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Space Syntax Reading in Traditional Mosques of Khorasan Razavi and Its Relationship with Iranian-Islamic Wisdom

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ABSTRACT

The construction of the mosque is a prominent manifestation of art in the spiritual and sacred realm, which should provide the ground for the ascension of man from the lowest to the highest level of existence. The architecture of the mosque if it wants to be in harmony with this ascension, must have houses and a hierarchy corresponding to what rules the universe. Many scholars believe that this feature is derived from the wisdom of Iranian-Islamic architecture, so this article aims to study the spatial arrangement and its features in traditional mosques, seeking to understand the relationship between structural values and form resulting from spatial arrangement with concepts originate from Iranian-Islamic wisdom in traditional mosques of Khorasan Razavi. The method of this research will be combined, which includes descriptive-analytical methods and logical reasoning. First, using observation, field survey and library studies, information and maps of mosques are prepared and in the next step, the maps are analyzed in Space Syntax software (Ucl Depth Map) and the results are presented. Research findings show; The degree of transparency, coherence, geometric order and visibility of spaces along with the depth of each space in traditional mosques, which are the most important indicators of the method of space syntax, are directly related to the components of wisdom in Islamic architecture, including spatial arrangement. It can be said that Iranian-Islamic wisdom has had a direct impact on the placement of each space of traditional mosques and determining the relationship of each space with other spaces.

Keywords*: Iranian -Islamic Wisdom, Khorasan Razavi mosques, Space syntax*

1. Introduction

Architecture is the art of space arrangement, and in the meantime, the sacred architecture uses various architectural techniques to achieve its primary goal, which is human closeness to God, by sanctifying the space created and arranged.

The existential nature of the mosque mainly manifests the sacred architecture of Islam [1]. The earthly body of humans connects to the reality of existence in the mosque; in other words, the architecture of the mosque facilitates and intensifies the transcendence from the lowest to the highest levels of existence.

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The architecture of the mosque should have characteristics and hierarchy corresponding to what governs the universe to be in harmony with such transcendence and facilitate it. Given the connection of different existential realms, this hierarchy should have complementary and multiple layers and dimensions to provide the grounds for the path to perfection in the mosque. This feature and many others, which stem from the wisdom of Iranian-Islamic architecture, as some scholars believe, gradually manifested in the architecture of mosques from the Seljuk period and led to the emergence of a special type of mosque architecture unique to Iran and Iranian-Islamic architecture and culture [2].

Therefore, in this study, in order to study carefully and benefit from new theories in architecture, we will study the components derived from the wisdom of Iranian-Islamic architecture with respect to the availability of buildings in the case mosques of Khorasan Razavi, with the help of software Ucl Depth Map, which is a set of methods and theories that study how the structure of the configuration structure of space and content interacts [3].

Since these concepts play an influential role in the development of human excellence in architecture, they can be used as a critical tool to improve the condition of today's mosques, which due to the view of modern architecture and along with the new generation of academic architects, undergo changes in form and space [4]. They have been used to be contemporary, in such a way that they do not have any specific form characteristics and their quality has not provided the satisfaction of religious people or architects. In this regard, one of the issues that is considered important is the special attention to the detailed spaces and spatial connections that have been forgotten in most of the spaces of today's mosques. A study of successful examples of Iranian past architecture confirms that there are valuable principles in the architectural design of our traditional mosques that can be extracted by researching in this field, these patterns that are considered a solution for the architecture of today's mosques. Accordingly, recognizing some components affecting spatial organization (communication, depth, interconnectedness, order and visibility) and their relationship with the values embedded in the architecture of traditional mosques, is an approach that is expected to pave the way for today's mosque architecture. Therefore, in the present study, we will seek to answer the following questions:

Given the diversity of mosque configurations, how is there a connection between the spatial layouts of traditional mosques?

What is the relationship between structural and formal values resulting from spatial arrangement and Iranian-Islamic values and concepts in the architecture of traditional mosques in Khorasan Razavi?

2. Review of Literature

In the study of research records about mosques and researches that have sought to find the concepts hidden in the interior of its architecture, we can refer to the book "Iranian mosque, the place of ascension of believers", written by Seyyed Mohammad Beheshti (2010), which in the form of four articles The interior deals with Iranian architecture and the esoteric meaning of Iranian mosques, he noted. Mohammad Naghizadeh (1999), in his article "Mosque of the body dominates the Islamic complex", analyzes the role that the architectural spaces of mosques play in relation to increasing the presence of the heart and the evolution of the human soul from material to spiritual. In the article "Mosque architecture from concept to body, from the past to the future", Abdolhamid Noghrekar (1999), after examining the values governing the architecture of mosques over time, states: Values in architecture derive their originality from the transcendent course of man they take. Mohammad Sadegh Falahat (2005), in his article "The role of physical design in the sense of mosque location", examines the sense of people's place in mosques and states that physical signs, architectural design and activities are important identifiers defining the mosque.

Space syntax was one of the methods introduced to understand the invisible structures and systems behind the forms and phenomena of architecture [5]. This method includes theories and techniques for the analysis of the space configuration, proposed by Bill Hillier and Julienne Hanson in the late 1970s, based on the theories of Christopher Alexander and Philip Steadman, after years of study and finding the effective factors and hidden patterns beyond architectural forms [6]

A review of the literature on the application of there have been various studies on the use of this method in architecture, no independent research has examined or compared the space syntax of Khorasan Razavi traditional mosques to understand its relationship with the wisdom of Iranian-Islamic architecture. However, a study by Bemanian et al. (2016) addressed the relationship between spatial configuration and philosophy in the architecture of Isfahan Madrassah-Mosques. Another study by Mehdi Nejad et al. (2020) investigated the structure of traditional (Jameh Mosque of Isfahan), contemporary (the University of Tehran and Al-Ghadir), and post-Islamic revolution (Shahrak-e Gharb) mosques using space syntax. Also, other researches and articles on the method of arranging space in architecture, such as; Abbaszadegan (2002), Memarian (2002), Abbaszadegan and Malekzadeh (2003), Rismanchian and Bell (2011), Bahraini and Taghaben (2012), Siadtan and Pourjafar (2015), Madahi and Memarian (2017) and Soheili and Arefian (2016), Bazai et al. (2016) have been conducted until now.

3. Research Method

This research is practical in terms of the objective because it seeks to provide the space syntax in mosques shows that although ground for human spiritual transcendence and excellence using the relevant literature and ultimately reduce the prevailing spiritual crises in society. Hence, a type of mixed method resulting from the interaction and combination of qualitative and quantitative methods was used in this process. Accordingly, the characteristics of the Iranian mosque and the manifested principles of wisdom in Iranian architecture were primarily identified in the first step, using qualitative research method and a descriptive-analytical search in library and documentary studies. Finally, the indicators of the manifestation of these principles in Iranian architecture were set with an analytical approach.

The second part of the research, carried out quantitatively, analyzed the space syntax indicators in 7 traditional mosques of Khorasan Razavi using specialized space syntax software (Ucl depth map). Finally, the relationship between Iranian-Islamic wisdom and the space syntax of traditional mosques was evaluated using reasoning and interpretation to obtain results.

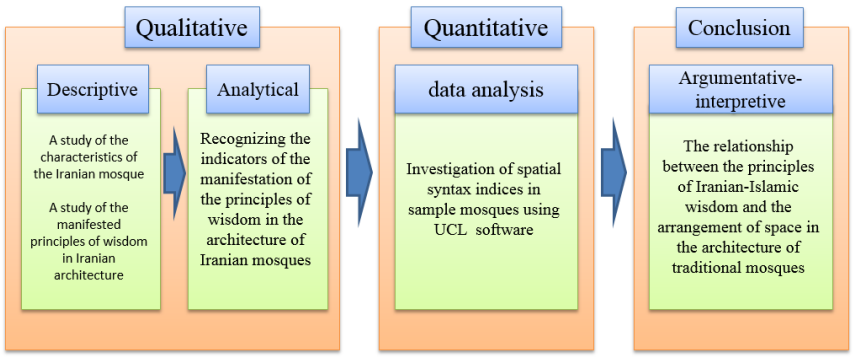


Fig.1 Research method and steps (Source: Authors)

3.1 Study Population

The study used cluster sampling due to its geographical scope, selecting Khorasan Razavi province according to country divisions of Iran. It was necessary to select the mosques efficiently to provide a successful presentation and significant example in the field of the study and make it possible to perform a comprehensive investigation. Thus, the selected mosques, including the Grand Mosques, were the center of attention by the architects of Islamic religious buildings in terms of their construction method and special physical and conceptual features in different eras. They were all more than one hundred years old and experienced the least physical changes over time.

4. Theoretical Foundation

4.1 Architecture of Iranian Mosques

The Prophet planned the foundations of the worship system in the mosque. He designed the mosque a simple and at the same time strong to help the God servants attend in the

presence of His Almighty regardless of the intellectual space of the material and tangible world, purify their hearts and tongues, and obtain excellence [7].

Hence, mosques, like all places with the primary objective of worship as the foundation of human spiritual growth and excellence, are oriented and systematized under the influence of two theoretical and behavioral areas. Accordingly, Muslim artists have placed the verses of the Qur'an and Islamic concepts at the forefront of their work in the construction of traditional mosques, manifesting various Islamic arts in the mosque body and configuration.

The viewpoint of Muslim architects in establishing spiritual effects of the mosque is institutionalized in their belief system, according to which they discover the truths of existence and express their knowledge through actions and behaviors to pave the way toward the origin of the creation. Hence, the architecture of mosques is a general reflection of humans' thoughts, worldviews, and vision, revealing the themes inspired by their vision through symbols and similes [7]. Thus, Iranian-Islamic architecture is a kind of wisdom, as the only knowledge that can understand and express this Islamic (sacred) art. In the meantime, the architecture of mosques is an example of art realized in expressing wisdom [8]. All concepts such as decorations, physical and functional forms and functions, and extrinsic and intrinsic characteristics of the architectural components of Iranian mosques, both in form (material) and nature (spiritual), correspond to the universe and reflect unity in the realm of plurality, the journey from the external to the internal [9], and hierarchy. Based on transcendent wisdom, which is the connection point of all various intellectual currents in Iran, the manifestations of the principles of Iranian-Islamic wisdom influenced by the basic principles of transcendent wisdom (existentialism, gradation of existence, pantheism) can be as shown in Figure 2.

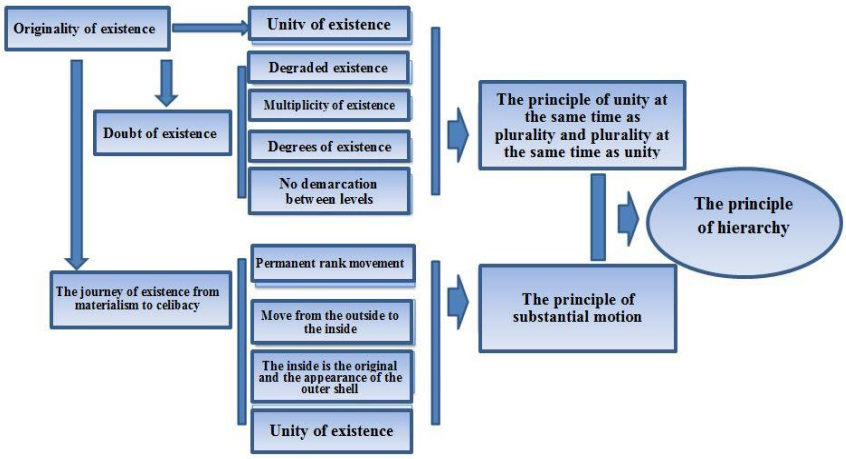


Fig.2 Basic principles of Iranian-Islamic wisdom and indicators of its manifestation (Source: Authors)

Since human craft is the factor of human (microcosm)-universe (macrocosm) communication, traditional arts are in full harmony with the principles governing the universe, and among them, hierarchy is one of the basic principles used in these arts. These arts are not only based on hierarchical principles in the structure of their formation, but also in line with the current harmony in the world and the existential hierarchy that is higher than the related material order [10].

Traditional architecture, as one of the prominent manifestations of human artifacts, has different dimensions of hierarchy. Hierarchy in architecture is a manifestation of the attempt to express the concept of transition and the gradual aspect of the process of perception. This principle reflects the fundamental pattern of separation, transition, and connection in the hierarchy of reaching a space such as a room, revealing the gradual aspect of reaching the space and emerging as a hierarchy of access from outside to inside. The mosque is the most obvious place for the manifestation of this principle [11].

The totality of Iranian mosques, from partial to general order, is the physical embodiment of perfection and invites the attendants to seek

perfection and awake, and the mosques themselves play a facilitating role in this important issue [12]. The physical body of these mosques prepares the human soul step by step from the courtyard to the dome and the sanctuary, preparing for spiritual journey, transcendence, and approach to the presence of God, which is the main goal of human creation. Hence, the prevailing ideas in society are visualized through the art and architecture of the time.

4.2 Definitions and Concepts of Space Syntax

Amos Rapoport believes that buildings belonging to the folk tradition are the direct and unconscious reflection of the needs, values, desires, and instincts of people in the language of a nation's civilization. Thus, this kind of architecture is a worldview expressed differently. Hence, various methods have been used in the contemporary era to analyze the architectural space, including formal, historical, and climatic methods. Space syntax is one of the methods evolved to understand the invisible structures and systems behind architectural forms and phenomena, based on the studies of Christopher Alexander and Philip Steadman [13].

The method of Space Syntax has a thematic and conceptual similarity to the method of word classification in the literature, called syntax. This method led to a new discussion on the subject of morphology in architecture. The main goal of researchers involved in this field is to understand the social relations in space such as privacy and the degree of privacy and publicity of spaces [14].

Hillier states that, just as linguistic rules of grammar provide a logical way for the word arrangement to express a particular meaning, it is possible to discover the logic of space arrangement or the space order arising from social relations through the method of space syntax [15].

The advantage of this theory over other theories is that it provides the researchers with a tool for quantitative identification of social behaviors, which are usually qualitative, to facilitate perception of space structure and configuration. Space syntax analyzes the relationship of all spaces to each other and can present the results in the form of mathematical and graphic parameters. Mathematical parameters can be used to create a model that predicts the function and behavior in spaces [16]. Finally, the fundamental objective of the theory of space syntax is to seek approaches to describing space configuration. Such a description should be able to discover the hidden social logic in its underlying layers and provide the basis for secondary theories on social and cultural events [17].

4.2.1 Spatial Syntax Variables and Their Place in the Present Study

The indicators used in the specialized syntax space software in this research are visual connectivity, depth, integration, visual entropy, and visibility (transparency).

Visual Connectivity, which is a feature of Islamic architecture, reflects the number of points directly related to other points and examines the transparency and the assimilation of the two spaces.

Depth is the number of steps taken to pass from one point to another. Depth has a social significance and indicates the degree of separation of a particular space from the overall space configuration. In other words, a greater depth of space means that more intermediate spaces have to be passed to reach that space; thus, such a space is more isolated and provides more privacy and solitude [18].

Integration is the most significant factor in the space syntax, indicating spatial cohesion. In other words, a greater degree of space integration indicates more cohesion of that space with other spaces and the totality of the space organization [19].

Visual Entropy or Space Chaos is a qualitative quantity, which does not mean chaos in dimensions and size, but in how to select access routes and visibility in any space. More openings to the space, including doors, windows, etc., lead to lower levels of privacy and depth of space, while fewer openings will increase the privacy and depth of space.

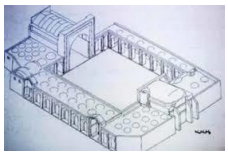
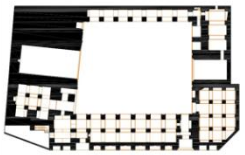
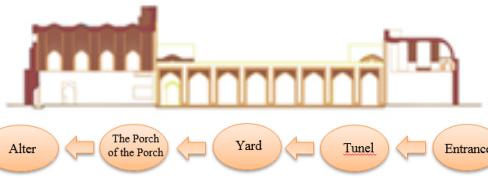
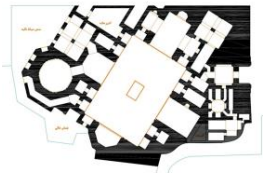
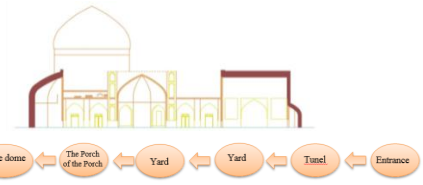
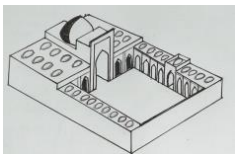
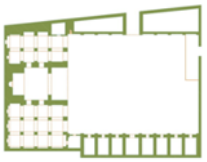
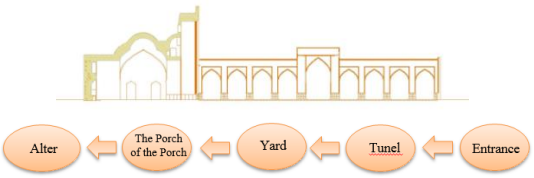
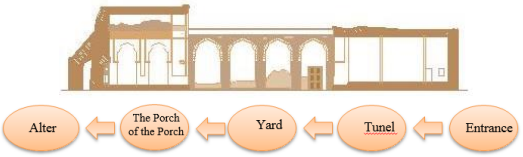
Visual Visibility (Transparency): Bill Hillier believes that transparency is directly related to the concept of shaping the whole space in the mind and putting these pieces together [20]. Given the characteristics of this indicator, its score in the sample mosques can reflect readability, simplicity, and movement circulation.

As shown in Table 1, limits are defined for the above variables in space syntax software, displaying the minimum values in blue and the maximum values in red across a continuum. Therefore, the following table presents a summary of the above:

Table 1. Indicators studied in space syntax software and their impact range (source: authors)

High range	Medium range	Low range	Study variables
Visual connectivity	15 and below	15 to 30	30 and beyond
Depth	1 to 1/5	1/5 to 1/8	1/8 to 2/2
Integration	10 and below	10 to 15	15 to 25
Visual Entropy	0/5 to 1	1 to 1/5	1/5to 2
Visual visibility	15 and below	15 to30	30 and beyond

Table 2. The sample traditional mosques in Khorasan Razavi (Source: authors)

Title	Form	Geometry
Gonabad Grand Mosque (early seventh century AH) Area: about 3200 square meters	  	
Blue Mosque Gonbad Kalat Naderi (Seljuk and Afshari period) Area: about 2400 square meters	  	
Khalilabad Grand Mosque (Qajar 1308 AH) Area: 1200 square meters	  	
Sangan Khaf Mosque (Khwarezmshahian period) Area: 600 square meters	  	

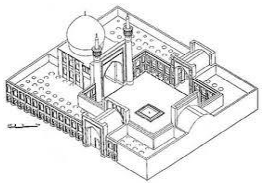
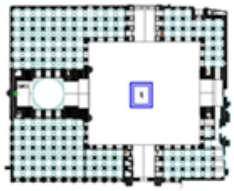
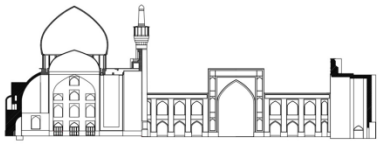
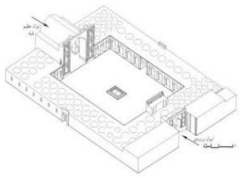
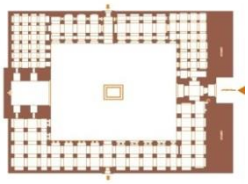
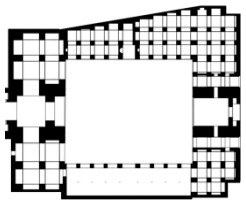
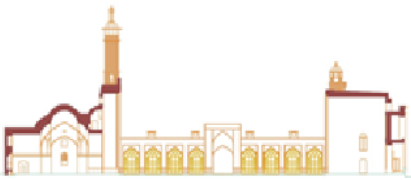
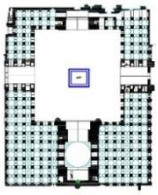
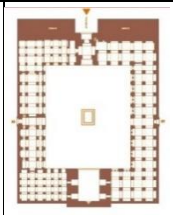
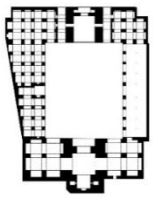
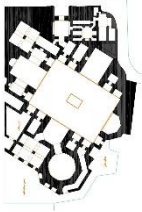
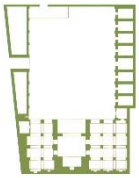
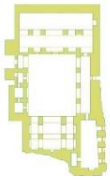
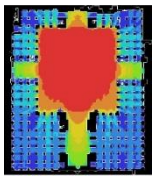
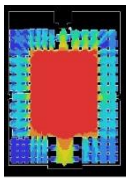
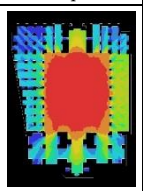
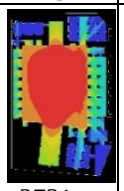
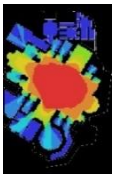
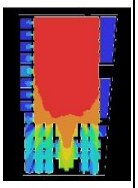
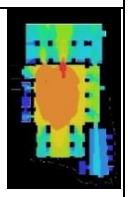
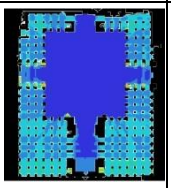
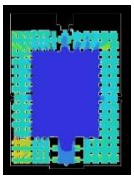
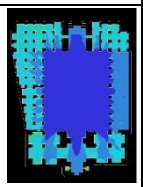
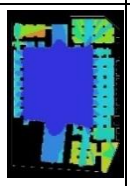
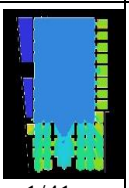
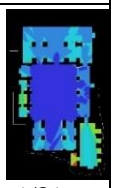
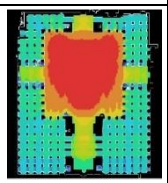
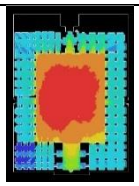
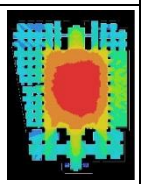
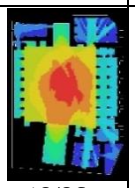
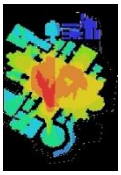
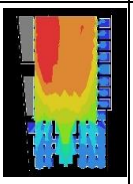
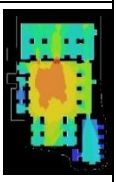
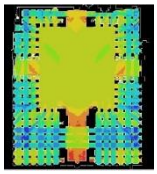
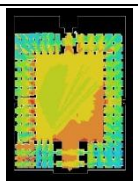
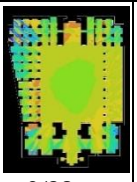
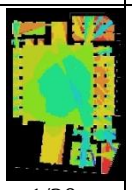
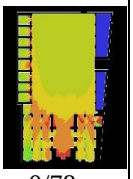
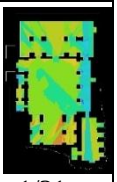
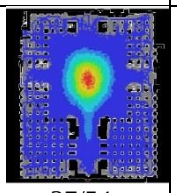
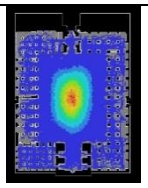
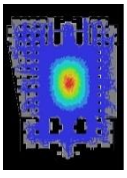
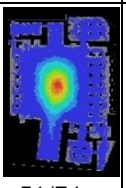
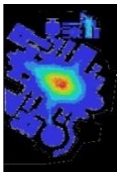
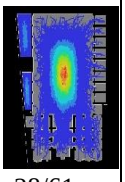
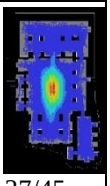
Title	Form	Geometry
Goharshad Mosque (Teymouri -821 AH) Area: about 9400 square meters	  	
Neishabour Mosque (Teymouri -899 AH) Area: about 7000 square meters	  	
Sabzevar Mosque (Sarbadaran period of reconstruction in 1299 AH) Area: about 4000 square meters	  	

Table 3. Syntactic reading of sample traditional mosques (source: authors)

mosques / Indicators	 Goharshad Mosque	 Neishabour Grand Mosque	 Sabzevar Grand Mosque	 Gonabad Grand Mosque	 Blue Dome Mosque	 Khalifabad Grand Mosque	 Sangan Mosque
Visual connectivity	 3371	 3408	 4785	 3731	 1922	 6451	 4178
depth	 1/82	 1/69	 1/64	 1/71	 2/38	 1/41	 1/81
Integration	 15/21	 18/10	 19/96	 18/86	 9/28	 31/48	 15/30
Visual entropy	 1/03	 0/96	 0/98	 1/20	 1/74	 0/78	 1/21
Visual visibility	 37/54	 45/99	 34/05	 51/74	 63/97	 28/61	 37/45

According to the graphs provided in the above tables, it is possible to compare the quantitative results obtained from the syntactic reading of the sample traditional mosques based on diagrams (4-9), revealing the following results:

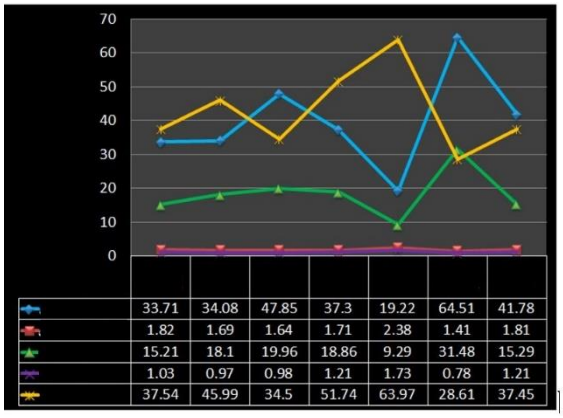


Fig.3. Graphic analysis based on syntactic reading indicators in sample traditional mosques (source: authors)

The sample traditional mosques have almost identical and close scores in two items of visual entropy and depth. There are relatively small differences in the Gonbad Kabud Mosque in Kalat County, which is due to the axial asymmetry of the mosque and its excessive entropy. However, in the three items of visual visibility, visual connectivity, and integration, the quantitative values resulting from syntactic reading have undergone considerable changes as follows:

- The high level of visual connectivity – above 30 – in all sample traditional mosques, except for the Gonbad Kabud Mosque, indicates the space connectivity and transparency in these mosques. The presence of the central courtyard and its direct connection with the main spaces of the mosques has a very significant role in the high score of this indicator.
- The high scores of depth – above 1.5 – in all sample traditional mosques, except for the Khalilabad Mosque (about 1.4), indicates a high degree of space privacy. This is due to the multiplicity and diversity of spaces (the entrance complex, courtyard, porches, Shabistan, dome, and altar) and their arrangement, leading to the greatest distance of the main worship places from the outside environment.
- The high scores of the integration – above 15 – in all sample traditional mosques, except for the Gonbad Kabud Mosque, indicate the combination of closed and open spaces, which can be attributed to the location of all mosque spaces around the courtyard, leading to more interactions in the central courtyard of the mosques.
- Lower levels of space chaos – 1.2 and less – in all sample traditional mosques, except for the Gonbad Kabud Mosque (some spaces do not have a regular geometry), indicates the use of the regular geometry in the architecture of traditional mosques, reflecting the greater privacy and depth of the spaces of these mosques, as mentioned earlier.
- High scores of the visual visibility – 30 and more – in all sample traditional mosques, except the Khalilabad Mosque (which can be due to the lack of east and west Shabistans and axial asymmetry of the mosque), indicates readability, simplicity of design, and movement circulation in these mosques in interaction with the open space. In the meantime, the arrangement and placement of spaces around the central courtyard play a significant role.

5. Conclusion

The construction of the mosque has a high position among the architectural works of Iran and deciphering its architecture can be a big step towards understanding Iranian architecture. Therefore, in this study, in order to recognize and study the spatial arrangement and its features in traditional mosques and to understand the relationship between structural and formal values resulting from spatial arrangement and Iranian-Islamic values and concepts in the architecture of traditional mosques in Khorasan Razavi, mosques The sample has been analyzed in terms of visual connectivity, depth, integration, visual entroy and visual visibility of spaces using the space layout method and its specialized software (ucl depth map). Which can be expressed based on the obtained graphs;

- In the architecture of traditional mosques, the courtyard has considerable transparency and connects different spaces to create

spatial unity and cohesion. According to the indicators of visual connectivity and integration in the space syntax analysis, the mosque courtyard has allocated the highest scores to itself.

- On the other hand, the geometric arrangement of traditional mosques results in legible architectural design and easy circulation while also maintaining the coherence and unity of the existing elements. Hence, lower values of visual entropy indicators and higher transparency on the space syntax analysis can confirm attention to these issues in the architecture of traditional mosques.
- Traditional mosques have various spaces, among which the altar is the main place of worship based on the space syntax, placed in the most secluded and quiet part to prepare the ground for the presence of the believers before God. According to the indicator of depth in space syntax, the highest depth concerning the entrance in the sample mosques was related to the altar, indicating the observance of space hierarchy (entrance, courtyard, porch, Shabistan, dome, and altar) and attention to the journey from the outer to the inner world in these mosques. As the analysis of the maps shows, going through the entrance and continuing toward the entrance porch provide a better viewpoint of the courtyard and other spaces of the mosque. This is due to the slow movement of the worshipers along the porch, separating them from the external material space through the main worship spaces that provide the ground for peace of mind and presence in the divine court.
- The analysis of maps also shows that according to Islamic wisdom, the altar of the mosque should have the highest degree of depth and the lowest permeability to establish the necessary solitude for worship. It should also be visually visible from most spaces of the mosque to enable the worshipers to see and recognize their Imam. As the graphic presentation of the plans of visually visible step depth reveal, this dual function is well understood and applied because the spaces of the courtyard, porches, Shabistans, which are directly related to the altar, have a lower degree of depth compared to the altar. This has led to a hierarchy in the building configuration, increasing the visual visibility of the altar through proportional dimensions of the porch and Shabistan.

Finally, according to the above-mentioned diagrams and contents, the relationship between the space syntax software indicators and the indicators of the manifestation of the principles of Iranian-Islamic wisdom in the architecture of Iranian mosques can be underlined in the chart below.

Based on the results of the graphs and diagrams, the studied indicators in traditional mosques had acceptable scores, indicating a significant and direct relationship between the values and concepts derived from Iranian-Islamic wisdom and the structural and physical values resulting from the space syntax in traditional Iranian mosques, which can be revealed using the method of space syntax.

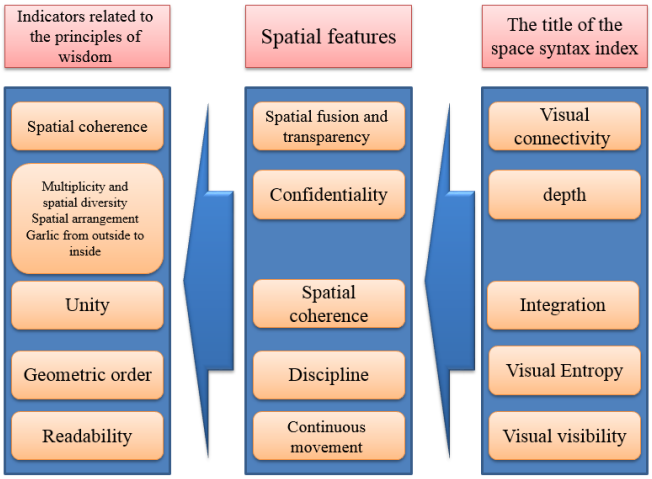


Figure 4: Relationship between space syntax and principles of Iranian-Islamic wisdom (Source: Authors)

Finally, according to the issues raised, the results of this study can be compared with the results related to the direct impact and decisive role of Islamic wisdom in the position of each space of mosques and determine the relationship of each space with other spaces as well as the mosque as a whole. The study of Mohammad Reza Bemanian and his colleagues (2016) and the position of the central courtyard in creating communication and spatial cohesion in the architecture of mosques, which is the result of the research of Mehdi Nejad and his colleagues (2016) and using the space syntax software (ucl depth map) Mature, similar and aligned.

Achieving successful and comprehensive models regarding the layout of the space that governs most mosques, can be suggested as one of the important issues to researchers who continue this way.

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