

Similarity between Geometric Patterns in Persian –Islamic Architecture and Carpet Design and the Expression of Concepts

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ABSTRACT

The geometry of Persian -Islamic architecture and carpet design is used to express certain concepts with a focus on the idea of unity in multiplicity. In other words, geometry is a visual language that stems from the worldview of the artist or architect and it leads to the production of a work of art that expresses certain artistic perspectives. At various times in history, the idea of diversification and transformation have been seen in Persian-Islamic architecture and carpet design. In this paper, two goals were attempted. The first goal was to investigate geometric forms in Persian-Islamic architecture and carpet design and the similarities between these two very different art forms. The second goal was to find out the reasons behind the similarities.

KEY WORDS: Persian –Islamic, architecture, carpet, geometry, unity in multiplicity.

1. INTRODUCTION

Different forms of traditional Persian-Islamic art contain different figures of semantic representation. They all share concepts that reveal a combination of Persian and Islamic beliefs [4]. The languages of these arts are symbolic and each artist uses allegorical tools in his work that are appropriate for the art form. Carpet and architecture design are two art forms in Persian art that embody symbols [5, 6].

Susan K. Langer believes that art is creating symbolic figures to express human emotion. Art often uses concepts that are directly related to the symbols for emotion expression giving the art work an intellect dimension [6, 7]. Kasyrr believes that symbols can be used to create a direct and immediate relationship between man and art. According to his ideas, the architecture uses the highest and most direct symbolic forms to create a relationship with us [8]. Thus, the architecture is capable of transferring concepts between the individual and the art of a building through the medium of space. This spatial experience is an important tool of expression used in Persian architecture and it has spiritual and historical contexts [9].

Symbolism is important to mankind. One significant manifestation of its importance can be seen in art. According to the Islamic perspective, each symbol has a visual, worldly, and spiritual aspect [10]. In other words, all worldly things are represented as tokens of another world [11]. Religious artists turn to allegorical language to express and substantiate their concepts. There are several forms of Persian art that use these symbols, including architecture [12] and carpet design [10].

The relationship between symbolism and art contains many complex issues. Art benefits from symbolism as it adds levels of expression. An example of this can be seen in traditional Persian art where different forms of artistic expression have the same meaning, which is derived from Persian and Islamic beliefs. These forms of traditional Persian art also communicate the idea of unity through multiplicity, which is an important value expressed in Persian art. In addition to creating beautiful images, Persian artists further understanding through symbolism [5].

As mentioned, Persian-Islamic architecture and carpets use symbolic language. To understand how concepts are expressed, an analysis of the Persian -Islamic architectural and carpet design was undertaken and will be discussed in this paper. This analysis considered art forms and their geometry and did not consider other visual elements such as the colours and material. As will be seen, traditional artists express concepts using the symbolic language of geometry.

The goal of this study was to compare Persian -Islamic architecture and carpet geometry. After identifying important geometric symbols, this paper explained the similarities between the symbols used in Persian-Islamic architecture and carpet design as well as the reasons behind the similarities.

2. MATERIALS AND METHODS

This study focused on archaeological remains in Iran relevant to Iranian history. When developing this study, it was possible to establish a geometric method. The first step in this analysis was accomplished by using the library to collect data. After the data was collected by reviewing historical records and other documents, the geometric symbols of both art forms were analyzed and discussed. The method used to draw similarities

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between geometric symbols in terms of their shape was considered. To accomplish this task, the images obtained from documents were analyzed using AutoCAD software to draw guide lines. After describing and comparing the symbols, their historical and visual relevance was studied. This process required an examination of the evidence and previous theories related to symbolic expression of Persian-Islamic art.

3. RESULTS

3.1 Persian-Islamic Architecture

An important element of Islamic architecture is the mosque. The mosque is seen as the House of God, and it is the most fundamental symbol of Islamic architecture [13].

Building a mosque is a very important task; therefore, only believers are called to take part in its construction (Qur'an, Surah Al-Taubah, and Ayat 18). A mosque has a variety of functions, in addition to acting as a place of worship; it provides a place for all religious affairs to be conducted. This space also used to educate, feed and tend to the welfare of its members. Robert Helen Brand in a book on Islamic architecture states that the mosque is an embodiment of mystery and symbolic expression [14]. He believes that the architecture of the mosque is a manifestation of deeply held religious beliefs.

According to some researchers (Esfahani, 1953), the Mihrab is pivotal in the architecture of the mosque [15]. The Mihrab is the heart of the mosque and it is located in the Qibla wall. The word "Mihrab" means jihad or war, which is interpreted as the war against evil and passion. Helen Brand states that the Mihrab represents the gates of Paradise where illumination falls. In other words, the Mihrab is not only a place to fight against passion, but also it also a safe haven and place of spiritual comfort. The architectural and decorative appearance of the Mihrab reflects its heavenly and spiritual identity [16, 17].

3.2 Persian-Islamic carpet design

The Arabic word for carpet is "Farsh" and "Vystrg" in Pahlavi (Old Persian) which means layout or spread. [18]. A carpet, when it is spread out becomes a symbol of the earth and contains qualities that can be described as "spreading," "motherly," and "cradling" as it provides comfort to the users of the carpet. Even though a carpet is symbolic of the earth, it is also symbolic of the sky as every terrestrial phenomenon has a celestial origin or represents a celestial concept. A carpet, therefore, is like the mirror of Arsh. Any figures contained in the design of the carpet can be seen as the expression of a celestial mystery [4] (Figure 2).

A carpet is an important symbol of the vitality and spirit of the Iranian community. According to the perspective of traditional Eastern commentators and scholars, abstract motifs are not only visually appealing and useful for filling in empty space but every line and colour in every twist and turn is symbolic of Eastern, Persian, and especially Iranian, concepts [19].

Ragheb Esfahani states that a carpet is " Arabic: بسط الثياب " and can be defined as meaning spreading and expansion [15]. In the Quran (Surah Al-Zariyat, Ayat 48) "Arabic: *وَالْأَرْضُ فَرَشْنَاهَا فَنِعْمَ الْمَاهِدُونَ*" is an Ayat that expresses the concept of "spreading ground." Furthermore, the Ayat "Arabic: *الَّذِي جَعَلَ لَكُمُ الرِّضْفَارَ شَا*"; the same idea is expressed as: "God who spread out the earth for you".

The pattern in a carpet is about goodness and the beauty in the world. In addition, it calls the pious man to move towards betterment. Burckhardt emphasized the import role that carpets play in the expression of religious observance and states that a carpet is a symbol of the whole as well as a symbol of the continuity of the universe. He asserts that the fabric of the carpet is symbolic of the Divine upon which the universe bases its existence. The existence of the universe disintegrates when the fibres are pulled out of the carpet and the carpet itself dissipates. He and other traditionalists claim that the enduring quality of the Divine is the reason the world exists. Perhaps influenced by this Quranic idea, Burckhardt states that the carpet is like the earth and it is also a symbol of the heavens. Most carpets will not show a particular object that can be easily identified as symbolic of the celestial realm, but they still illustrate the heavens. For example, the complex pattern of carpet represents eternal truth through abstraction. According to this opinion, diversity as a manifestation of unity is clear [19].

The structural elements of carpet design are as follows:

1. Symbolism
2. Regular geometry
3. Quadrilateral (rectangular)
4. Symmetry and balance
5. Context and margin
6. Avoidance of deep views (perspective)
7. Aesthetic escape from the vacuum of thinking [19] (Figure 2).

Carpets, like other cultural artefacts, reflect the worldviews held by their designers [20].

3.3 Concepts Influencing Architectural and Carpet Design.

Some would assert that every object is a manifestation of Divine and that it contains divine truths as experienced by its maker. The perception of divine truth can also be seen as an interpretation of human essence. According to a traditional perspective, unity is an expression of the Divine because it is a mirror that reflects perfection [13].

These attitudes and the use of symbols contain an eternal and ultimate goodness. They are repeated over and over again in art and architecture. Not only are they symbolic, but also they provide a prospective for focusing on the origins of the universe. The geometry of Persian-Islamic architecture and carpet design reveal essential truths about the nature of the divine [13].

Burkhart remarked that looking at art base on Islamic vision through the lens of symbolism, is the only way to give spiritual dignity to the material [16].

Carpets are designed in the same way as other artworks and they consider order, proportion, harmony, contrast, and balance as design elements while expressing unity through multiplicity. This means that different decorative elements and components introduce harmony and unity to the composition. Ultimately, the design of a carpet reveals the artist's genius and the mystical, abstract concepts that influence Persian –Islamic art. Like carpet design, the art of architecture contains symbolism that it is rooted in theosophy [13].

Nasr defined Persian - Islamic architecture as a spiritual tradition. He stated that the symbolic and metaphysical meaning of architecture has not been adequately studied. To fully understand the meaning of Persian –Islamic architecture, which is centred on the idea of unity, it is necessary to examine both the external and internal components. In other words, spiritual investigation can result in a greater understanding of worldly facts, especially in the case of Persian – Islamic art. For example, the Roundel is a symbol of light and monotheism. When a Roundel is placed away from the centre, multiplicity and polytheism are expressed. On the other hand, when the Roundel is placed at the centre, the importance of unity and monotheism is highlighted [13].

Another example of Nasr's assertion that spiritual investigation can result in a greater understanding of worldly facts can be seen in carpet design. Persian –Islamic carpets contain arabesques that are similar to the designs in the space beneath the dome of a mosque. These arabesques, whether located on a carpet or the floor of a mosque can be interpreted as an expression of the soul in the material world [13] (Figure 2).

Suhrawardi states that the beliefs of ancient scholars were based on the origins of light. The presence of a stable light element in art and the insight it represents continues [21]. An example of the use of light in traditional art forms appears as cypress patterns in paintings and roundels in architecture and carpets [22].

3.4 Geometric expression in architecture and carpet design

Geometry is a science that leads to an understanding of essence and substance. It is a key component for other forms of knowledge and wisdom. Some scholars have claimed that the foundation of all scientific and practical knowledge is the perception of essence, which can be more fully understood through the study of geometry (the Ikhwan al-Safa, geometry paper) [23]. (the Ikhwan al-Safa, geometry paper) [23].

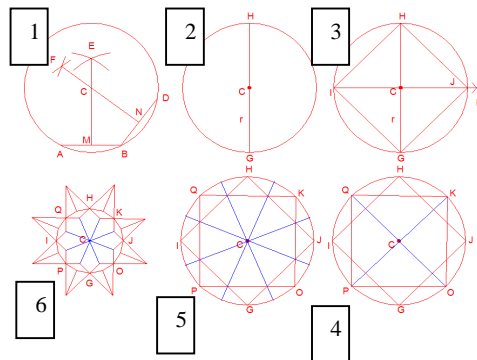


Figure 1 The process of Geometric expression

The process from top left to bottom left starting with the first figure shows how to find the centre of a circle using by two equal lines drawn perpendicularly. In the second figure, based on Figure 1-1, the circle is divided into two (diameter drawing). The third figure shows the addition of a square. The fourth figure is divided into 8 to create a roundel. The fifth figure reveals how the shape is further divided into sixteen regular polygons [3].

Geometry in art creates a holy space in which the presence of God is reflected. The foundation of this geometry is the circle, which is also symbolic of unlimited potential. A circle can be divided equally to form a polygon. The polygon can be further transformed into a star-shaped polygon by continuously manipulating the

proportions. From the Islamic perspective, dividing the circle into all possible equal arcs is symbolic of unity [23, 24].

Nader Ardlan and Laleh Bakhtiar (1999) stated that geometric designs can be interpreted as abstract forms that are eternal and timeless. They can be seen as spiritual symbols through which mystical truths are revealed [11].

Primitive carpets or the urban decorations decorated with geometrical features contain elements that are constant. This is also true in geometric architecture decorations. In architecture, the layout of spaces such as rooms and courtyards relied on Iranian Golden ratio. Persian Golden ratio is obtained from dividing a rectangle into a hexagon. Persian Golden ratio is also seen in the layouts used in carpet design [23] (Figure 3).

Some scholars assert that geometry clears the mind and improves thinking. These scholars state that that geometry influences the mind are very clear as it is unlikely that any geometrical argument is wrong because, unlike the mind, geometry is strong and regular. When your mind is constantly stimulated by geometry, it is unlikely that errors in thinking will occur [13].

The Ikhwan stated that the science of geometry is about values, dimensions, quantities, and those properties that defined a point of origin. Geometry is divided into sensory and logical forms. The values are expressed in intuitive geometry and the rational geometry debate regarding the understanding and perception of meaning [23].

The Ikhwan stated that geometry precedes other sciences. They believe that God created the universe as circular with spheres of rotational motion. Based on their opinions, the circle was the most important geometric shape and they attempted to interpret all components as logical forms [23].

Floral designs, such as the arabesques use in mosques, Shah Abbas flowers, and vase patterns are more examples of geometrical designs used in inscription and pictographs [2] (Figure2). "Arabesque" is a term used for the design of intertwined floral patterns, and it is one of the most prominent motifs in Islamic art [25].

According to Kayani, the three principles that influence motifs designs are repetition, rotation, and transfer. The geometry of these motifs is influenced by Euclidean geometry and a combination of squares, circles, and triangles [2] (Figure 4).

One frequently used geometric designs is a roundel [2]. A roundel is created by placing a square on top of another square. It also called a star because it is similar into certain celestial bodies. . In terms of Islamic motifs, this shape is referred to as "Shms-h" (sun) [26] (Figure7).

Carpet design and architecture is used to create harmony and discipline through the use of geometry, colour, and material. Geometric design used on carpets and in architecture is based on the same ideas and the worldview. It is a manifestation of the Divine and reflects heaven on Earth [11].

3.5 Geometry in carpet and Architecture

The Ikhwan Safa emphasized that geometry plays both a structural and spiritual role in the creation of artefacts. Accordingly, if the heavens are based on Holy Geometry, then artists, architects and craftsmen can use geometry in their creations. Geometry is a philosophical science, so anyone who knows geometry can also be called a philosopher [23].

The foundation of architecture is geometry, indicating that there is a relationship between architecture and philosophy. Geometry, mathematics, astronomy, and music are part of theoretical philosophy. Each of these disciplines play an important and practical role, for instance; numbers are important components in music, geometry plays an essential role in architecture and mathematics is influential in astronomy [17, 23].

Geometrical patterns are said to be a conduit for spiritual truth. Geometric patterns are symbolic and can be infinitely expandable. According to the Islamic perspective, God creates diversity and multiplicity in unity and this is the most desirable geometric context for the Muslim craftsman or artist considering how a surface should be decorated. Direct expression of thought is shown by unity through multiplicity [17, 23].

Nasr in his book *Science in Islam* claims that Muslims love math, especially geometry and numbers. Geometry and numbers are directly related to Islam, which is the belief in monotheism. In the Islamic world, holy mathematics appears with great frequency in art [13].

4. ANALYSIS AND DISCUSSIONS

Decorative elements used in traditional Islamic art, holds a special place. These elements reflect the ideas of artists and the unique traditions of each region [2]. An artist's worldview and their faithful interpretation of paradise as described in religious texts influence the similarity of motifs found in architectural and carpets design [4].

4.1 Analysis of form based on the main structure of architecture and carpet's design

In this section, the general design and details used in architecture and carpet design are compared and analysed. As discussed in Section 3-2, the schematic structure of carpet design includes seven components as listed below:

1. Arabesques are used to symbolize reason. They are symbolic of the Garden of Paradise and some artists use arabesques as an interpretation of the heavens. (Figures 2)

2. The regular geometry found in both architecture and carpet designs are characterized by analytic geometry. (Figure 2)
3. Both art forms can be quadrilateral or rectangular, allowing them to be defined according to Euclidean geometry. (Figures 2)
4. Architecture and carpet design are both symmetrical and balanced .(Figures 2)
5. Architecture and carpet design contain a “context” or central motif and “margins” or borders that surround the ground section. (Figure 2)
6. Perspective is avoided in carpet design but the essence of architecture is spatial and this characteristic makes it distinct from carpet design. However, architecture and carpet design do not show differences in symbolic expression. In this instance, the difference lies in how we perceive their symbolic expressions (Figure 2).
7. The amount of detail in the design of both art forms allows the viewer an escape from the vacuum of thinking. (Figures 2)

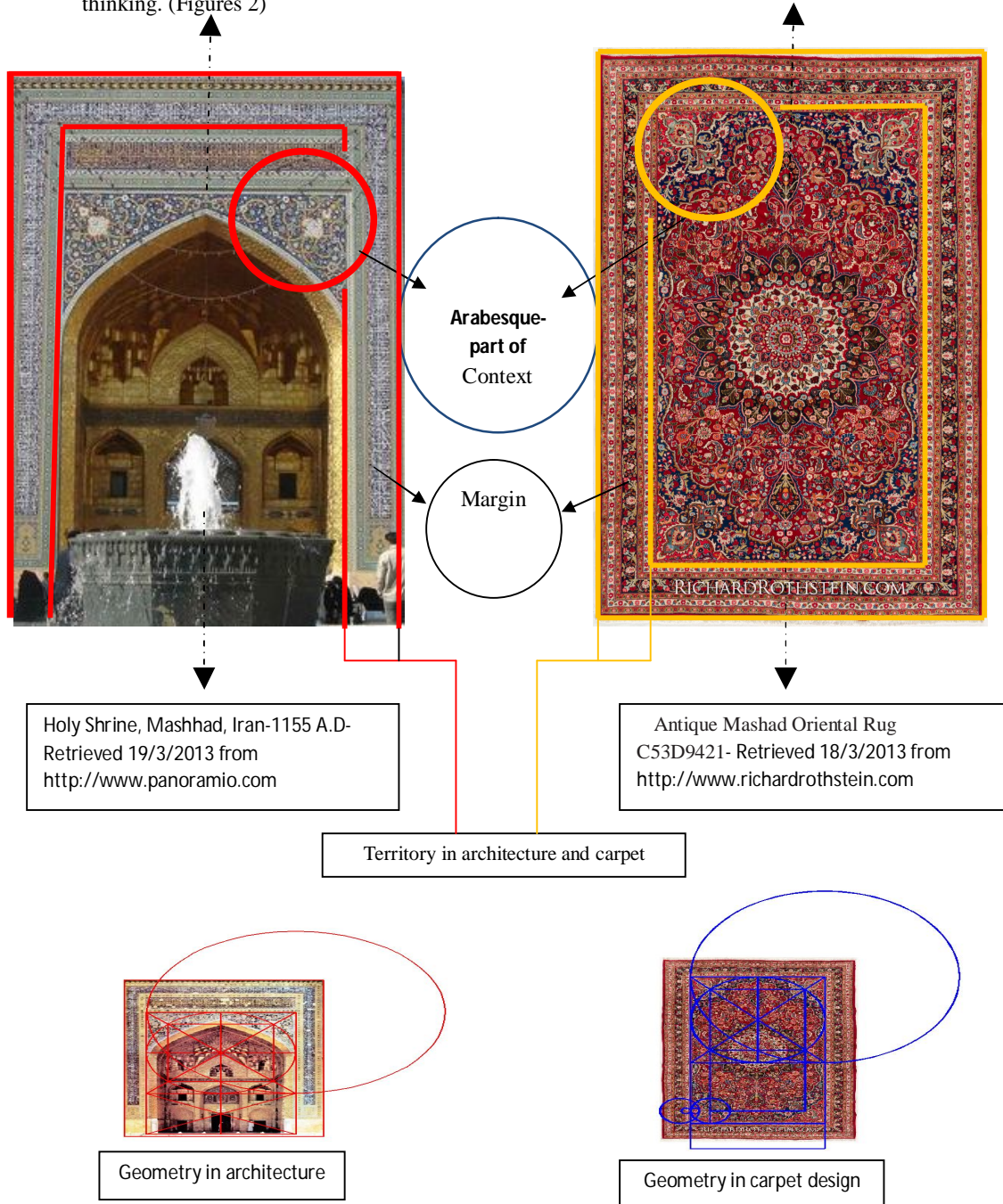


Figure 2 Analysis of form based on the main structure of architecture and carpet's design

4.2 Comparing the golden ratio of Persian-Islamic architecture and carpets

Figure 3 demonstrates that geometric expression in architecture and carpet design is based on Persian Golden ratio as discussed in Section 3.4. The Persian golden ratio is obtained by dividing a rectangle into hexagons. According to Figure 3, both Persian -Islamic architecture and carpet design are based on the Persian Golden ratio.

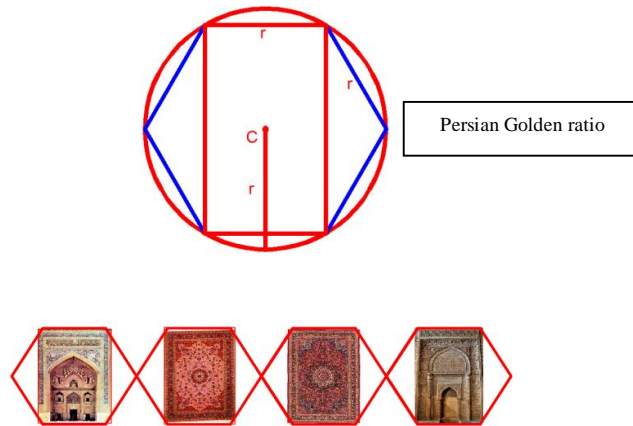


Figure 3 Persian Golden ratio in architecture and carpet design

4.3 Similar geometry in Persian-Islamic carpet design and architecture

In Section 3.4, the three principles that govern motif design were discussed. These three principles were repetition, rotation and transfer and they are illustrated in Figure 4.

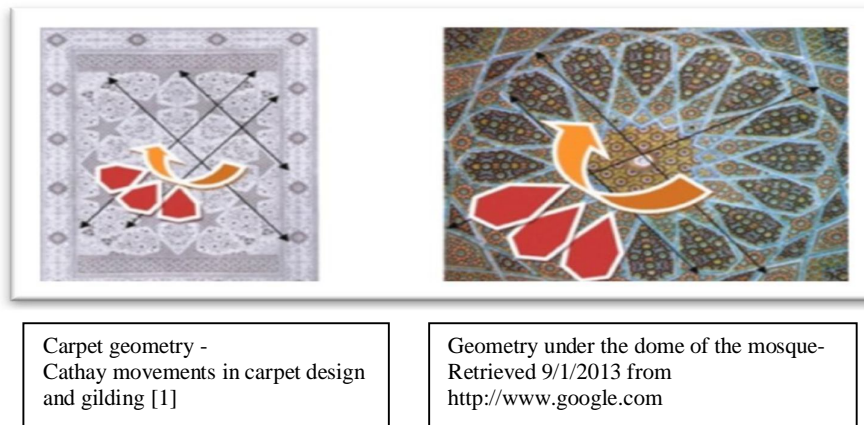


Figure 4 Similar geometry principles

4.4 Concepts expressed in Persian-Islamic architecture and carpet design

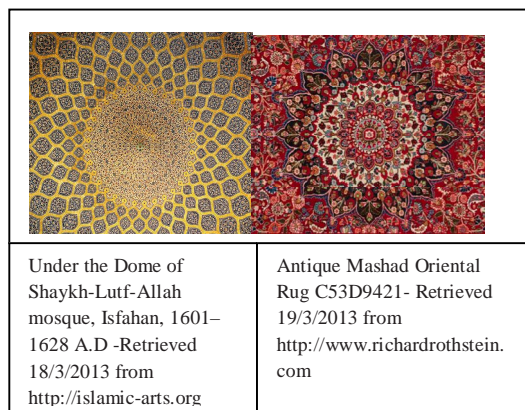


Figure 5 Concepts expressed in Persian-Islamic architecture and carpet design

Unity in multiplicity is an expression of the monotheistic system in Persian-Islamic architecture and carpet design and it is communicated symbolically in these art forms. As noted in Section 3-3, the concepts that influence the creation of a piece of architectural or the design of a carpet, are seen as spiritual messages and their representation should reflect their heavenly origins. One very common concept is that of multiplicity in unity and unity in multiplicity as seen in the figures shown above.

4.5 Similar geometric designs

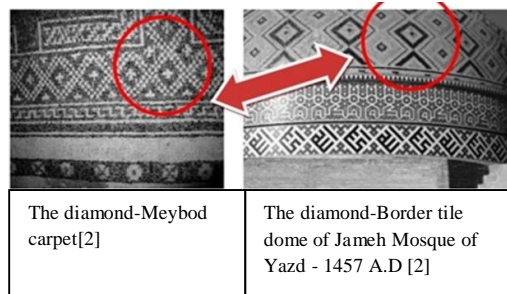


Figure 6 Similar geometric designs

As discussed in Section 3.4, geometric shapes used in architecture are also found in carpet designs. Figures 6 of the Great Mosque of Yazd and the Meybod carpet clearly demonstrate this claim (Figure 6, 7).

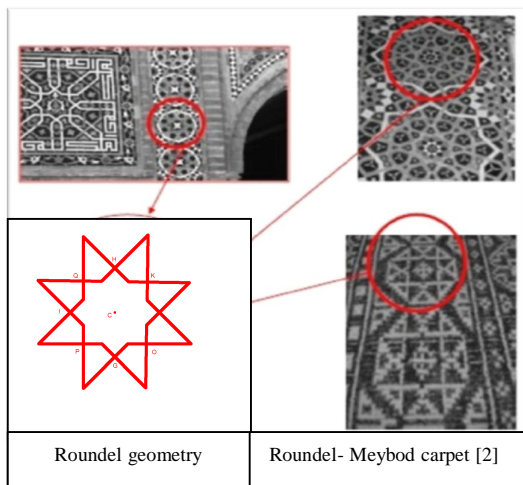


Figure 7 The roundel geometry in architecture and carpet design

4.6 Combinations of geometrical shapes in architecture and carpet design.

Another similarity between architecture and carpet design is the combination of simple geometric shapes as shown in Figure 8. The details shown are from the Meybod Yazd carpet and they are repeated in the dome of the Yazd mosque.

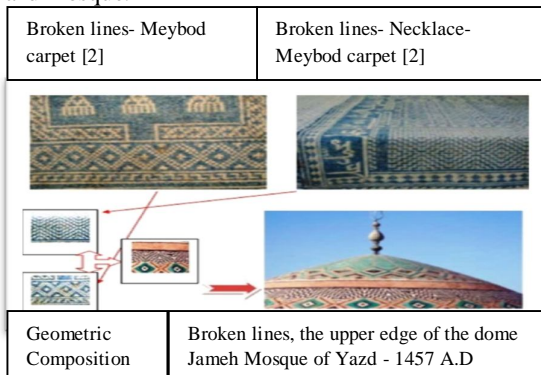


Figure 8 Combinations of geometrical shapes

4.7 Proportions of artistic component compared to the whole

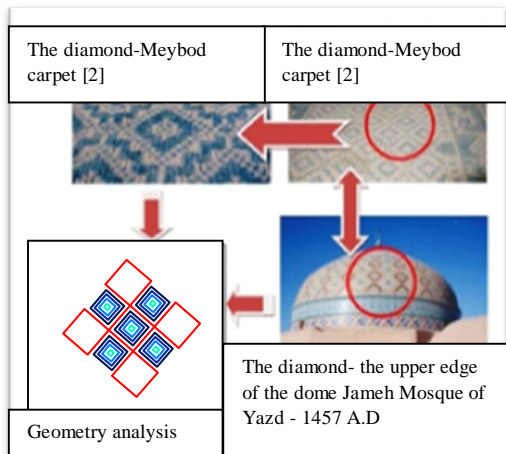


Figure 9 Proportions of artistic component

The relationship between different parts of an art form to its overall composition is illustrated in Figure 7 where proportion is used to create harmony and balance in both architecture and carpets. This relationship is further explained in Figure 9.

5. Conclusion

In this study, we found that the design details used in both architectural and carpets are similar, or at least adopt the same principles and procedures. A wide range of similar icons and symbols are used in both art forms to express various concepts. Furthermore, the use of geometric symbols in Persian-Islamic architect and carpet design is greatly influence by a monotheistic worldview. In both art forms, geometric symbols are used to indicate logic and order, which highlight a monotheistic perspective. Artistic principles such as symmetry, balance and proportion create visual beauty in any work of art. The design components evident in Persian -Islamic architect and carpet design make use of the geometry to not only express concepts such as monotheism but to also harness the potential of the artistic principles listed above. Figure 2 demonstrated the different areas in Persian -Islamic architect and carpet design. For the purpose of this paper, only the context and margin were considered. Figures illustrate the artistic principles of repetition, rotation and transfer, which were also discussed in Figure4.

Suggestions for further research

Further research is required to explore other dimensions found in the geometry of Persian-Islamic architect and carpet design and how these dimensions are integrated into other aspects of design. One interesting issues is how designers integrated geometrical design with structural design, especially in domes. Another interesting question is the relationship between the decoration used on carpets and the underlying geometrical scheme of the carpet.

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