Generative Art as Islamic Art: a mixture of fractal art and unity in diversity

Abstract

In his research, the author seeks to answer some questions for the practical use of the logic of Islamic art in the emerging field of generative art, and in this way, he examines the decorations of Sheikh Lotfollah Mosque in Isfahan. The library method and field observations were used to collect the required data, and the descriptive method was used to analyze the data. The author's investigation indicates that fractal geometry is used in the design of these works, and this issue is rooted in the religious-mystical attitude and the artist's special view of nature as a manifestation of Substance monism. Based on this, it can be hypothesized that a similar way of looking at existence was widespread in this era, which caused the works of Muslim artists to be similar in form throughout the Islamic countries. On the other hand, by abstracting the form and content characteristics of these works of art, a contemporary manifesto of the concept of Islamic art can be created, which, in combination with generative art, has the possibility of shaping contemporary works. Based on this, the researcher formulated a new concept called "ModaUm or مُداأم" in the form of a manifesto that can be used by Muslim artists:

Keywords: Islamic Art, Fractal Geometry, Generative Art, ModaUm, Sheikh Lotfollah Mosque, Substance monism

Introduction

In a world that is becoming increasingly complex with the increase in the number of variables, it seems that one of the ways to overcome the complexities is to move towards bionic design and use the logic of nature. The issue of bionic design, especially in the last 50 years and after the clarification of the dimensions of fractal geometry, has received more attention than before, and it is as if humans are experiencing a return to nature. (Deng, Jian , Xiang, & Hou, 2023, p. 6) This is while Muslim artists and scientists used this special way of looking at nature in their thoughts and actions to create their artifact and works more than at least 5 centuries ago. (Patuano & Lima , 2021, p. 8)

Muslim art and its manifestation in daily life is a result of the relationship with nature and the way of looking at existence. Fractal geometry is a tool that Muslim artists used over five centuries ago to create their works. Western artists have also been exposed to eastern art and fractal geometry, leading to works that resemble those found in Islamic countries. However, the subject matter and content of Muslim artists' works are significantly different from Western forms. The emergence of generative art, which uses logic and fractal mathematics, is a new form of art where artists create dynamic, autonomous forms that interact with the audience through computer codes. (nasr & seyed hosein, 1987, p. 75)

Muslim art utilizes fractal geometry, a tool that artists have been using for over five centuries to create their works. This form of geometry allows artists to create dynamic, autonomous forms that interact with the audience through computer codes. While Western artists have also been exposed to eastern art and fractal geometry, the subject matter and content of Muslim artists' works are significantly different from Western forms. Fractal geometry is a new branch of mathematics that presents a new concept of physical dimension and concepts such as infinite intricacy, zoom symmetry, complexity from simplicity, and fractional dimensions. It is a tool that artists can use to create new designs in line with their naturalist psyche. (Pudine, 2016, p. 258)

Muslim artists have been using fractal geometry in their art for over five centuries, creating dynamic and autonomous forms that interact with the audience through computer codes. This new branch of mathematics presents concepts such as infinite intricacy and complexity from simplicity, allowing artists to create new designs in line with their naturalist psyche. While Western artists have also been exposed to eastern art and fractal geometry, the subject matter and content of Muslim artists' works are significantly different from Western forms. Muslim artists aim to produce works of art arising from the specific culture of Islamic nations and especially the monotheistic mysticism of Muslims, making their art distinct from similar Western forms. (Lyons, 2019)

The mentioned process has recently entered a new stage with the formation of new artistic tools and mediums, which is moving art in a new direction. A new form of art is emerging where artists are more than "creators of an artifact". (Franke, 1989, p. 25) Generative Art, in which logic and fractal mathematics are specially used, is an emerging form of art in which

the artist creates dynamic, autonomous forms that interact with the audience by designing and writing computer codes. In this case, the artist creates a creature that has agency, and although the artist can predict the movement of the creature, the dynamics of the created system may create a kind of beauty that is beyond the artist's ability to think (Dorin, McCabe, McCormack, & Monro, 2012, p. 12).

Based on what has been said, in the article that you will read, first with a reference to fractal geometry, a case study of the use of this geometry in the Sheikh Lotfollah Mosque will be investigated, and then the Islamic art and fractal geometry will be discussed, then why and how the roots of religious, spiritual and ethnic expression of this special type of art, and then by introducing generative art, the claim is made that generative art can be a bridge between the past and the future of Islamic art.

Islamic art decorations and fractal geometry

In this section, along with the introductory introduction of fractal geometry, a case example of the application of this art in Islamic art and architecture (Sheikh Lotfollah Mosque of Isfahan) is examined, and then based on this example and some other studies, the relationship between Islamic art and fractal geometry is checked.

Characteristics of decorations in Islamic art

People are always receiving information from their surroundings. In architecture, most of these messages are provided to the audience through decorations, and one of the most important manifestations of Islamic art is the decorations used in the architecture of places. These decorations carry valuable geometry that not only produces a kind of visual beauty, but also carries messages from the world view of the artist and his ontology, which mainly originates from religion, mysticism and connection with nature (sartipi & valibeig, 2018, p. 262).

This theme can be seen in all types of decorations throughout the Islamic world: from the tiling of mosque domes, to all kinds of moqrans, gilding, carpet weaving, and even the tradition of painting throughout the Islamic world, from the Al-Hamrah Palace, the Mosque of Muhammad Ali, to the Grand Mosque of Damascus. and Buratha Mosque in Baghdad to

Sultanahmet Mosque and Sheikh Lotfollah Mosque in Isfahan. This repetition in the similarity of artistic expressions shows a kind of connection and unwritten unity between artists and artisans throughout the Islamic world. In a way that even with the difference in the methods of implementation and the mathematics used, in the end, what is achieved has a family and genetic resemblance to each other (Moch Wahib, Ziad, & Kamar, 2022). For example, the In a recently published article (2022), two different methods of geometric drawing of decorative motifs in Iran and Morocco ("Hasba" and "Iranian radial methods") were compared and the conclusion was reached that although in terms of form and methods of implementation Artists have different approaches, but the essence of both decorative methods is the same in terms of implementation logic (Shirvani, 2022, p. 30).

Islamic ornamentation consists of three types: floral designs, calligraphy and geometric patterns. It occurs in rich profusion throughout Islamic cultures. It is found on a diversity of materials and many types of objects. The last category (geometric patterns) is one of the most distinguishing features of Islamic art. Islamic star patterns are the most beautiful in Geometric patterns. They are the result of repeated copies of symmetric shapes that resemble to a ‘star’ or ‘rosette’. The star and rosette shapes with 6, 8, 10, 12 and 16 rays are the most frequent. (KHAMJANE & BENSLIMANE, 2017, p. 6)

Despite the complexity of geometric forms, decorations in Islamic arts follow a simple logic in which it is created by repeating a simple process over and over in an ongoing feedback loop. Geometrically, they exist in between our familiar dimensions. Fractal patterns are extremely familiar, since nature is full of fractals. For instance: trees, rivers, coastlines, mountains, clouds, seashells, hurricanes, etc. However, it is not easy to design a Fractal Islamic geometric pattern because of the properties of Islamic geometric patterns. (KHAMJANE & BENSLIMANE, 2017, p. 14)

Numerous studies indicate that almost throughout the Islamic civilization, traces of fractal geometry can be seen in geometric decorations and works of art, which in combination with aesthetic principles, including the golden mean, translate Islamic values and spirituality into visual artistic language. In Islamic civilization, the use of fractals is not only limited to the decoration of objects and architecture, but can also be seen in urban design, clothing, textiles, and even in other arts such as music and poetry. (Alavizadeh, Islami, & Habib, 2018, p. 4).

In addition, even the different readings of Islamic art decorations also express the fractality of these arts in another language. For example, the Biomorphic art, (also known as Islimi, nebati, Arabesque) is one of the three distinct disciplines that underpins Islamic art (the other two being Calligraphy and Geometry). Islimi designs are biomorphic, floral patterns representing the underlying order and unity of nature; they are evident throughout the artwork of various cultures within the Islamic world from Morocco to Malaysia. There are a variety of different styles of Islimi within Islamic art but they all follow the same archetypal principles. Three key elements at the heart of biomorphic compositions (Williamson, 2020):

- The eternal spiral

  Behind most designs there is a spiral from which the motifs and leaves sprout. The movement of nature inspires the unbroken flow of the spiral, it has no hard corners and the curves are sweeping and gentle. As the spiral advances it radiates secondary spirals, they in turn radiate spirals and soon the page is overgrown. The spiral progresses from its source like a plant from a seed growing toward the light. This centrifugal movement reflects the progression of creation from the creator, moving to infinity.

- Symmetry and structure

  Once a section of spirals are drawn they are reflected and repeated to fill a page wall or dome. Symmetry is fundamental to a harmonious design, it exemplifies completeness and perfection and the desire for unity.

- Rhythm and Balance

  Islimi designs tessellate across the surface with an even rhythm and texture. No part of the design takes precedence and pushes to the foreground; the designs vibrate and oscillate evenly, undulating like the sea. This effect is created by the repetition and the careful even arrangement of the motifs.

Fractal geometry

In mathematics, a fractal is a geometric shape containing detailed structure at arbitrarily small scales, usually having a fractal dimension strictly exceeding the topological dimension. Many

fractals appear similar at various scales, as illustrated in successive magnifications of the Mandelbrot set. (Mandelbrot, 1983, p. 55)

This exhibition of similar patterns at increasingly smaller scales is called self-similarity, also known as expanding symmetry or unfolding symmetry; if this replication is exactly the same at every scale, as in the Menger sponge, the shape is called affine self-similar. The consensus among mathematicians is that theoretical fractals are infinitely self-similar iterated and detailed mathematical constructs, of which many examples have been formulated and studied. (Gouyet, 1996, p. 125)

Fractals are not limited to geometric patterns, but can also describe processes in time. Fractal patterns with various degrees of self-similarity have been rendered or studied in visual, physical, and aural media and found in nature, technology, architecture and law. Fractals are of particular relevance in the field of chaos theory because they show up in the geometric depictions of most chaotic processes (typically either as attractors or as boundaries between basins of attraction). (Vicsek, 1992, p. 31) Characteristic of fractal shape are infinite intricacy, zoom symmetry, complexity from simplicity and fractional dimensions. In short, it can be said:

- It is predictable according to the way it is formed.
- Evolution is simultaneous.
- It has an optimal replacement.
- It is rooted in simple rules.
- There is an element of repetition in formation.
- It is a nested system.
- Euclidean shapes are made using static functions, but fractal shapes are made with dynamic processes. Dynamic processes are processes that have memory and their behavior depends on the past.
- It has the characteristic of self-similarity.
- Not every repetitive and dynamic process creates complex fractal structures. The processing mechanism of such dynamic structures is chaos. In fact, a fractal is a mathematical representation of chaos.

In fact, the shapes of fractals resulting from the continuous generation of different forms are based on specific rules that can be created in the form of both linear and non-linear dynamic

dynamic systems. The latter definition is very similar to the way abstract geometric motifs are born in the decoration of Islamic art and architecture. So, can we say that Islamic art is a kind of fractal art? In the next section, a case example is examined (Razavi, 2020, p. 122).

A case study of Sheikh Lotfollah mosque in Isfahan

Traditional Iranian Architects were always putting the nature one of the most important sources of inspiration. Original works of this architecture show that they have been well aware of strong and complex geometry that was used in the structure of the natural elements. Based on the preliminary studies, The Interior of the dome ornament of Sheikh Lotfollah mosque is also designed using fractal geometry. (Mostaghni & Alimoradi, 2016, p. 103)

Muslim artists have been using fractal geometry in their art for over five centuries, creating dynamic and autonomous forms that interact with the audience through computer codes. This allows artists to create new designs in line with their naturalist psyche, resulting in works of art that arise from the specific culture of Islamic nations and monotheistic mysticism of Muslims. The shapes used in Islamic architecture cannot be separated from the traditional concept of mathematics, especially geometry and geometric shapes. The dome of Sheikh Lotfollah mosque in Isfahan is an example of how natural patterns and fractal geometry inspired the artist who created it in its design. The artist tried to induce the feeling of passing from multiplicity to unity by choosing elements that resemble natural fractal forms. . In Fig 1: The fractal similarity of sunflow You can see the similarity of the design of this array to the elements of artistic decorations and its similarity to natural fractal forms. (Seyf, 2007)

Muslim artists have been using fractal geometry in their art for over five centuries, creating dynamic and autonomous forms that interact with the audience through computer codes. The dome of Sheikh Lotfollah mosque in Isfahan is an example of how natural patterns and fractal geometry inspired the artist who created it in its design. The artist tried to induce the feeling of passing from multiplicity to unity by choosing elements that resemble natural fractal forms. In fractal architecture, the change of the position of the observer and the change of the position of the architecture, both exist simultaneously, and that is why this type of architecture is dynamic. (Farshid Rad, Etessam, & Ghobad, Explanation of Fractal Geometry Laws in the Structural Form of Architecture; Presentation of a Form-Based Architecture Model, 2019). Muslim artists have been using fractal geometry in their art for over five

centuries, Today, these forms are created through computer codes. The dome of Sheikh Lotfollah mosque in Isfahan is an example of how natural patterns and fractal geometry inspired the artist who created it in its design.

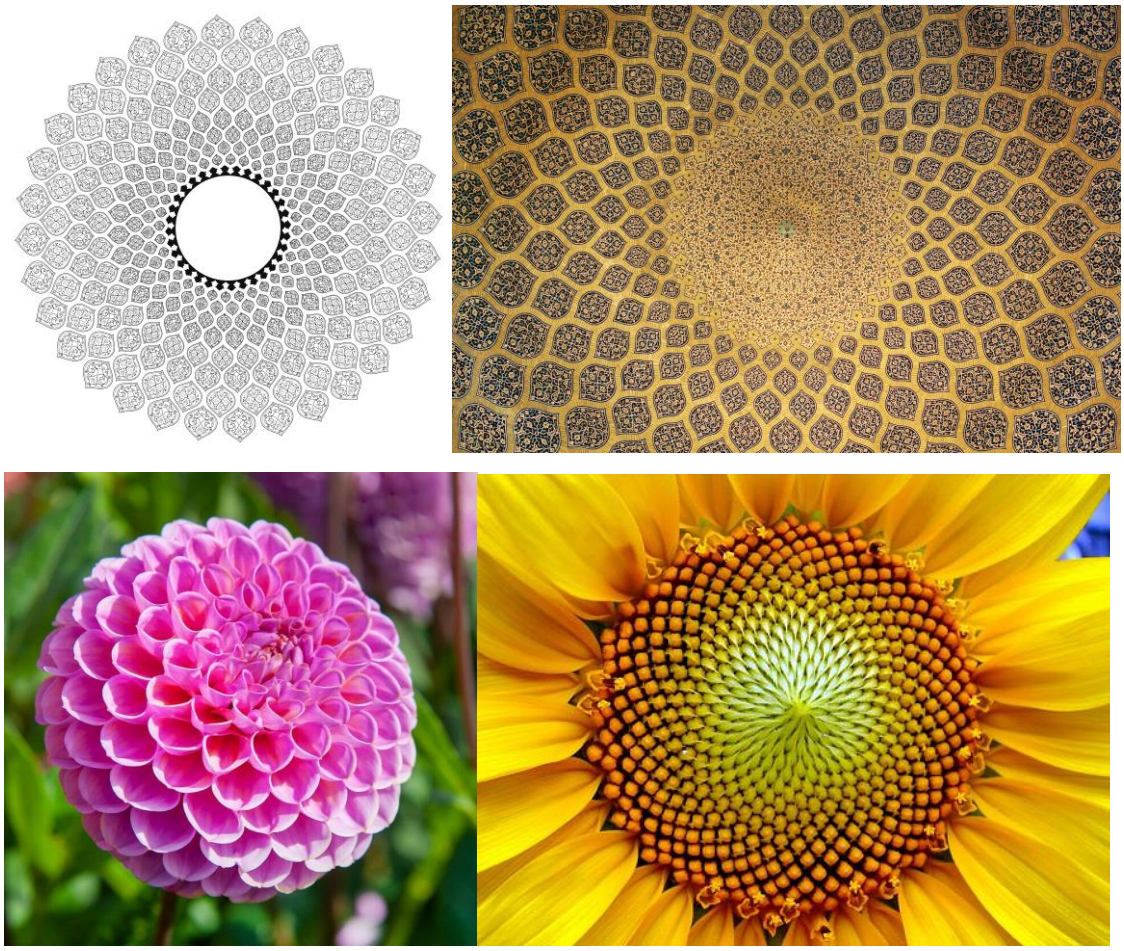

Fig 1: The fractal similarity of sunflower and sheikh lotfollah Decorations

num	fractional dimensions	Sheikh Lotfollah decoration
1	predictablity	**Yes**
2	Evolution	**Yes**
3	element of repetition	**Yes**
4	nested system	**Yes**
5	self-similarity	**Yes**
6	Unity in diversity	**Yes**

Table 1: Fractal features of Sheikh Lotfollah mosque decorations in Isfahan Source: (Farshid Rad, Etessam, & Ghobad, Explanation of Fractal Geometry Laws in the Structural Form of Architecture; Presentation of a Form-Based Architecture Model, 2019, p. 14)

Fractal nature of the architecture and decorations of Sheikh Farda Allah Mosque has been mentioned in several researches, including: (Bakan, 2020) , (Mehdi Nezhad & Sadegi habib

Abad, 2019) , (Torabi, 2017) , (Mostaghni & Alimoradi, 2016), (Hadi Poor Moradi & Hadi Poor Moradi, 2016) , (Mirzakhanaian & Shahroodi, 2014) , (Bemanian & Alinasab, 2014) , (Dahar & Alipour, 2013). Therefore, regarding the architecture and decorations of Sheikh Lotfollah Mosque in Isfahan, it can be said with confidence that fractal geometry has been clearly used in the architecture and decorations of this building.

Simply and by using the tools of architectural software, it is possible to examine the issue of using fractal geometry in all works of art as well as historical monuments of other Islamic countries. Many researches have been done in this field, but scientific institutions and governments need to pay more attention to preserve and document these components using new tools. More details will be given in the next section.

Islamic art and fractal geometry

Fractal art can be presented in simple, reproducible language that is at the same time orderly in the postmodern world. In fractal art, such as visual arts, visual elements such as dots, lines, surfaces, etc. have been used to combine and repeat them and have been expressed in complex shapes and beautiful visual textures. Fractal is an interdisciplinary art related to geometry and mathematics and plays a major role in today's world. It should be said that fractal knowledge makes a unique design possible for the artist. (Hedayati, Behnam, & Sheykhi, 2021, p. 92) Especially in recent years, when the use of digital tools has made it possible for everyone to understand the complexity of Islamic geometric forms, in the contemporary world of Islamic art, it is recognized as fractal geometry, and in some cases it is also considered as the stone of this type of geometry. (Webster, 2020). Regardless of the originality of the researcher and the field he/she has considered in his/her research with the subject of Islamic art, a large group of researchers have noticed the fractal nature of this art in their research both in visual forms, in logic and in the intellectual-spiritual background of the artist. have became. (Balilan asl, sttarzade, noori, & khorshidian ahmar, 2014, p. 52). The use of fractal geometry and logic is not only limited to decorations and Islamic architecture, but its manifestations can be seen even in urban planning, urban layout, garden design, and even Islamic military and scientific affairs. (Sharghi, Azizmoghadam, & Jamali Gandomani , 2020, p. 34) It seems that this unity in plurality in the use of this particular type of geometry must have meta-aesthetic reasons, which manifests itself in different ways throughout the Islamic lands. (Hayati & Agha mohammadi, 2015, p. 17).

The reason for the widespread use of this particular type of geometry can be examined from the individual perspective of Muslim artists in three areas. First, the religious-religious roots, secondly, mystical roots and thirdly, the special type of connection of Muslims in Islamic lands with nature. Other issues also affect this issue, including government policy, historical background, cultural encounter with other cultures, cultural fusion, and especially language structure, but based on numerous researches, the weight of the influence of the first three mentioned cases is more than the others. (Shafizadeh, 2019, p. 51). In fact, the Muslim artist in different fields, based on the geography and culture in which he lived, using the language of art and especially by mastering engineering mathematics, was able to establish a kind of balance between the material-spiritual worldview (Elgohary, 2019, p. 89) and through that a religious understanding of order in To visually express disorder, unity in diversity and diversity in unity the unity of the universe for the members of the society. (Patuano M & Lima, 2021, p. 2)

Muslim artist: balancing spirituality and nature

Most of the people who are known as Muslim artists in history were mathematicians, astronomers and in most cases omniscient, therefore it is not so strange if the results of their activities are also based on mathematics, astronomy, numerology and geometry. However, the root of Islamic art is not only in the knowledge of Muslim artists, but religion, mysticism and the special relationship of the people of Islamic countries have also had an effective influences on this issue. (Jones, 1989, p. 33)

The religion of Islam permeates into every aspect of man's life, leaving nothing untouched by the sacred. This, by extension, means that there is no differentiation between the sacred and the profane in the life of every Muslim. There is simply a hierarchy of being which has its roots in Divine Unity and which manifests itself at every level of existence. This sense of unity is most evident in the arts of the Islamic world. Islamic art is synonymous with sacred art. It is an art which transmits a Divine message and transcends time and place. It draws its roots from the Spirit and manifests itself in our physical world. If one has to define the essence of Islamic art it will be the religion of Islam itself which derives its identity from the concept of unity (tawhid). Although the religion of Islam does not set out a mode of artistic expression, every aspect of it contains within itself the possibility of visual and symbolic representation.

The main influence on this artistic expression is the Koran, in fact the Koran through inscriptions, recitation and prayer sets the rhythm for the life of every Muslim.

However, there is an important paradox which should not be overlooked in that the Koran does not set a specific model for the form of Islamic art. Islamic art does not, as in the case of Christian art, depict episodes from the lives of the prophets, or as in Hinduism have a formal canon to interpret a particular cosmology through its architecture. There is no principle of composition to be found in the Koran which can form the framework of an artistic expression. Furthermore, Islamic art cannot draw its inspiration from the Divine law (shariah), which simply regulates the daily life of the Muslim community by setting limits and guidelines, it can not be the source of artistic creativity. (Azzam, 2002)

Furthermore, one cannot simply attribute this expression of unity to 'religious feeling', since however intense an emotion may be it is not enough to inspire the overwhelming range and depth of this art. The root of this unity transcends the realm of emotion which is 'necessarily vague and always fluctuating'. It is a much deeper 'intellectual vision' that is the basis of Islamic art. The term Intellect must be used in its original sense; the Intellect is the faculty in man that gives intuitive knowledge of the Absolute and timeless realities – it is thus on a much higher plane than reason. Intellect, or 'al-'aql' in Arabic, is the capacity to perceive the concept of Divine unity. The Islamic tradition teaches that man's fundamental quality is being endowed with an Intellect capable of metaphysical knowledge and hence the expression of an Absolute Reality. This faculty of the Intellect is not only expressed through the gift of speech but also through artistic creation. It is this vertical axis which gives the process of work in craftsmanship a sacred dimension and a direct link with the higher levels of reality and the creative rhythms in nature. It is from this wisdom that Islamic art derives its sense of beauty. (Burckhardt, MIRROR OF THE INTELLECT, 2001, p. 229)

The universal message of Islamic art draws its inspiration from both a physical and a metaphysical order both of which have their origin in the Truth of the Absolute. (Nasr, 2016, p. 12) On the level of the physical Islamic art seeks its fundamental principles from the laws of the natural world. These are the laws of the natural order of being which man has experienced on a daily basis since the beginning of time. Man, in Islam, is not the measure of all things. The Muslim artist acknowledges by his Islam – his submission to the Divine will –

that God is the Supreme Artist. Thus the relationship between the Muslim and his surrounding space is one that is based on reverence and not arrogance. If he has to leave an imprint on this physical space then it must be done with humility and with no sense of defiance to the natural order of being (Azzam, 2002). In this respect, the Muslim artist creates art in a balance between religious submission, mysticism and nature.

Religious roots

The Middle Ages were an amazing time for Islamic Art to flourish. In Islamic Art, we can actually see the connection with mathematics as the shapes represented are usually geometrical shapes with a mathematical reflection behind. This type of art avoids the representation of living figures as it is considered as an exclusively divine activity to create living beings. This is why geometric shapes and calligraphy were two of the most widely used patterns in Islamic Art. Geometric knowledge could decisively be conceived as a theoretical instrument in visual arts. (Group of writers, 2020, p. 3)

As the representation of living figures was considered a sin, Muslim artists used geometry to express their creativity. They designed complex patterns of geometrical forms that were tipically repetitive and seemed infinite, which aimed at representing the greatness of Allah's creation. The circle, considered as the perfect infinite shape, as well as the eight-pointed star were often used as a basis to build other patterns. This is why artists used a ruler and compass to build their works. Islamic geometry was used to decorate furniture, rugs, houses, and other buildings such as mosques. (Sadeghpour & Khalilzadeh, 2013, p. 80)

Although the content of Islamic art aspires to express the highest principles, the actual means of representation are quite defined. One of the most commonly discussed features of Islamic art has always been the prohibition of the portrayal of human figures. This needs to be explained further.In western art, through the influence of the Greek and Christian civilisations, iconography or the portrayal of the image of man occupies a central position (Jesus is the word made flesh ; icons are central to christian art). Islamic art takes quite a different view: (Azzam, 2002)*'let us not forget that the image of man is always the image that man conceives of himself. The image bears back on its author, who thus never quite frees himself from the spell it casts upon him. The whole course of European art, with its increasingly accelerated phases of action and reaction, is mainly a dialogue between man and his image.*

Islam banished all this ambiguous play of psychological mirrors at an early stage, thus preserving the primordial dignity of man himself.' (Burckhardt, MIRROR OF THE INTELLECT, 2001, pp. 212-213)

However, this must not be interpreted as a total ban on the depiction of the human figure. Firstly, Islam forbids the visual representation of God since the nature of God goes beyond any visual or liturgical interpretation. Secondly, Islam does tolerate the depiction of human form as long as it is not an attempt to create the illusion of living beings. These two principles are seen in the art of Islamic miniature painting which reached peaks of beauty and refinement, but which always remained on the periphery of the world of Islamic art and away from the liturgical domain which was dominated by the arts of architecture and calligraphy. (Razavi S. , 2008, p. 78)

There might be a suggestion that the prohibition of images in Islamic art has created a void which had to be filled, and thus lead to the development of a more abstract aspect of this art, in particular geometrical patterns and arabesque forms. However, a true understanding of Islamic art would make it obvious that these art forms are not a compensation for the lack of images, but a positive contribution towards a perception of a higher reality than material form. 'By transforming a surface into a tissue of colours or into a vibration of light and shadows, the ornament prevents the mind from fixing itself on any form that says 'I', as an image says 'I'. The centre of an arabesque is everywhere and nowhere, each 'affirmation' being followed by its 'negation', and vice versa.' (Burckhardt, MIRROR OF THE INTELLECT, 2001, p. 226)

However, one has to clarify the meaning of this universal beauty. In Islam earthly beauty is only understood to be the reflection and in a sense the extension of the Divine quality of Al Jamil. And yet the interpretation of this quality of beauty cannot be arbitrary or left to personal taste. Every traditional or sacred art form is based on certain principles and canons which relate to the spiritual message of the tradition. (Eskandari, 2001, p. 19)

The Islamic tradition is based on a Divine revelation and therefore in its origin and principle transcends physical time. Furthermore, the application of this revelation is not restrained by physical location since it is a principle which provides guidelines that are always contemporary to the time and relevant to the place. This is most obvious in the realm of the arts of Islam

which thrived for centuries over a vast area and were always of their time and answered the physical, social and cultural identity of the location. (Mousaviyan, 2017, p. 101) Therefore, in summary, it can be said that Islamic art has its roots in the religion of Islam and the basic concepts of this religion, especially unity and revelation, and based on that, art is a tool to remember God Almighty and prevent the beauty of God.

Spiritual-mystical origin

The Muslim artist, by his very Islam, his 'surrender' to the Divine law, is always aware of the fact that it is not he who produces or invents beauty, but that a work of art is beautiful to the degree that it obeys the cosmic order and therefore reflects universal beauty' (Burckhardt, MIRROR OF THE INTELLECT, 2001, p. 211) It must be made clear that Islam considers the beauty of an art to be independent of the psychological state of the artist. The beauty of Islamic art does not rely on a subjective individualistic expression but remains objective and impersonal like that of nature. (Azzam, 2002) 'For the Muslim mind, art reminds man of God when it is as impersonal as the laws that govern the movement of the heavenly spheres (Burckhardt, MIRROR OF THE INTELLECT, 2001, p. 211)

In fact, for the proper understanding of the Islamic arts and architecture should be structured on the belief that the traditional Islamic arts are the product of a fulfilled human being. This can only be achieved by finding the right harmony between the hand, the heart and the mind. It is because of this understanding that we stress that an intellectual appreciation of the arts, or the individual expression of the artist is not enough. The true identity of the artist can only be realised when he fulfils his role as a craftsman, and his means of expression can only be truly valid when it derives from the principle of unity which underlies every aspect of the Muslim's life. (Alin, 2018) It is precisely in this view that the spiritual connection of the artist's life with the works of art in the Islamic perspective shows itself.

The spiritual life has to begin with submission. The Islamic tradition teaches that without submission there can be no true understanding and without discipline there can be no flowering of the spirit which leads to true and essential knowledge. This is most evident in the relationship between the fundamental aspects of Islamic art which are geometry, biomorphic form or arabesque and calligraphy. Geometry is an objective manifestation of the principles of creation and forms the underlying framework for the visual expression of the path which

leads from unity to diversity; arabesque or biomorphic forms, which symbolise virgin nature, and which interlace with and balance the geometric patterns would be meaningless and formless without the structure of the underlying geometry. (Ghayomi Bidhendi, 2010, p. 190) Furthermore, both these art forms are the setting for the word of God and the calligraphy of the Koran. Art and architecture have always held a central role in the civilisation of Islam a role which encompasses the wide range of values which make up this civilisation. Although the art of calligraphy is always considered to be the highest form of Visual art in Islam, since it expresses the Divine word which is the essence of the Koran it is the art of architecture which encompasses the full range of disciplines and crafts which are identified with the Muslim world such as masonry, carpentry, mosaic work, stained glass, gypsum carving and also calligraphy. Architecture is the setting for the different disciplines of the arts and crafts of Islam it is the evidence that these arts and crafts do not exist for their own sake, but to embellish our everyday lives and environment. (Delzenderoodi & Gholamreza, 2020, p. 40)

The language of sacred geometry and symbolism are only truly relevant within the context of a sacred tradition since then they are set within a spiritual context. There is a general impression amongst contemporary Muslim artists that the ‘abstraction’ of their modern art is related to and even inspired by the symbolic nature of traditional Islamic art. To clarify this point one has to indicate that modern abstraction is merely an artistic mannerism or a technique of expression in which the technique overrides the real meaning of the art. Islamic art is truly abstract because on the one hand it conveys concepts which cannot be expressed through mere physical form, and on the other it understands and fulfills the meaning of the symbolism of form. Form which exists on the physical level has limits which are constricted by time and space. However, physical form also has an aspect of conveying the metaphysical and it is this aspect which imbues certain forms with a timeless quality. This ‘abstract’ interpretation of form, as seen in Islamic art, raises the perception of reality from the physical realm. It encourages a contemplative state of mind and a perception, through the language of symbolism, of ‘unity in multiplicity and multiplicity in unity ‘. The language of symbolism is the threshold between the physical and the metaphysical. An understanding of the symbolism of form overwhelms the individuality of the artist without suppressing his creative instinct; it stretches his mode of expression to the realm of metaphysics. (Khakpour & Khazaei, 2010, p. 19)

Connection with nature

Islamic art seeks its fundamental principles from the laws of the natural world. These are the laws of the natural order of being which man has experienced on a daily basis since the beginning of time. Man, in Islam, is not the measure of all things. The Muslim artist acknowledges by his Islam – his submission to the Divine will – that God is the Supreme Artist. Thus the relationship between the Muslim and his surrounding space is one that is based on reverence and not arrogance. If he has to leave an imprint on this physical space then it must be done with humility and with no sense of defiance to the natural order of being. (Azzam, 2002)

Today, returning to nature and patterning it seems to be one of the most important needs in the world. Iranian architects have been successful in applying scales and connecting different scales to one another, as well as facing nature around them. Geometry, while being abstract, is the most important language through which the architect creates specific spatial qualities and a geometry that derives its essence from the laws and logic of nature can best express the relationship between man and nature and a very suitable model for biodesign in all fields. Fractal geometry, as a branch of geometry that is inherently dependent on the logic of nature and natural forms, is the best expression for the geometric expression of nature-based art.

Fractal geometry has features including nonlinearity, irregularity, imperfection and non-Euclidean geometry, chaos, and special rules, representing its naturalistic aspect along with the lack of rest and relation of geometries. (Sharghi, Azizmoghadam, & Jamali Gandomani , 2020, p. 31)

In addition to his cultural-historical relationship with nature, due to the religious and spiritual foundations of his art, the Muslim artist assumes nature as a manifestation of the divine essence and uses it as a source of inspiration for any kind of artistic representation or craftsmanship. The same basis of using natural generative forms can be seen abundantly in the remaining works of Islamic civilization. (Hejazi, 1999, p. 22)

In addition, Islimi designs gradually emerged as the floral, vegetative style of Islamic art in various forms around the world. As Islam spread and nations adopted the faith, they stylized their decorative arts to fit the principles of Islam. At the same time they were inspired by each other. Most notable influences were from Chinese and Byzantian arts. The development of

one of the most common Islimi styles; Rumi (a Turkish and Persian term) was developed by the Seljuks from Central Asian Turk cave paintings of animals and birds. As the Seljuks moved into Anatolia in the 10th century and adopted Islam they stylized the wings and beaks and developed the Rumi motif. This motif was then replicated and developed around the Islamic world. Motifs are abstract palmettes and stylized flowers. What separates the different Islimi styles are the motifs because they are representations of local plant life. This can make these designs feel like a continuum of the surrounding nature. (Williamson, 2020) What is clearly visible in all types of Islamic arts is the use of the generative logic of nature in combination with religious beliefs and spirituality for artistic expression within the framework of Islamic culture and civilization.

Generative art as Islamic art

In this section, a brief introduction of generative art, its background and contemporary opinions about this emerging field will be made, and then the formal similarities of this particular type of art with the types of Islamic art and some of its contemporary manifestations will be discussed.

An introduction to generative art

There are various definitions and descriptions of generative art in the contemporary world of art. Artists have always explored new media, and computer-based artists are no exception. Generative art, a technique where the artist creates print or onscreen images by using computer algorithms, finds the artistic intersection of programming, computer graphics, and individual expression. (Pearson, 2011, p. 241) Art historians use the term to refer to any art practice in which the artist cedes some control over the final product to a system—like a computer program or machine—that is to some degree autonomous. (Rizzo, 2022) Defined as art that was made entirely or partially using an autonomous system, generative art may take different forms, including music, literature, and computer visuals. Any algorithm, whether mathematical, mechanical, or biological, can describe this system. Nowadays, the autonomous system is usually a machine and algorithm that generates AI art. However, the term in a broader historical sense refers to any non-human entity that is capable of independently choosing aspects of a piece of art that would normally require a direct choice from the artist. The artist or creator may frequently assert that the whole generative system

embodies their original artistic concept. However, there are instances where the machine completely steps into the role of the artist or creator. Besides being a visual medium, generative art has also found applications in other fields such as music (John Cage, Brian Eno) and architecture (Michael Hansmeyer). (Hencz, 2021)

As a movement, generative art evolved after modern art avant-guarde experiences praising the chaos and unpredictability, from Dadaism to Surrealism. Designers and artists began to experiment with analog devices and mechanical systems already in the 1950s. They were the forerunners to the works of digital art pioneers who would come after in the 1960s. Surprisingly, these early pioneers were scientists and engineers working at university laboratory facilities, as they had access to sophisticated and powerful computing resources there. In the 1970s, generative art started to evolve beyond the walls of computer labs and spilled over to the greater art world. The phrase quickly came to refer to geometric abstract art in which simple components were repeated and altered to create more intricate patterns. Artificial intelligence is now primed to disrupt the realm of visual art. AI art generators will also challenge artists to reconsider their relationship with art. It is not the matter of competition, but embracing new technologies and collaborating with machines. The combination of human ingenuity and the possibilities provided by AI will result in perhaps the most unique artworks we have yet to witness. (Hencz, 2021)

Despite the relatively long history of generative art, many people involved in the art world are still skeptical about this area because generative art refers to any art practice where the artist creates a process, such as a set of natural language rules, a computer program, a machine, or other procedural invention, which is then set into motion with some degree of autonomy contributing to or resulting in a completed work of art. The simplest argument against generative art is that it is not the artist who actually creates something, but the software itself. This point of view has caused many controversies regarding "artist's rights" in this field of art. (Arlot, 2017). In addition to what has been said, in recent years, one of the most important reasons for the opposition of the art community to this field of art is the emergence of A.I in creating new forms of works of art, which cannot be easily distinguished from works made by real artists. For this reason, in addition to the fact that many artists do not consider the works produced in this genre to be art, the creators of these works, who are

mostly software engineers, do not consider themselves worthy of the "artist" label. (Chambers, 2020)

Formal similarity of generative art and Islamic art

There is a very interesting relationship between generative, computer-programmed art and Islamic art starting with the simple fact that in both patterns and numbers underlie everything (Behiery, 2013) In addition, due to the increasing demand for the international desire for localization - against the increasing globalization - on the one hand and returning to natural forms on the other hand, especially in Islamic countries, there has been a great demand for tools and products that are either logical in their design. The nature is used or there is such a feature in their appearance and decorations. Clearly, parametric design software is in high demand. This issue can be seen more clearly in Muslim countries, which have a historical record of using abstract and fractal art, which are very similar to generative art. (Ranjazmay Azar, Bemanian, Mahdavinejad, Körner., & Knippers, 2023, p. 2) Today, there are many online tools available for free generative art development, including Runway, ML Deep Dream Generator, ArtBreeder, StarryAI and Fotor.

As it is clear from the name "Generative Art", the basis of this art of generative forms is based on algorithmic logic, which is rooted in the use of genetic algorithm and fractal art pattern. The basis of this art is the systematic repetition of forms based on linear or non-linear dynamic systems, which derive their identity and nature from the special characteristics of nature. This art genre is very similar to what we know as the manifestation of Islamic arts, both because of the type of artists that include mathematicians, engineers, and architects, and because of the use of nature as a source of inspiration. In a way, maybe if the current digital medium was available to Muslim artists before the modern era, maybe they would have produced generative art.

Conclusion: A bridge to the future

On the level of metaphysics, Islamic art aspires to the highest principles. It acts as a bridge or vehicle to transmit the realm of heaven into our physical world. This metaphysical inspiration, however, cannot be fully explained in rational terms. Traditional art is a reminder of a higher state of being; it is a support for contemplation. All traditional art forms are representations of higher models. They are symbols on

earth of the essence of the archetype which is in heaven. It is this contemplative nature of traditional Islamic art which removes it from the constraints of time and place. It is through the understanding of this fact that the contemporary artist can draw not only physical but also spiritual inspiration to form a basis for his art. These timeless values will truly provide the freedom from social constraints and psychological pre-occupation which every artist searches for in his work. (Azzam, 2002)

The language of Islamic art should not be perceived as solely transmitting an aesthetic message. It is a fact, however, that our contemporary perception of this art has been somewhat distorted. The qualitative nature of Islamic art has been relegated to the periphery and its quantitative character has become the sole means of understanding this art. The rational approach reduces all spiritual values to the human plane, explaining only the historical context of Islamic art with no reference to its most important aspect; its spiritual content.

Such a perception would limit our understanding to a purely outward appreciation limited to the sensory world. In fact the message of Islamic art is synonymous with every aspect of man's life which has a physical reality but also a metaphysical principle which underlies this reality. This is reflected in Islamic spirituality by the Divine names Al-Zahir and Al-Batin. It is these two Divine characteristics / principles which maintain the equilibrium of the hidden and revealed character of Islamic art which by extension has an impact on our physical and spiritual levels of being. The language of Islamic art is a contemplative one and by nature contemplation is a spiritual activity.

Based on what has been said, Islamic art is considered to be a kind of fractal art in terms of form, and considering that emerging generative art produces this type of art form in the latest form and using the most up-to-date mediums, considering the formal similarity of this Art with Islamic arts can be used in this new field of art as an aesthetic bridge between the distant past and the future, a contemporary form of Islamic art with a new tool. There are fundamental problems in this path, the most important of which is the lack of spiritual dimension in the productions of generito art

of today, because basically the forms of this art are not based on religious expression. For this, it is necessary for the Muslim artist to produce works of art by connecting to religious and spiritual-mystical roots using new tools, the same thing that Muslim artisans have done throughout history to express monotheism artistically.

To start the author, based on the nature of Islamic art, a new concept as ModaUm abstracted from the characteristics of Islamic art with the following coordinates, which may be used as a basis for the production of generative works of art (both digital and non-digital). The manifesto of this concept is as follows:

- The ModaUm artifact is evolvable so that it can be logically improved at any moment.
- The ModaUm artifact is self-replicating. It has a fixed unit whose parts can be produced by repeating the same unit (Self Similarity).
- Although the ModaUm artifact has intellectual complexities (Internal Complexity), but it is easy to use (Easy to Use). In other words, a complex order is created based on repetition. With this description, the ModaUm object has incomplexity.
- The priority in the design and production of ModaUm artifact is Non-Euclidean Geometry derived from nature (Natural Base), for this reason it can be considered a type of design based on biopatterns (Bionic Design).
- ModaUm artifact has self-optimization and compatibility feature.
- ModaUm artifact changes are not in the origin and identity but in the nature.
- ModaUm artifact is timeless and timeless (can be used anytime and anywhere Perpetual). It can be used in any situation and adapts to any environmental situation.
- ModaUm artifact is durable (both mentally and physically sustainable).
- The ModaUm artifact is easily returned to nature and the environment and can be recycled.

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