2024).

A linear alcove tells us that to pass through any space, one must pass through another space. Each level of deepening means an increase in the degree of privacy of deep spaces. The results obtained from the general shape of the diagrams are finding the degree of connection and differentiation of the spaces about the outer space or the origin and each space with the other space. These diagrams can be drawn in the form of a computer program and the degrees of depth of the spaces can be calculated relative to the starting point. When each space is placed in a deeper category than the space before it, when a space has a more navigational connection with other spaces, the computer calculates it relative to the starting point and gives a number.

A space with more connection with other spaces shows a greater degree of connection between those spaces, and on the contrary, spaces with less connection have a lower degree of connection. By comparing the obtained numbers, the degree of connection and differentiation of the spaces can be obtained. The designers of this chart believe that the higher the degree of differentiation of the space, the more private the space is, and the higher the degree of connection between a space means having a relationship with other spaces, which in a sense indicates that the space is more public (Maleki et al, 2024).

These circulation diagrams give their audience a quick understanding of the connection between spaces, and by drawing them, you can see the movement of navigation in the building. As stated, according to the belief of the inventors of this method, social communication shows itself in the form of movements made by consumers in space. Using these diagrams, a complex plan can be translated into a simple diagram, in other words, a building as a text is a complex thing that finds a simple translation with this method. Comparing different circulation diagrams together provides interesting results, in this comparison, the differences and commonalities in circulation communication can be easily recognized (Naghibi Iravani et al, 2024).

Comparing the degree of differentiation and cohesion in buildings and investigating the reasons for differentiation and cohesion are other results that can be obtained from these charts. Circulation charts can be criticized and analyzed in two ways. First, the general structure of the diagram and the connection of its components, then the factors that affect the circulation system and communication of a building and as a result of the diagram.

Methodology

In this research, various methods have been used for the comprehensiveness of the work, so the combined method in the case study is the focus of the work in this research. In this way, firstly,

the data and raw materials of the research are collected with analytical and statistical methods, and then the design solutions are presented using logical reasoning. The specialized software is UCL Depth Map. In this software, all the calculations about them are done by computer. This software can be installed separately on the system, in addition, it can be installed as a plug-in on the GIS software. The output of this software after analysis in any method provides the materials for review analysis and conclusions.

As can be seen from the diagram of research steps, firstly, the concepts of house and field planning have been examined, and at the same time, the knowledge of the research field and configuration theory and the method of space syntax have been studied. In the next step, based on the studies, the hypotheses were explained, houses were selected, drawn, revised, and simulated, and the physical classification of the houses was done in a 5-fold division (Iravani & Ahd, 2021; Maleki et al, 2024). In addition to organizing cases for the next stage of analysis, a shape and pattern division for the houses that are being designed will be provided. At the same time, interviews have been conducted, and the results obtained from them are listed below in an organized manner.

Among the indicators introduced in the theory of space syntax, three components "depth", "connection" and "connection" have been used, which have been investigated using "convex method" and "representative graph", and the results are These analyzed are expressed in the form of graphs and analytical images. One house of each species has been examined. In the following, the analysis of the guest space in these houses has been carried out using the visible graph method, which examines the amount of the investigated indicators between this space and more private spaces. Finally, the results obtained from these analyses and interviews are summarized and mostly the design solutions are expressed at the end. These solutions are specially used in the proposed plan.

Since the analysis is looking for results to provide design solutions, therefore, an all-around view is necessary to achieve this goal. To achieve a comprehensive view, the use of the combined method has been evaluated as the best solution, because the shortcomings of each method can be covered with other methods. Here, two different types of data led us to mainly choose two quantitative and qualitative methods. In the research methods, the "statistical method" and "analytical and modeling methods" have been used to collect information, and the "logical reasoning method" has been used to achieve suitable outputs and design solutions.

To prepare raw materials for analysis using the specialized software of space syntax, we need to simulate houses from the local and historical context of Yazd. Therefore, these data have been produced by using the technique of building collection and in some cases library study (Naghibi Iravani et al, 2024; Samami et al., 2024). After drawing, the selected houses are categorized by software. This classification is based on the placement of the volume that has been done in previous research, which is finally classified into six groups, which we will see in the next chapter (Iravani & Ahd, 2021; Iravani & Ahd, 2021). After defining the spaces of each house and collecting and categorizing them, one or two houses from each pattern have been selected for analysis using the specialized software of syntax of space. The analyses include various tables and results, based on which part of the design solutions are provided (Maleki et al, 2024).

The Badrian neighborhood was chosen as the design area. Among the 33 ancient neighborhoods in Yazd, the Badrian neighborhood has been chosen because of its proximity to the ancient valuable fabric and also the empty land that exists in this landscape. Another reason for choosing this part is to organize the unfavorable shape of this part of the city and also to improve the quality of this area. The selected part is shown in the images below (Iravani & Ahd, 2021; Maleki et al, 2024).

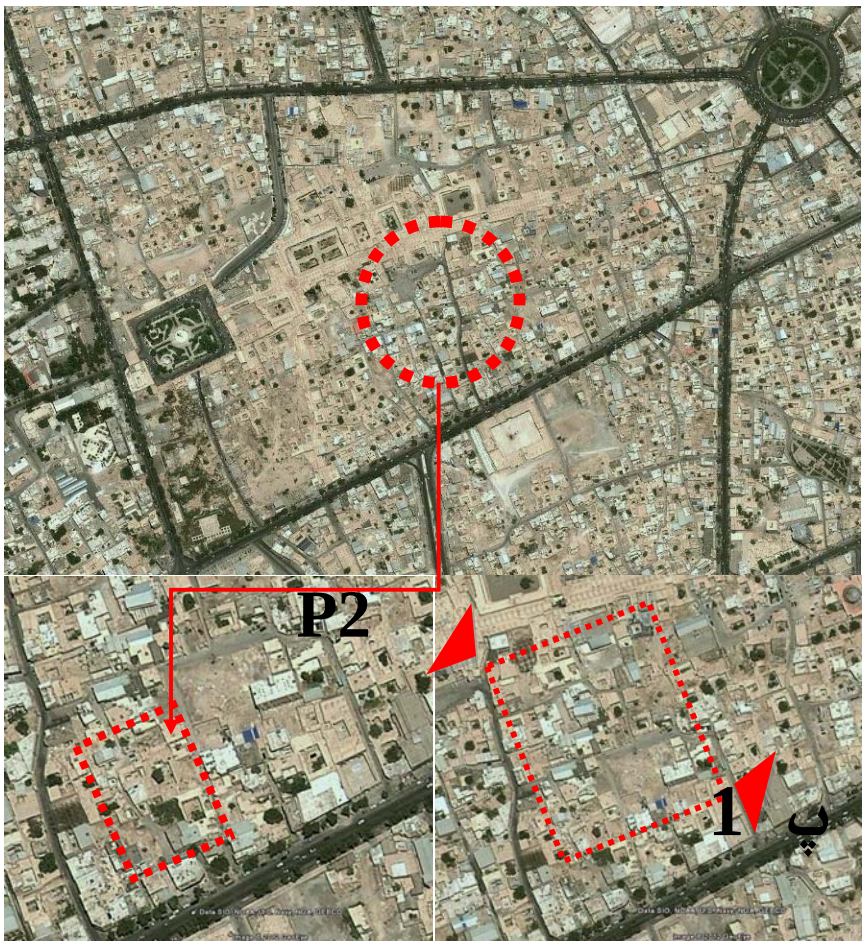


Figure 3. Aerial photo (2012) of the Badrian neighborhood of Yazd, the area selected for the design
Source: Authors, 2024.

Figure 4. Panorama image 1 view of the site from the eastern corner
Source: Authors, 2024.

Figure 5. Panorama image 2 view of the site from the northwest corner
Source: Authors, 2024.

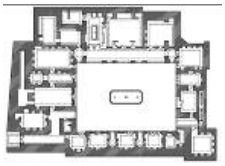
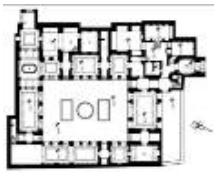
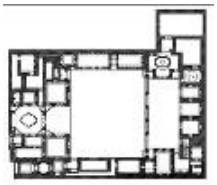
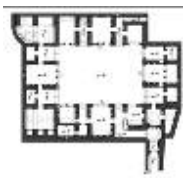
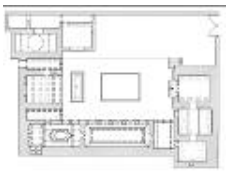
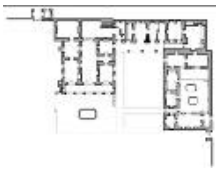
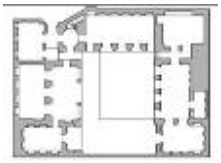
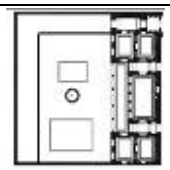
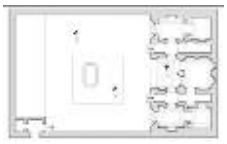
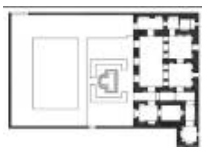
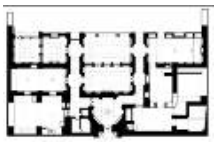
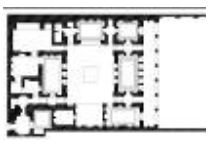
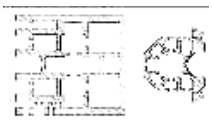
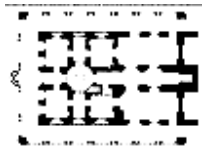
Figure 6. Pictures of the alleys around the site
Source: Authors, 2024.

Results and Discussion

Based on the research done by Kamalipour, who classified the houses of Yazd. To carry out this part, thirty-eight houses in the historical context of Yazd, as a single building in different parts of the context, were identified, collected, classified, and in some cases, redrawn and modified. The existence of both types of classification related to the combination of introverted and extroverted shapes can be recognized in the context of the historical context of Yazd city (Samami et al., 2024). In the introverted classification, there are two shapes including houses with one and two yards, which can be identified in four subgroups three sides of volume, two sides, one side, and four sides of volume. In the extroverted classification, there are garden houses. Examples of plans related to each of the classifications of introverted and extroverted shapes have been brought.

After classifying the houses, the introverted shape composition has been selected for more detailed investigation and study. Therefore, in the continuation of the research process, the simulation and analysis of indicators are limited to the classification of introverted shape composition. Regarding the field observations and the investigation of the houses in the context, it is necessary to pay attention to the fact that randomness and dispersion of the houses in different parts of the context were considered in the selection of samples (Iravani & Ahd, 2021; Iravani & Ahd, 2021; Maleki et al, 2024). Also, from each classification, a sample has been selected, examined, and analyzed. Due to the large number of four sides of the volume, two samples have been examined.

Table 2. Classification of Shape Composition of Yazd Houses.

				The four sides of the volume	Houses with one yard	Introverted classification
Multiple house	House of deli-very	Goldadeh house	Yunsi's house			
				Three sides of the U-shaped volume		
Musavian's house	Farhamand's house	Mohibi's house	Shesh Dange's house			
				Both sides of the L-shaped volume		
Hatef's house	Lockrabi's house	Honorable house	Khomeini's house			
				One side of the volume		
confidential house	prayer house	Industrial house	Porthani's house			
				Houses with two courtyards		
scientific house	Astronomical house	The House of Zoroastrians	the house			
				House of gardens	Extrovert classi-fication	
The mansions of the reception garden	Shoghian's house	House of swords	Naal Ashke-nian's house			

Source: Authors, 2024.

Analysis by convex method and exponential graph with three indicators From each of the divided types, one sample was selected from each building and their analysis was done using the convex method and exponential graph. The results of the convex analysis are shown in the form of graphs, and the results of visual graph analysis based on the "connection" index, as well as the examination of the guest space with the "depth" index, are shown in the form of graphic images. In the following, each of these cases has been examined and described (Iravani & Dehghan, 2022). According the analyses carried out, we discuss the diagrams and maps obtained from the analyses for each house (Maleki et al, 2024).

Zoroastrian house:

Integration: In the courtyards of Zoroastrian houses, a high level of integration is observed, while this level is minimal in most rooms and services.

Connectivity: This rate is the highest in yards, as can be seen in the initial analysis. And like the connection, this amount is minimal in the rooms and services.

Depth: The rooms and services are located at the maximum depth. Preliminary examination of the level of communication in the Zoroastrian house. From the analysis of the visible graph based on the relationship index, it can be seen that this index has the highest amount in the yard and the rooms have the lowest amount. Also, the inner courtyard is less connected than the outer courtyard (Iravani & Ahd, 2021; Iravani & Dehghan, 2022).

Goldadeh House:

Integration: The integration level is at the minimum value in two points which are the rooms. The staircase of the second floor and the service are also less connected than other places. The yard is also at the maximum degree of connection with other spaces.

Connectivity: the degree of continuity in the yard and some corridors is at the maximum level, while the rooms, service, and stairs are at the minimum level of continuity.

Depth: This component is located at the maximum, unlike the other two components, the service rooms and the staircase.

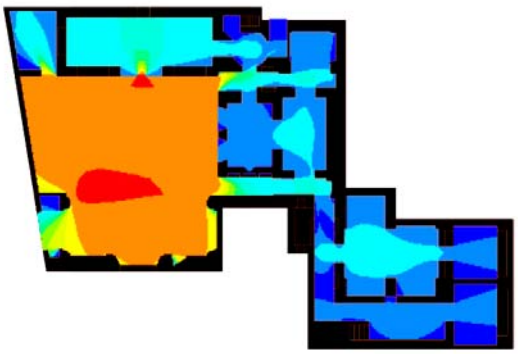


Figure 7. Preliminary examination of the level of communication in Goldadeh house. Source: Authors, 2024.

Based on the analysis of the visible graph and the relationship index in this house, it can be seen that the amount of this index is at its maximum in the yard of the house. This is while the rooms are at the lowest level and the corridors as communication elements are at the middle of this level.

In the continuation of the research process, the fielding of the space related to the guest was investigated using the method of visible graph analysis. According to the comparative comparison of the reception space of the houses and the direct observation of the researcher, it seems that in the houses with two courtyards, the possibility of organizing the guest space was more available than in the houses with one courtyard. Also, in the classification of one-sided volume, two-sided volume, and three-sided volume in the shape combination of a courtyard, no difference has been seen in the direction of the guest space between different classifications (Iravani & Ahd, 2021; Iravani & Dehghan, 2022; Naghibi Iravani et al, 2024).

The noteworthy point is that in the classification of the four sides of the volume in the shape of a courtyard, the staging of the guest space has been different from each other due to its placement in the longer and shorter width part of the courtyard (Maleki et al, 2024; Naghibi Iravani et al, 2024). Therefore, in this classification, the possibility of separating the guest area is greater in the case that the reception room is located in the longitudinal direction of the yard than in the case that this space is located in the transverse direction. Field impressions and direct observation of the researcher also confirm this finding.

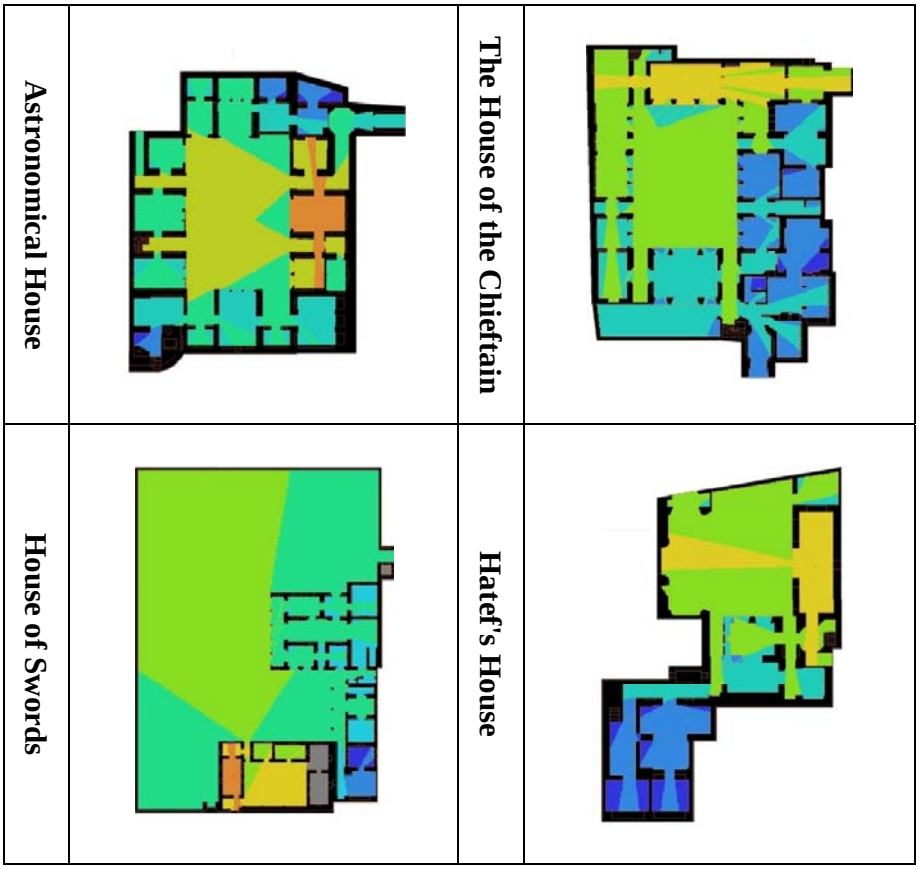


Figure 8. Preliminary Examination of the Level of Communication in Nojoomi house.
Guide: In each plan, the letter "P" indicates the reception space, and the color range from red to blue, respectively, indicates the maximum to the minimum navigable depth of other spaces of the house compared to the reception space.
Source: Authors, 2024.

Conclusions

The design perspective of the desired residential complex is described as follows: "Badrian residential neighborhood will be a neighborhood with low-cost and flexible houses, safe and with medium density, encouraging social interaction and participation and giving identity, providing service needs at the scale of the neighborhood and having the qualities of an urban landscape, while maintaining And reviving the native architecture of Yazd and organized in terms of the cavalry and infantry system and emphasizing on the pedestrian circuit. According to the vision proposed for the design of the desired neighborhood, the following goals can be extracted from it and strategies for them can be presented. In the coming chapters, based on these strategies, design solutions will be discussed at the neighborhood scale and also at the unit scale.

Goal 1) Creating low-cost houses in flexible areas
- Strategy 1) Using prefabricated construction
- Strategy 2) predicting spaces for neighborhood growth

Goal 2) Creating security in the neighborhood
- Strategy 1) Create a hierarchy
- Strategy 2) Increasing social monitoring
- Strategy 3) Appropriate facilities and furniture

Objective 3) Medium density
- Strategy 1) Increase units per hectare

Goal 4) Encouraging social interactions and popular participation and identity
- Strategy 1) Creating micro-neighborhoods and multi-family cells
- Strategy 2) Creating public spaces and public participation

Goal 5) Provider of service needs at the neighborhood scale
- Strategy 1) Organizing the existing commercial bar
- Strategy 2) Creating access to services

Goal 6) Improving the quality of the urban landscape
- Strategy 1) organizing the skyline
- Strategy 2) organizing flooring
- Strategy 3) Organizing the side and internal corridors of the site

Goal 7) Reviving Yazd native architecture
- Strategy 1) extracting design lines from native housing
- Strategy 2) Qualitative reading of Yazd native housing architectural spaces

Goal 8) Cavalry and infantry system with emphasis on pedestrian circulation
- Strategy 1) Organizing the access system with an emphasis on pedestrian traffic
- Strategy 2) Organizing access and cycling system

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