



"Organized Complexity" in Iranian Traditional Architecture (Islamic Era)

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Abstract

Organized complexity -as a concept which brings into mind the notions of order and chaos simultaneously- is considered as one of the key characteristics of outstanding Islamic and western medieval architecture; what facilitates the observers' perception of such sophisticated designs and keeps them away from being bored. Not surprisingly, several architectural researches were conducted whose main focus were on the clarification and comparison of the afore-mentioned concept in the realm of nature and architecture. Concerning the way architects could reach the state of organized complexity in their designs however, a very limited of number of sporadic statements have been made. In this regard, the present paper examined traditional architecture of Iran to discover some of the methods employed by architects for organizing the complexity. According to the findings, resulted from pictorial investigations & content analysis of related literature, the visual complexity of studied buildings is mostly regulated through the application of repetitive, symmetrical and self-similar patterns; thoughtful color arrangement as well as adjusting the Observation distance and Time sequence of space perception.

Keywords: organized complexity; Iranian traditional architecture; Islamic era.

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1. Introduction

Following the radical criticism of modern oversimplified designs by Robert Venturi in the second half of 20th century, "complexity" turned to a hot topic in architectural discourse; in his famous book "complexity and contradiction in architecture", Venturi "argued for a "both/and" approach to architecture, one that was complex, contradictory and could not be reduced to an "either/or" one-liner": a complex whole. Later more scholars including Christopher Alexander [1] and Nikos Salingaros [2, 3, 4] addressed this notion. Based upon comparative analysis of biological organism and architectural entities, they suggested some of the common characteristics of complex yet organized buildings in western architecture which seems to be present in Iranian Islamic architecture, as well. In this regard, the present paper attempts to examine different methods of organizing complexity employed by Iranian architect during the Islamic period.

2. Research Methodology

Comparing complexity in architecture and nature analytically, this paper examined different methods of organizing visual and spatial arrangements in traditional architecture of Iran (Islamic period) based on pictorial investigations & content analysis of related literature.

3. Complexity in Nature and Architecture

Life, whether biological or artificial, results from the physical concentration of information [4] and the more information content in a system, the more complex it would be; not surprisingly, human body consists of more than 75 trillion cells ,each of them contains 10 bit of information [2]; a considerable size of data resulted from high level of stored information in memory and the complexity of mechanisms such as evolution and natural selection which take place through the body of organism to adapt to the changing condition of environment [2];since, enhancing organisms capability of adjusting to the surroundings will led to more complexity, in the same way as the addition of more layers to a computer aided design (cad) will increase its file size.

Similar inductions could also be made in the field of architecture. As we know, Human saves data internally (in memory) and externally by imprinting them on the environment through various methods such as painting, calligraphy, and creating objects increasing in size up to architectural and urban spaces [4]. In this regard, a building can be considered as an information storage system in and of itself; a structure whose level of complexity – according to the theory of systems - depends on several factors such as its novelty, orderliness, the number of its visible parts (details) and their distinctions [5] as well as the speed of their perception by the viewer [6].

Consequently, buildings designed in a way to fulfill several demands such as human physical and psychological needs or to respond to local climatic condition are more complex than ones designed in the absence of such consideration; what explains the inherent complexity in most traditional architecture including Iranian building in Islamic era.

4. Visual complexity and Perceptual threshold

The survival of living organisms depends upon quick reception of information from the environment, so that they can make appropriate reactions against dangers immediately.

According to the researchers conducted on brain function, low level of received information - will cause human visual tensions and mental suffers such as horror which make him disinterested in his surroundings. Exceeding human's perceptual threshold is also proved to be an undesirable situation which result in failure in the processing of the received data, hence confusion [7].

Regarding this, Nikos Salingaros convicts modernists for detaching people from their environment by offering them the lowest level of information through super simple and minimal design; those which seems to be a kind of punishment for society, more appropriate for designing prisons [2].

Based on the system theory -in which visual integrity of a complex form is conditioned on the existence of ordered structures in several scales- he also criticized some of postmodern buildings for lacking such interrelated ordered structures [3] and suggested designs with a careful balance of complexity and order; What – according to Smith [8] - is a key factor in recognizing something as beautiful.

It is notable that this claim is approved by some researches whose results suggest that there is a U form correlation between buildings visual complexity and their desirability among people. Which means that buildings are recognized as desirable when an average level of complexity exists, and the desirability of building will increase when the level of complexity precede or exceed this level [9].

5. Organized complexity in traditional architecture of Iran (Islamic period)

As mentioned earlier, buildings which fulfil a wide range of demands are usually considered as complex systems. That's why Iranian architecture are mostly introduced as sophisticated one. Such a complexity however- though seems to be excessive at first glance – is organized in a way to be recognized in a harmonic and uninterrupted manner. A goal reached through several techniques which are as follows:

1- Self-similar and modular patterns

Due to constraints resulted from the prohibition of realistic depictions during the Islamic period, Iranian artists focused their attempts on developing sophisticated abstract patterns through repetition, division and replication of basic geometric shapes including circle, square, and triangle.

In this way, they created complex yet highly organized forms which consists of self-similar and hierarchically related structures at different scales (Fig1); what –according to Christopher alexander [1] - is an influential factor in maintaining the wholeness and integrity of not only organisms but also man-made structures such as architecture.

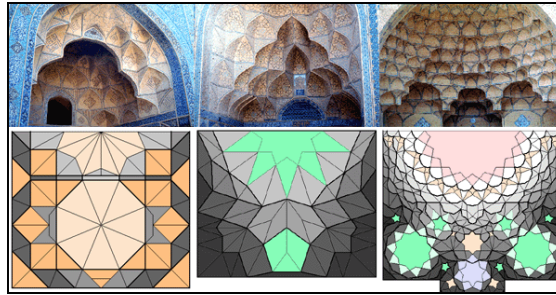


Figure 1: Self-similar patterns in Iranian architectural ornaments

2- Symmetry and Repetition

Repetition in a visual composition makes our brain needless to process the patterns over and over again. As following the recognition of basic units and their arrangement system, it needs little information to predict the remained ones and to form its scheme. Conversely, in a composition with random patterns, brain should process each unit separately through a time and effort consuming operation [3]. Considering this, Iranian architect (in Islamic era) used symmetrical and repetitive patterns in their designs in order to facilitate their perception by observers (Fig 2&3). This technique was also helpful in simplifying the building construction process; as following the construction of one half, the other one is repeated exactly by the workers.



Figure 2: Jame mosque ornaments, Isfahan, Iran

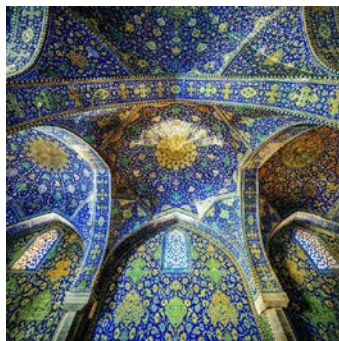


Figure 3: Interior space of Imam Mosque, Isfahan, Iran

3- Common layouts

Generally, Complex systems could be classified into organized and disorganized ones. What distinguishes between them however, is the type of interactions take place among their part; as disorganizes complex systems have numerous elements with random interactions while organized ones include non-random and correlated interplays [10].

Based upon this theory, Nikos Salingaros and Christopher Alexander claimed that the existence of common ordered structures (patterns) at different scales of design will enforce its visual integrity and facilitates the process of their perception by the observers through increasing their predictability; a considerable method which was extensively employed in western and Iranian traditional architecture.

In spite of encompassing various styles, Iranian architecture followed a limited number of visual and spatial arrangement system, among the most significant of them is the cross pattern; one whose prevalence -not only in the ornaments composition and facades design [11], but also in spatial arrangement of buildings and city spaces -is the main reason behind the similarities in different type of buildings (i.e. houses, schools, mosques, etc.) [12] and the unity in the context of historic cities such as Kashan and Yazd. (Fig 4-7)

An examination of traditional architecture of Iran indicates that the immanent presence of cross pattern kept people away from confusion at the time of confrontation with such complicated architecture. As due to their familiarity with this pattern, the prediction of the spatial and visual organization of buildings (and city) would not be very difficult.

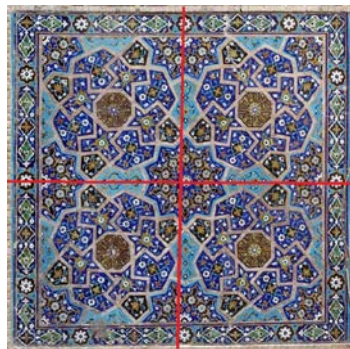


Figure 4: Jame mosque ornaments, Isfahan, Iran

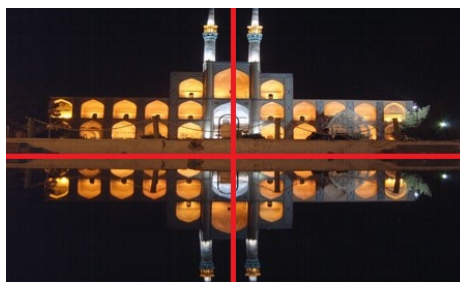


Figure 5: Amir Chakhmagh mosque, Yazd, Iran

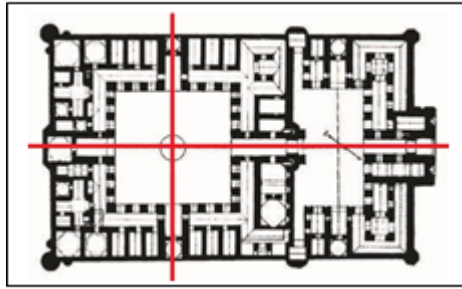


Figure 6: Cross Pattern in Sharaf Karvansara plan, Mashad, Iran

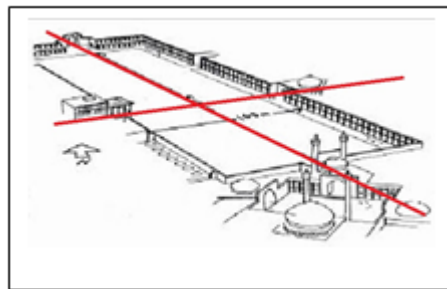


Figure 7: Cross Arrangement of major buildings in Naghshe Jahan Square, Isfahan

4- Time sequence of space perception

Perception of architectural spaces is highly dependent upon the way they are experienced by the users. Basically, space perception is formed through a chain of consecutive images formed in memory during the observation process. Each scene has a specific position in this chain according to the sequence of its recognition by the observer and is connected to previous scenes through a background which is remained in memory. Any extra increase or decrease in the normal duration of sequences will respectively results in loss of perception integrity and confusion [13]; highly contrasted scenes and their unpredictability will also led to the same results.

Taking into consideration the afore-mentioned facts, Iranian traditional architects paid much attention to observers' position and the duration of the observation process; hence designed different parts of buildings in a way that individuals could observe an appropriate amounts of details depending on its position and walking pace.

In such designs, first contact is made when the visitors are outside the building; where they only can see the building outline. In a closer observation however, hierarchical organization of the surfaces, involute frames, rhythmic and symmetric forms, will appear. In this way, a chain of visual perception will be formed which will be richened eventually by observing more details such as ornaments and its fine components (flowers, leaves, etc.)(Fig 8&9).

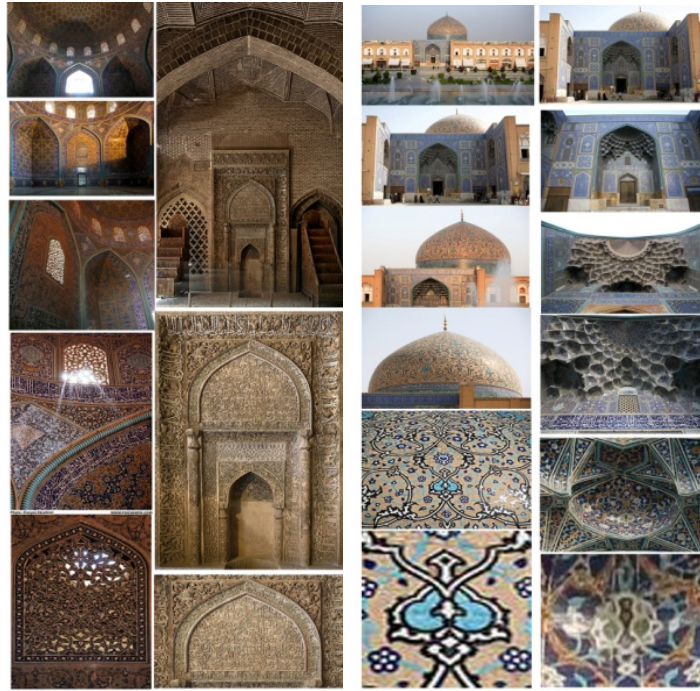


Figure 8 (Left): Gradual perception of Mihrab details in Jameh mosque, Isfahan, Iran

Figure 9 (right): Gradual perception of Sheikh Lotfullah mosque, Isfahan, Iran.

5- Observation distance

Ornament had immanent presence in Iranian traditional architecture. They existed almost in every parts of the Buildings from top to bottom; What is theoretically expected to result in an over-complexity hence, confusion in visual perception of the space. This risk however, is eliminated by thoughtful architects through employment of methods such as providing a distanced access to excessively ornamented object by placing them on the upper levels of walls or behind the barriers such as the nets which prevent a scrutiny of ornamental patterns by observer.

6- Color arrangement

Proper Color arrangement was one of the methods used by Iranian artists for organizing the visual complexity of ornamental patterns in traditional architecture. Designing dark-colored patterns in small scales and placing it behind the small and light-colored ones, they formed multi-layer surfaces [14] in which some motifs are seen bolder and some vague. In such designs, complex patterns acquired a hierarchical order which facilitate their perception by observer. (Fig10&11) Traditional artists also used monotone motifs where the ornamental patterns were so rich that any additional color could led to an information overload.



Figure 10(Left): Imam Mosque Dome, Isfahan, Iran

Figure 11 (right): Sheikh Lotfullah Mosque Dome, Isfahan, Iran

7- Light Intensity

Iranian architects (in Islamic era) are usually considered as skillful "light hunters" whose designs (including Stucco and brick panels and stone-carved walls) caught indifferent light of the environment and exploited it in an exceptional manner [15]. In their works, the specific position of elements in the hierarchical order of architecture were accentuated by light intensity through creating strong shadows of deep indents in major elements and leaving inferior ones planar; see (Fig 14).

They usually used light in a way to amplify visual effects such as rhythm, symmetry, balance or to add new layers of forms to the walls and floors by passing it through colorful glass of "Orosi" windows. (Fig 12, 13)

They also controlled the level of visual information received by observer by regulating the light intensity, knowing that employing very high and low intensity of daylight would led to a kind of temporary blindness in observers; A situation similar to what occurs when some layers of cad drawings is turned off. This method was clearly used in traditional inward- seeking houses in cities such as Kashan and Yazd; where guest and stranger had to pass a narrow and opening-less corridors to reach the inner courtyard which was full of light; A confrontation during which individuals experienced a short- lasting vision loss which gave the female habitant of the house enough time to put on their veils; see (Fig 15).

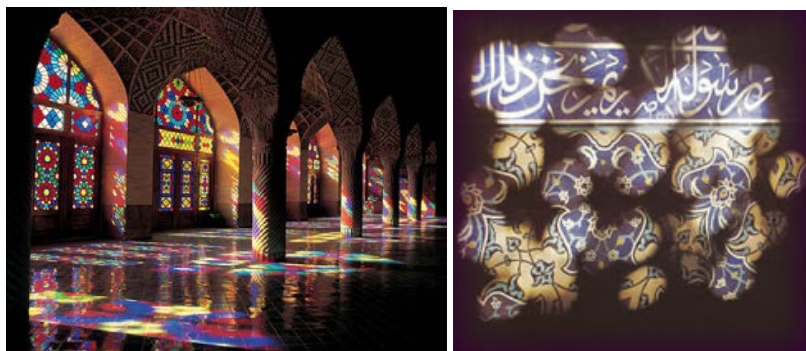


Figure 12(Left): Colorful Reflections through "Orosi" Windows in Nasirul Molk mosque, Shiraz, Iran

Figure 13(right): ornaments, Sheikh Lotfullah mosque, Isfahan, Iran



Figure 14(Left): Ameriha house, Kashan, Iran

Figure 15 (right): the inner hall of Sheikh Lotfullah Mosque, Isfahan, Iran

6. Conclusion

This paper addressed the concept of organized complexity in nature and architecture and examined some of the techniques employed by Iranian traditional architects to reach this state in different scales of architectural designs. According to the results, all systems with multiple parts are considered as complex; however, it is the type of relationship between the systems elements which determine its level of organization. This means, the more harmonic the relations, the more organized the system would be; what keeps it farther from chaos and confusion.

Being aware of this fact, Iranian architects used some methods to organize the visual complexity of their designs in order to facilitate their perception by the observers; their techniques according to the findings include employing repetitive, symmetrical and self-similar patterns; thoughtful color arrangement in designs and adjusting the observation distance and time sequence of space perception.

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