Role of the Architectural Application of Nature in Improving the Quality of Semantic Depth in Iranian Urban Housing

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Abstract

The purpose of this study is to investigate the effects of the architectural application of nature's (AAN) components in improving the quality of semantic depth in Iranian urban housing to determine the most effective architectural indicators in this context. This research uses a mixed methodology in terms of the data's nature, and the research method is descriptive-analytical (causal and comparative). The components and indicators related to the AAN have been collected through the study of theoretical foundations and literature review. To determine the relationship between these components and the semantic depth variable in housing design, the method of logical reasoning has been employed. Data were collected through a questionnaire with the participation of 96 occupants of Phase 1 of Ekbatan residential town, to determine the perceived quality of research variables. The results of regression analysis on quantitative data confirm the research hypothesis regarding the key role of maintaining the principle of spatial hierarchy in increasing the possibility of understanding the semantic layers in housing that most of them exist due to the presence of various manifestations of nature.

Keywords: architectural application of nature, semantic depth, spatial hierarchy, qualitative aspects of nature, Iranian urban housing.

Introduction

Nature has always been the context of human activities, and the construction of any kind of buildings that aims to meet human needs and expectations always requires touching nature and contemplating the threefold relationship between man, nature, and architecture. This relationship depends on the position of nature and its related components in the worldview, culture, and lifestyle of society. There is also an obvious interaction between the architecture form and content with nature. Concerning the development of human settlements, the two approaches of overcoming nature or interacting with it are more theoretically discussed. The first approach whose intellectual roots date back to the late renaissance considers nature as a mechanism whose order is mechanical (Nasr, 1996). According to this view, architecture operates using a human-centered approach

to overcoming nature, regardless of the limitations and potentials of the context and relying on technology capabilities. The basis of the second approach is taking advantage of the potentials of nature to provide the proper conditions for human comfort (Noghrekar, 2013). In this regard, Iranian architects have succeeded in creating an environment conducive to human habitation in harsh climates by making proper use of the capabilities of the earth and elements such as water, wind, plants, knowledge of the principles of shading, and understanding the properties of natural elements and materials.

The difference between a house and a shelter is providing the necessities to meet the psychological and spiritual needs of man along with his material needs. Therefore, housing is not a purely functional subject and the presence of semantic layers in its spaces is effective in meeting human high-levels needs. Nature has always been respected from the perspective of the monotheistic worldview and Islamic culture that prevails in Iranian society, and it is a sacred thing that has been considered as a sign of the presence of God. Therefore, from the perspective of Iranian-Islamic culture, the application of natural elements or their dominated rules and qualities in architectural design can be an important factor in inducing implicit and explicit concepts and values through creating semantic layers in housing design and this process ultimately leads to improved quality of semantic depth in housing design. In this regard, nature appears in the architecture of traditional Iranian houses, sometimes as objective forms and sometimes as qualities derived from the conceptual, functional, and formal features of natural elements. But in new types of urban housing, especially apartment complexes, there are many restrictions on direct contact with nature in the interior of the residential units. This shows the importance of landscape design in open spaces of these complexes and the application of subjective qualities derived from nature and its objective aspects. In other words, it can be acknowledged that the architectural application of nature (AAN) creates the main semantic layers of the house, which in their absence, a house has no different from a shelter. Therefore, this study was conducted to investigate the effects of the AAN's components on improving the quality of semantic depth in Iranian urban housing to present practical strategies in new types of urban housing. In this regard, the following questions are raised:

What components of AAN affect the quality of semantic depth in Iranian urban housing?

What is the mechanism of the effects of these components in improving the quality of semantic depth?

Theoretical Foundations and Literature Review

Nature is the source of responding to human physical and spiritual needs and inspires him in his creations and initiatives. The relationship between architecture and nature, generally, can be investigated in three periods: pre-modern, modern, and postmodern. The general concept of nature in the pre-modern era was known as the origin and essence of things. In this context, the cosmic character of nature has taken precedence over its terrestrial character (Falahat & Shahidi, 2010). After the Industrial Revolution and the advancement of technology and the prevalence of humanist thought, especially in Western societies, the concept of nature was considered equivalent to the whole material world, which includes all beings and resources needed for industrial development. In this view, nature has been dominated by man to meet his material needs and Functionalism has been the dominant aspect of architecture. The purpose of architecture was limited to meeting the material and in some cases the psychological human needs. In the postmodern era, ecosystems and the type of relationship between living things and the environment were considered by architects, the result of which was the emergence of concepts such as sustainability, climatic architecture, eco-architecture, biophilic design, and so on. During this period, technology sided with nature to resolve the crisis of modernist thoughts. Among these concepts, the biophilic design which is based on the biophilia theory was developed and adapted within the architectural domain, at the beginning of the 21st century (Zhong, Schroder, & Bekkering, In press). Based on the biophilia hypothesis by wilson (1984;1993) Biophilia is 'the innately emotional affiliation of human beings

to other living organisms.' After humans migrated to the built environment, we inherited a need for nature, which evolved into 'thinking about nature'. Kellert (1993;2008) defines biophilia values as 'utilitarian, naturalistic, scientific, aesthetic, symbolic, humanistic, moralistic, dominionistic, and negativistic'. He also defines biophilic design as 'a deliberate attempt to satisfy the need of contact with natural systems and processes in the contemporary built environment, and to improve people's physical and mental health, productivity and wellbeing'.

The development of any kind of human settlement requires concentrating on the threefold relationship between man, nature, and architecture. Gruter (1987) categorizes three practical approaches to these relationships. In his view, in the schools of thought of nature opposition, man and nature have no relation with the supernatural world, and the goal of man during his presence in this world is only the material exploitation of nature to meet the needs of his material dimension. The objective manifestation of such an approach in architecture is mainly related to the architectural developments after the Industrial Revolution and the period of modern architecture. Nature disparity schools of thought have sought to humanize nature. From the viewpoint of these schools, man and nature have two completely different essences. Therefore, the main strategy in architecture has been to separate man from nature. In naturalistic schools of thought, the main approach is to naturalize man. From the viewpoint of these schools, any transcendental realm is within this nature, and the only way to reach it is to conform to nature. The view of naturalism has existed in Eastern schools for a long time, but a kind of formal naturalism can also be sought in the form of organic architecture in the West. The main difference between Eastern and Western schools of thought in this area is the general view of God. In the Eastern schools, nature is a sacred thing and their status has risen to the level of divinity and in some cases, they turn to the worship of nature. But in Western naturalistic schools of thought, the dignity of divinity is diminished and the gods are equivalent to nature. Noghrekar (2013) confirms this classification and introduces nature making schools of thought on the relationship between man, nature, and architecture. In these schools of thought, which are in line with the Iranian-Islamic culture, nature is a part of man and acquires its identity from him, but both have a divine essence.

Numerous studies have examined the role of nature and its related elements in Iranian architecture. Afshari Basir et al (2017) have investigated the presence of water, plant, and light elements in traditional houses in Yazd and concluded that these buildings are designed concerning nature. Adeli (2013), outlines two fundamental principles of human and nature's intrinsic unity and human perfectionism about the human-nature relationship within the framework of Islamic ontology. Daneshjoo et al (2015) have concluded that the use of natural-based materials and natural forms has had the greatest impact on how to tend to nature in contemporary Iranian architecture. Keramati (2007) believes that nowadays the component of nature in architecture is so poor so that the triple relation of man, nature, and architecture is unrecognizable.

Daeipour (2014) believes that nature's presence plays a positive role in gaining a sense of place in traditional Iranian houses which is due to the ability to activate human sensory, activity, and semantic perceptions. Mehdi Nejad et al. (2012) believe that it is not planned for the beauty of nature and the reason for this beauty is the correct response to the performance that converts natural beauty into an intrinsic and unconscious feature and they propose to pay attention to the geometry in the natural elements to enjoy this kind of beauty. Khakzand and Ahmadi (2007) believe that the presence of nature's spirit in architecture leads to its promotion. Mamani et al. (2018), believe that the principles of Iranian architecture are derived from a rational logic and these principles are found in nature as a divine creation so any artifact that is compatible with these principles is committed to nature and God and respects human beings and human reason.

The position of nature from the perspective of Iranian Islamic culture and the review of literature is evidence that the presence of various manifestations of nature is an important factor in improving the quality of semantic depth in housing design. But architectural subtleties play an important role

in inducing these meanings, therefore, investigation of the presence of nature in the architecture of traditional Iranian houses can be effective in finding the components of the AAN and related indicators to improve the quality of semantic depth in new species of urban housing.

The presence of nature in Iranian architecture, especially in the residential environment, has always been either in the form of objective elements or qualities, laws, or institutional mechanisms of nature. These items, which in this research were called "architectural application of nature's components", can be classified based on their representative indicators in architecture in the form of three formal, conceptual, and functional factors.

The first component that its indicators mainly appear in the architectural forms is unity. The unity of nature idea is a strong metatheoretical theme in several scientific and environmental fields and the reason of adaptation this idea to these fields is to give rise to an inspiring, optimistic, socially-responsive, and environmentally-friendly worldview (Marshall, 1999). Leibniz believes that monads, as inseparable components in nature, have unity. According to this view, the universe is an organized system in which Infinite types of monads have been combined to create a harmonious whole (Copleston, 1993). Therefore, the quality of unity is present in almost all natural systems and elements, also based on the position of nature in Iranian Islamic culture, its use in architecture refers to the oneness of God.

Transparency is another semantic component related to the AAN which its architectural indicators are reflected in the form, space structure, and details. Transparency and the absence of clear boundaries are obvious features in most natural landscapes. Also, the presence of water and light in the traditional houses of Iran is one of the primary priorities, which is a manifestation of transparency and purity. There are basically two ways of transparency in architecture; Literal transparency indicates how clear the visual boundary between the interior and the exterior space is, and phenomenal transparency which defines a type of architectural organization and is seen spatially in the form of ambiguity and uncertainty in spatial boundaries. The most prominent feature of this organization is that it is possible to have a simultaneous perception of different spatial locations, just as the metaphorical meaning of the term (easy to perceive or detect) indicates (Rowe & Slutzky, 1963).

Honesty is considered one of the greatest moral virtues and an attribute of the essence of God. Since nature is one of the manifestations of God in Iranian culture, therefore, it is free from all lies. The indicators of this quality in architecture are mainly related to the materials, static, and the functionality of the building's elements. A true architecture can be defined when the intention and spaces truly serve the function they simply should. The main point is to allow the building to speak of its nature and intention through the materials used, spaces designed or the structure built (Harries, 1984).

Hierarchy is one of the principles governing natural collections, components, and phenomena. The existence of beings is a function of a defined hierarchy whose undeniable role in defining the components of a collection and identifying them is important. Hierarchical order defines the position and value of each component of a whole as well as the value of a whole individually and relative to other collections (Naghizadeh, 2012). Types of hierarchies in the man-made environment can be divided into two categories: legal and real hierarchies. The dimensions of the hierarchy can also be divided into neighborhood, functional, transit, and spatial hierarchy, which the last one is so important in Iranian traditional houses and is related to the principles of privacy and introversion.

In addition to these four components, due to the position of nature in Iranian Islamic culture, the presence of objective forms of nature can also enhance the semantic depth in housing design. Nature's objective presence has always been observed in Iranian architecture in three appearances of primary, secondary, and abstract. Primary nature's appearance refers to the concept of nature

Semantic Components of the Architectural Application of Nature
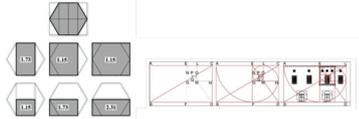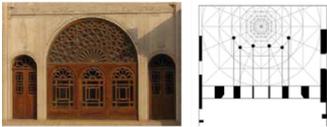
that has not been transformed by man (Spirn, 2000, p. 41). In this regard, the possibility of visual relation with the sky, benefiting from sunshine, wind, planting, and the presence of water in the central courtyard can be mentioned as indicators of the primary appearance of nature in Iranian architecture.
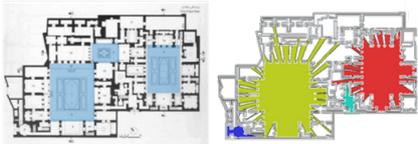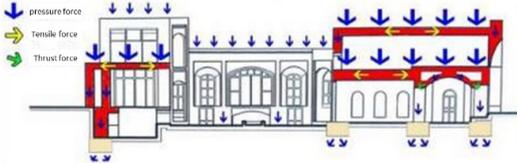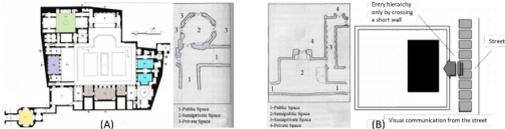
The abstract appearance of nature is mainly manifested in the form of patterns and abstract forms of natural elements in the decorations or form of the building components. Although the relationship with the primary and abstract appearance of nature in architecture is effective in providing suitable climatic conditions and increasing the quality of sensory beauty. but due to the cultural context and the symbolic role of natural elements, the application of these components can also enhance the semantic depth in architecture.

AAN's components are not the only factors that promote semantic depth in residential environments, and this is highly dependent on the mental background of the target community, which originates from cultural and social contexts. But in this study, considering the position of nature in Iranian culture and the symbolic role of natural elements, the objective forms of the presence of nature in architecture including primary and abstract appearance along with qualities such as unity, transparency, honesty, and hierarchy were considered as the semantic components of the AAN. Each of these components, depending on how they are used, can be effective in improving the quality of semantic depth in architecture from the perspective of the worldview and cultural context of the target community. Indicators related to these components which have been collected through literature review are presented in **Table 1**.

Table 1

Indicators related to the semantic components of the AAN

Components	Indicators	Descriptions and Figures	Source
Unity	Modular design	Fig. 1. Modular system in an Iranian traditional house	(Pirnia M. , 1992)
	Holistic approach (Harmony with urban fabric in terms of orientation, building materials, Full and empty spaces, and so on)	Fig. 2. Historical Context of Yazd	(Vincent, 2014)
	Using logical, numerical and geometric proportions	Fig. 3. Application of the enclosed rectangle in a regular hexagon in the proportions of traditional Iranian houses	(Hejazi, 2009)
	Similar proportions in decorations and geometric structure	Fig. 4. The yard enclosure is a constructor of dividing lines-Tabatabai's house in Kashan	(Ansari & Ebrahimi, 2010)

Components	Indicators	Descriptions and Figures	Source
Transparency	Mass reduction due to the dominance of space over mass (Embedding the central courtyard and so on)	Fig. 5. The transparency created by the installation of the central courtyard and the permeability of the walls- Golshan House in Yazd	(Noghrekar, 2008) (Mazaheri, Dezhdar, & Mousavi, 2018) (Momeni, 2018)
	Visual continuity due to the sequence of spaces and the permeability of the walls		
	Use of reflection phenomena and translucent openings	Fig. 6. Tabatabai's house in Kashan	
Honesty	Compatibility of the facade and its backspaces		Authors
	Using functional components in the building	Fig. 7. Method of transfer of forces in the structure of an Iranian traditional house	(Pirnia, 1997)
	Demonstrating the transfer of forces in the structure of building properly and the use of self-static forms and materials		(Bemanian & Amini, 2011)
	Using primary color and texture of natural materials		Authors
Hierarchy	Functional and visual separation of different areas outside and inside the house	Fig. 8. Real hierarchy (A) and Customary Hierarchy (B)	(Shia, 2007) (Tabibian, Charbgoo, & Abdolahimehr, 2012)
	Customary separation of areas on the way to the house		
	Avoiding indoor visibility from outside	Fig. 9. Avoiding indoor visibility from outside in an Iranian traditional house	

Components	Indicators	Descriptions and Figures	Source
Primary appearance	communicating with the sky, surrounding landscapes and natural elements	Fig. 10. Appropriate proportions for visual communication with the sky- Placing Pool, trees and wind catcher in the central courtyard	Authors
	Placing pool, waterfront, trees, and plants in the open spaces		
	Providing airflow and sunlight in the living space		
Abstraction appearance	Using abstract forms of natural elements in the motifs and decorations	Fig. 11. Abstract patterns of nature in borojerdiha's House in Kashan	(Makinejad, 2008)

The investigation of theoretical foundations and review of the literature shows that the presence of objective examples of nature besides the adaptation of nature's qualities and laws in architecture has been the main factor in promoting semantic depth in the traditional Iranian houses. The presence of the primary and abstract appearance of nature, in addition to the functions related to the regulation of environmental conditions and aesthetics, also have a semantic burden due to the symbolic role of the natural elements. The qualities of honesty, transparency, unity, and hierarchy, regardless of their effects on functionalism, formal aesthetics, and maintaining privacy in the Iranian houses, also include spiritual concepts. The important point is to create the necessary context to understand these semantic layers. Therefore, it is hypothesized that observing the principle of spatial hierarchy, considering its effects on increasing the privacy of housing, provides the necessary basis for mental preparation and the possibility of personal privacy and thinking about the semantic layers of housing which large amounts of them are created by improving the quality of applying the primary appearance of nature. Therefore, it is hypothesized that the application of the principle of the spatial hierarchy will have the greatest role in improving the quality of semantic depth in housing.

Research methodology

This research uses a mixed methodology in terms of the data's nature, and the research method is descriptive-analytical (causal and comparative). Semantic components of the AAN and their related indicators were collected through reviewing the literature using the qualitative content analysis method. The perceived qualities of these components are considered as independent variables of research which the perceived quality of semantic depth in housing is a dependent variable on them. To investigate the relationship between these variables a survey was conducted in Phase 1 of Ekbatan residential town in Tehran. In this regard, The results of the authors' observations on recognizing the indicators related to the research variables were provided to the residents in the form of photos or architectural drawings along with a questionnaire.The questionnaire consists of 29 questions. Six of which relate to the socio-demographic variables including age, sex, education, marital status, residence history, and ownership status. Nineteen questions relate to determining the perceived qualities of the indicators of dependent variables (the components of AAN), and four questions relate to determining the perceived

(0/75,1/00,1/00)	(0/50,0/75,1/00)	(0/25,0/50,0/75)	(0,0/25,0/50)	(0,0,0/25)
Very High	High	Moderate	Low	Very Low

Table 2

The equivalent of triangular fuzzy numbers to the 5-point Likert spectrum. Source: (Habibi, Izadyar, & Sarafrazi, 2014)

quality of semantic depth in housing. The scale of the questionnaire is based on the 5-point Likert scale that to present the regression equation related to the effects of independent variables on semantic depth, the data have been fuzzy based on the following table and formula.

To aggregate the occupants' views, the average of the fuzzy numbers is obtained from the following equation.

$$F_{.AVE} = (\frac{\sum l}{n} + \frac{\sum m}{n} + \frac{\sum u}{n}) = (L, M, U)$$

(l, m, u) = Fuzzy number

n = Number of Fuzzy numbers

After calculating the average of fuzzy numbers, the following equation is used to de-fuzzy.

$$x = \frac{L + M + U}{3}$$

The process of collecting data was in the spring of 2021 and the statistical sample includes 96 occupants of phase 1 of Ekbatan residential town. To determine the importance of the effectiveness of each of the semantic components of AAN in improving the quality of semantic depth, regression analysis was performed on the obtained results of the questionnaire.

Field study

A field study has been conducted in the southern part of phase one of Ekbatan residential town located in the west of Tehran (District 5). The initial design of this town is related to the period when the functionalism of modern architecture dominated the housing construction projects in Iran, but landscape design, relationship with natural elements in the open spaces, and the presence of indicators related to this research's variables in the design of this complex have been the reasons of its selection for the basis of the field study.

The initial purpose of building Ekbatan was to settle the surplus population of Tehran. The construction of Ekbatan was started in 1975 and at this time in 2021, this town consists of three phases including 33 blocks and 15675 residential units.

The results of recognizing the indicators related to the research variables in the southern part of the first phase of Ekbatan residential town are shown in **Table 3**.
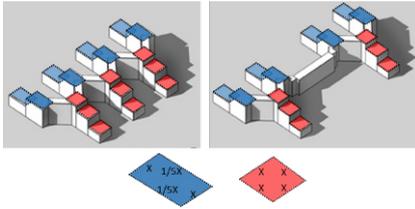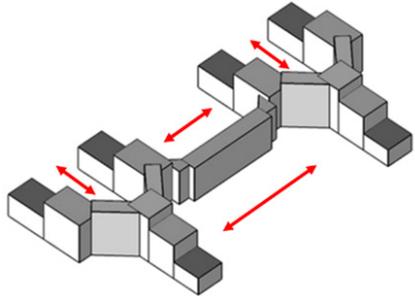

Fig. 12

Location of the Ekbatan residential town. Source: (Yasemi, 2016)

Table 3

Recognizing the Semantic components of the AAN in the Ekbatan residential town. Source: Authors

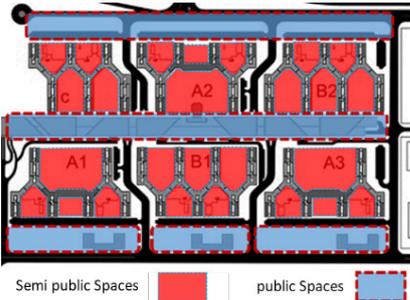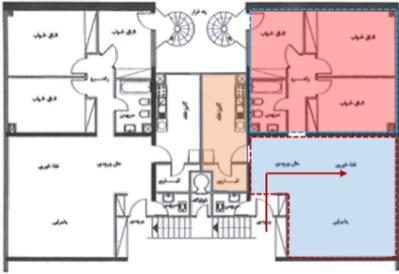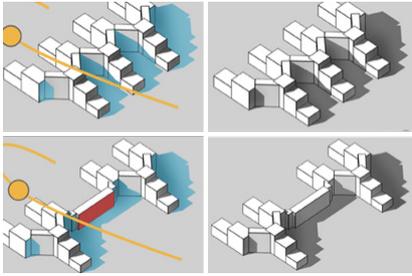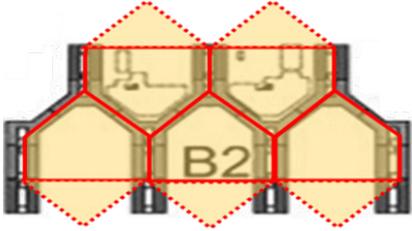| Components	Indicators	Descriptions	Figures
Unity	Using module	Due to the nature of mass housing, the dimensions of volumetric composition components have been designated modularly.	Fig. 13. Volumetric unity in Ekbatan residential town. Source: (Yasemi, 2016)
	Holistic approach (Harmony WITH urban fabric in terms of orientation, building materials, Full and empty spaces, and so on)	According to the modular design of the blocks, similar details in architectural forms, and using single material in the facades, the project is being seen as a coherent complex.	
	Using logical, numerical and geometric proportions	The components of the volumetric composition have geometrically fixed proportions.	Fig. 14. Fixed proportions in volumetric composition components. Source: Authors
	Similar proportions in decorations and geometric structure	No items were observed.	
Transparency	Mass reduction due to the dominance of space over mass (Embedding the central courtyard and so on)	The design of the volumetric module has been based on reducing the mass and increasing the negative spaces.	Fig. 15. Reducing mass and increasing negative spaces in volumetric composition. Source: Authors
	Visual continuity due to the sequence of spaces and the permeability of the walls	The combination of positive and negative spaces and the diverse geometry of the plan reduce the rigidity of the form to some extent, however, the form is not visually permeable.	
	Use of reflection phenomena and translucent openings	The horizontal stretched windows create less transparency compared with full-length windows. Regarding the use of the reflection phenomenon due to the installation of ponds and fountains, etc., no significant case was observed.	

Components	Indicators	Descriptions	Figures
Honesty	Compatibility of the facade and its back-spaces	The design of the facades does not represent the residential space and has mainly had a formal approach.	Fig. 16. View from different sides of the blocks. Source: Authors
	Using functional components in the building	The design of the volumetric composition and its related elements and details is quite functional.	
	Demonstrating the transfer of forces in the structure of building properly and the use of self-static forms and materials	The forms are cubic and visually stable.	
	Using primary color and texture of natural materials	The facade of the project is made from concrete with the primary color of cement.	
Hierarchy	Functional and visual separation of different areas outside and inside the house	At the scale of phase 1, the hierarchy of public, semi-public, semi-private (block lobby and floor lobby), and private (residential unit) spaces were observed. Also, the separation of public, private, and service spaces at the level of residential units is evident.	Semi public Spaces ▮ public Spaces ⬚ Fig. 17. Separation of public and semi-public spaces at the town level. Source: Authors
	Customary separation of areas on the way to the house	The negative spaces in the volumetric composition act as a semi-public space in the pedestrian access hierarchy of blocks.	
	Avoiding indoor visibility from outside	The entrance of most residential units has a functional and visual filter space.	Fig. 18. Separation of different areas at the level of residential units. Source: Authors

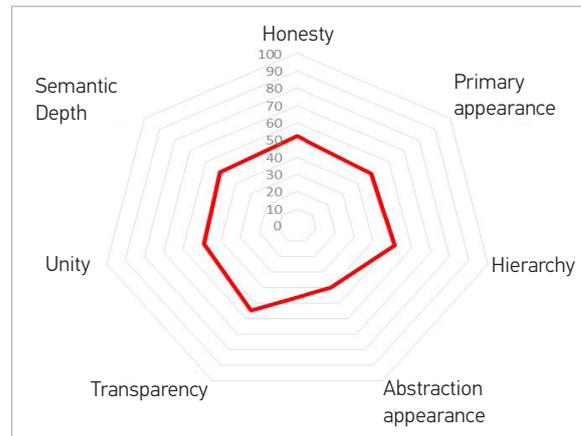| Components	Indicators	Descriptions	Figures
Primary appearance	Communicates with the sky, surrounding landscapes and natural elements	On the upper floors, the northern units have a good view of the mountains of Tehran. The central green space in each neighborhood unit has also provided the possibility of proper visual communication with the primary appearance of nature, from inside the residential unit.	Fig. 19. Communication with the primary appearance of nature from inside the units and in the open spaces of the complex. Source: Authors
	Placing pool, waterfront, trees, and plants in the open spaces	The form of the blocks is designed in such a way as to create open spaces that can act as semi-public shared spaces. The greenery of these spaces has increased over time.	Fig. 20. Greenery of negative spaces in volumetric composition. Source: Authors
	Providing airflow and sunlight in the living space	The blocks are stretched from west to east. The volumetric composition is such that the shading of the blocks on each other is reduced and most residential units can benefit from the desired airflow.	Fig. 21. Formation of volumetric composition with the approach of maximum use of airflow and sunlight. Source: Authors
Abstraction appearance	Using abstract forms of natural elements in the motifs and decorations	No case was observed in the architecture of the whole project. This indicator is mostly seen in connection with the decorations and interior furniture of the units, which did not exist in the original design.	Fig. 22. Association of natural patterns in the geometry of the plan. Source: Authors
	Using abstract forms of natural elements in the forms of building components	The plan of the blocks in phase one is reminiscent of the repetition of hexagonal patterns in nature.	

The results of recognition of the variables' indicators and other technical documents of the Ekbatan town were added to the questionnaire. In addition to the request for determining the perceived quality of the mentioned indicators, a request for determining the quality of semantic depth has also been submitted separately.

Results

Based on the study of theoretical foundations and review of literature, it was found that architectural application of the four components of unity, transparency, honesty, and hierarchy, along with the presence of primary and abstract appearance of nature improves the quality of semantic depth in housing design. In statistical analysis, the quality of semantic depth is considered as a dependent variable on the 6 mentioned variables (semantic components of the AAN). The descriptive results related to the percentage of perceived quality of independent and dependent variables are presented in **Figure 23**.

Fig. 23

Percentage of perceived quality of variables. Source: Authors

The results of the correlation test between the semantic depth variable and the semantic components of the AAN show significant relationships. There was also no collinearity between the independent variables.

These correlation coefficients confirm the establishment of the first condition for regression analysis. Regression analysis coefficients are presented in **Table 5**. These coefficients indicate that the components of the hierarchy and transparency have the greatest role in predicting changes of the semantic depth variable.

		Honesty	Primary appearance	Hierarchy	Abstraction appearance	Transparency	Unity
Semantic Depth	Pearson Correlation	.378**	.387**	.538**	.359**	. 407**	.388**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000
	N	96	96	96	96	96	96

Table 4

Pearson correlation coefficients between independent variables and semantic depth. Source: Authors

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	−0.168	.059		−2.840	.006		
Honesty	0.162	.074	.157	2.182	.032	.895	1.117
Primary appearance	0.210	.080	.187	2.621	.010	.908	1.101
Hierarchy	0.403	.072	.402	5.615	.000	.901	1.110
Abstraction appearance	0.124	.060	.147	2.058	.043	.906	1.104
Transparency	0.313	.077	.287	4.065	.000	.925	1.081
Unity	0.148	.057	.186	2.610	.011	.912	1.097

a. Dependent Variable: Semantic Depth

Table 5

Regression analysis coefficients. Source: Authors

Discussion and Conclusion

One of the main factors in making a difference in the concept of the house with shelter is the quality of semantic depth in housing design. Housing is not a purely functional subject, and in a meaningless home, it is not possible to respond to the higher residential needs of human beings, so the presence of semantic layers in residential environments is necessary to provide a platform for growth and excellence of human personality. Understanding the semantic layers of residential environments is deeply dependent on the cultural context of the target community and the individual's mental readiness to face the signs and symptoms that convey concepts. Due to the position of nature in the Iranian-Islamic culture, qualitative improvement of components of the AAN is one of the main factors of improving the quality of semantic depth in housing design. The important point is the quality of applying these components and providing a context in which the person can be able to mentally concentrate and understand the concepts of components of the AAN.

The results of the present study confirm that observing the principle of spatial hierarchy which separation of areas, installation of filter spaces, and control of visual communication between areas are its architectural indicators alongside applying the transparency component are key factors in improving the quality of semantic depth in Iranian urban housing design. This relationship can be interpreted from this perspective that observance of the principle of the spatial hierarchy provides the necessary basis for the mental preparation of residents to understand the semantic layers resulting from the presence of other semantic components of the architectural application of nature. Transparency is also the most important factor in creating a visual connection between residents and aspects of nature from the interior spaces. Therefore, it is another key component in improving the quality of semantic depth in housing architecture.

Based on the importance of each component of the AAN in improving the quality of semantic depth in housing design, the following strategies and tactics are proposed in the design of contemporary urban housing.

Table 6

Proposed strategies and tactics to enhance the semantic depth quality in housing design based on the importance of semantic components of the AAN (Source: authors)

Semantic components of the AAN	Strategies	Tactics
Hierarchy	Observing the spatial hierarchy concerning access from public spaces to private spaces	Designing neighborhood units and semi-public and semi-private spaces at the neighborhood level
	Observing the visual privacy of indoor spaces in apartment complexes	Functional and visual separation of the areas at the residential unit level Avoiding the placement of the openings of residential units in front of each other Blocking the direct sight of the entrance to other indoor spaces by using Hashti. Considering the proper depth for terraces
	Observing the visual privacy of the courtyards and interiors in single-family houses	Avoiding the access of strangers to the courtyard by applying height restrictions on the residential urban fabric and arranging for openings Providing visual privacy by planting Avoiding direct sight from the entrance to the yard Functional and visual separation at home level
Transparency	The dominance of space over mass	Creating porosity in architectural volumes
	Continuity of visual corridors	Visual communication between interior and exterior spaces by using appropriate openings
		Visual continuity in the separation of interior spaces

Semantic components of the AAN	Strategies	Tactics
Primary appearance	Avoiding blocking visual corridors to natural elements	Suitable designing of the residential urban fabric to maintain the visual communication of the house with the sky and other natural elements
	Planting trees and plants in the yard and making it possible to communicate with them	Using suitable openings to maintain the visual communication of the main spaces with the plants and trees in the courtyard of single-family houses
Honesty	Observing the principle of honesty in designing form and details	Avoiding the use of vain elements without a structural or functional role in the building Coordinating building facades, dimensions of openings, materials, etc. with interior spaces Avoiding unnecessary decoration
Unity	Creating harmony in the residential urban fabric in terms of form, the orientation of buildings, density and occupancy area	Developing appropriate regulations regarding compliance with occupancy and density
	Observing the geometrical proportions between different elements	Residential units separation and building design based on appropriate base modules
	Observing the geometrical proportions between different elements	Residential units separation and building design based on appropriate base modules
Abstraction appearance	The application of abstract appearance of nature	Designing patterns based on the abstraction of nature

References

Adeli, S. Nature and Architecture in Islamic Ontology A survey on traditional houses of central plateau of Iran with emphasis on four houses in Yazd, Naeen and Kashan. Scientific Journal of Motaleate-e Tatbighi-e Honar, 2013; 3(5), 103-117.

Afsharibasir, N., Nasiri, B., Mofidishemirani, S. The role of natural elements in Yazd vernacular houses. Journal of Urban Management, 2017; 16(46), 297-306.

Ansari, M., & Ebrahimi, A. The geometry of proportions in the architecture of Turkmens of the Qiyyunlu period, Kaboud Mosque (Turquoise Islamic World). Science and Technology Ketabmah, 2010; 35-45.

Bemanian, M., & Amini, M. A Study of Effective Indicators in the Formation of Balance in Muslims' Architecture (A Case Study: The Jameh Mosque of Isfahan). Journal of Studies on Iranian-Islamic City, 2011; 5, 17-27.

Copleston, F. A History of Philosophy, Vol. 1: Greece and Rome From the Pre-Socratics to Plotinus. Melbourne: Image; 1993.

Daeipour , Z. The relationship between the presence of nature and the increase in the sense of belonging in the Iranian traditional houses. Bagh-e Nazar, 2014; 11(30), 49-58.

Daneshjoo, K., Mirhosseini, S. M., & Mahdavinejad, M. An Introduction to the Naturalism in Examples of Contemporary Iranian Architecture. Hoviat Shahr, 2015; 9(23), 83-90.

Falahat, M., & Shahidi, S. Nature and Its Role in Architectural Design. Honar - ha - ye - Ziba-Memari-Va-Shahrsazi, 2010; 2(42), 37-46.

Grutter, J. K. Aesthetics in Architecture. Stuttgartr: W. Kohlhammer; 1987.

Habibi, A., Izadyar, S., & Sarafrazi, A. Fuzzy multi-criteria decision making. Rasht: Katibehgeel; 2014.

Harries, K. Space, Place, and Ethos: Reflection on the Ethical Function of Architecture. Artibus et Historiae, 1984; 5(9), 159-165. https://doi.org/10.2307/1483174

Hejazi, M. Sacred Geometry in Nature and Persian Architecture. History of Science, 2009; 6(2), 17-44.

Kellert, S.R. The biological basis for human values of nature. In: Kellert, S.R., Wilson, E.O. (Eds.), The Biophilia Hypothesis. Island Press; 1993.

Kellert, S. R. Dimensions, elements, and attributes of biophilic design. In Biophilic Design: the Theory, Science and Practice of Bringing Buildings to Life, (pp. 3-19). John Wiley & Sons; 2008.

Keramati, G.. Soft Space and Hard Space Companion in Iranian Architecture. PhD dissertation on Architecture; 2007.

Khakzand, M., & Ahmadi , A. Interaction of nature & architecture: A glimpse. Bagh-e Nazar, 2007; 4(8), 35-47.

Makinejad, M. Iranian Art History in the Islamic Era: Architectural Decorations. Tehran: SMT Publication; 2008.

Mamani, H., Yari, Y., & Haghir, S. Components of Iranian-Islamic Architecture and the Identity-Constructing Role of Embellishments. Journal of Art and Civilization of the Orient, 2018; 6(21), 37-46.

Marshall, Alan. The unity of nature: deconstructing a contemporary environmental metanarrative, Doctor of Philosophy thesis, , University of Wollongong; 1999.

Mazaheri, M., Dezhdar, O., & Mousavi, S. Analyzing the role of yards in spatial structure of Iranian houses using space syntax. Hoviat shahr, 2018; 12(2), 97-108.

Mehdinejad, J., Sabri, R., Damavandi, M., & Abaspour, J. Architectural Design on the Basis of Beauty and Function in Nature. Hoviatshahr, 2012; 6(10), 59-66.

Momeni, K. The Comparison between the Transparency Principle in the Form and Design of Safavid and Qajar Homes in Isfahan. ournal of Researches in Islamic Architecture, 2018; 6(1), 23-42.

Naghizadeh, M. Reflection on Understanding the Basics of Iranian Islamic Housing. Art Ketabmah,2012; 170, 38-54.

Nasr, S. H. Religion & the Order of Nature: The 1994 Cadbury Lectures at the University of Birmingham. Oxford: Oxford University Press; 1996.

Noghrekar, A. An Introduction to the Identity of Islamic Architecture in Architecture and Urban Development. Tehran: Ministry of Roads & Urban Development; 2008.

Noghrekar, A. Man's relationship with nature and architecture. Tehran: Scientific Center of Islamic Architecture, Iran University of Science and Technology; 2013.

Pirnia, M. Introduction to Islamic Architecture. (G. Memarian, Ed.) Tehran: IUST; 1992.

Pirnia, M. Stylistics of Iranian Architecture. (G. Memarian, Ed.) Tehran: Sorush Danesh; 1997.

Rowe, C., & Slutzky, R. Transparency: Literal and Phenomenal. Perspecta; 1963. https://doi.org/10.2307/1566901

Shia, E. With the city and region in Iran. Tehran: IUST; 2007.

Spirn, A. W. Language of Landscape (Later Printing edition ed.). New Haven: Yale University Press; 2000.

Tabibian, M., Charbgoo, N., & Abdolahimehr, E. (2012). The Principle of Hierarchy Reflection in Islamic Iranian Cities. Armanshahr Architecture & Urban Development, 2012; 4(7), 63-76.

Vincent, J. Biomimetics in Architectural Design. Intelligent Buildings International, 2014;12, 1-12.

Wilson, E.O. Biophilia: The Human Bond with Other Species. MA: Harvard University Press, Cambridge; 1984.

Wilson, E.O. Biophilia and the conservation ethic. In: Kellert, S.R., Wilson, Edward Osborne (Eds.), The Biophilia Hypothesis. Island Press; 1993.

Yasemi, M. Ekbatan residential town. Retrieved from Memarima: http://www.memarima.ir/, 2016.

Zhong, W., Schroder, T., & Bekkering, J. Biophilic design in architecture and its contributions to health, well-being, and sustainability: A critical review. Frontiers of Architectural Research, (In press).

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