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SACRED GEOMETRY IN THE HOLY QURAN: AN ETHNOMATHEMATICS STUDY

Wan Norliza Wan Bakar[1]
Junaidi Awang[2]
Nor Asmira Mat Jusoh[3]
Mazni Binti Omar [4]

[1]College of Computing, Informatics and Mathematics, Universiti Teknologi MARA (UiTM), Malaysia,
(E-mail: wliza349@uitm.edu.my)
[2]Faculty of Art and Design, Universiti Teknologi Mara (UiTM), Malaysia
(E-mail: junaidi042@uitm.edu.my)
[3]Faculty of Contemporary Islamic Studies, Universiti Teknologi Mara (UiTM), Malaysia
(E-mail: norasmira@uitm.edu.my)
[4] Faculty of Art and Design, Universiti Teknologi Mara (UiTM), Malaysia
(E-mail: mazni867@uitm.edu.my)

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Abstract: *Sacred geometry is defined as certain geometric shape or geometric proportion that is associated with the belief of divine creator of the universal. The geometry used in the design and the construction of religious structures such as mosques, churches, temples, religious monuments, altars and tabernacles has sometimes been considered as sacred. This paper studied the sacred geometrical shapes described in mushaf al Quran Rassam Uthmani which can be analyzed through the lens of ethnomathematics, a field of studies that traced mathematical elements of a culture. This qualitative study used triangulation method of documentation, interview, and observation. Results showed that few shapes were found, and they are comprised of rectangle, triangle, spiral and kite shape. The designs have their own character and were arranged in tessellation and reflection. The philosophy that lies in the creation of the shapes are stability, discovery between self and revelation, eternity and upgrading the knowledge in the world and hereafter. Future research can be made on other sacred geometry shapes to explore the meaning besides the design.*

Keywords: *Sacred Geometry, Holy Quran, Ethnomathematics*

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Introduction

Islam, an Arabic word meanings 'surrender' is a monotheistic religion developed in the 7th century based on the prophecies and teachings of prophet Muhammad. Followers of the belief system are known as Muslims meaning 'one who submits'. The Muslims believe in Allah, one God that created the universe, whom he revealed his messenger the Angel Gabriel to the prophet Muhammad who transmitted the truth of Islam which were compiled into the Quran, the scared text of Islam.

Al Quran literally meaning as 'the recitation' is the central religious text of Islam revealed by Allah to mankind.it is the sacred writings of Islam revealed by Allah to the Prophet Muhammad during his life in Mecca and Medina. The Quran emphasizes the oneness of Allah, the importance of faith, and the concept of monotheism.it outlines the purpose of human existence, which is to worship and obey Allah. The Quran provides guidance on moral values such as honesty, justice, kindness and compassion. The Quran encourages the knowledge and science and the appreciation of nature as the signs of Allah's greatness.

One of the knowledge areas that has been mentioned in the Holy Quran that has been studied by scholars is mathematics, the branch of abstract science of number, quantity and shapes (Narimah et al., 2017). The Holy Quran has mentioned few concepts of geometry such as line and angle.it was started by introducing the concept of day and night which has been stated in Al Hajj Verse 61-62:

'So shall it be because it is Allah who causes the night to emerge out of the day and causes the day to emerge out of the night and Allah is All- hearing and All-seeing'

And the concept of straight line that divided the day and night has been mentioned in Al Baqarah Verse 187:

'And eat and drink until the white thread (of dawn) becomes distinct to you from the black thread (of night)'

The concept of straight line has been applied in the building of Kaaba, a pilgrimage place in Saudi. The Kaaba has been built by the Prophet Ibrahim with the shape of cuboid where the height is 13.1 meters, the side is 11 meters, and the other fore shortened side is 12.8 meters.

The orbit of sun and the moon has been mentioned in the Holy Quran in Ar Rahman verse 5:

'The sun and the moon travel with precision'

The image of the angle can be seen in an eclipse where the moon, sun and earth are aligned and produced two rays that have an end points.it has been explained in Al Qiyamah Verse 7-9:

'And when the eye shall be dazzled and when the moon shall be eclipsed, and the sun and the moon shall be united (in the eclipse)'

Few concepts of geometries have been mentioned in the Holy Quran in Sura Al Qamar Verse 49:

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'Everything we created is precisely measured'

This beautiful creation of Allah has been applied by the Muslims in their daily life and being studied by scholars through the lens of ethnomathematics, a field of study that understand, explain, study and deal with community groups the idea of mathematics practiced in a certain way according to their cultural context (Orey, Rossa 2015).

One study had been carried out by an Egyptian researcher about the law of Golden Ratio that had been mentioned in Sura Al Qamar Verse 49. It is being proved that all the creations are being measured by the law of Golden Ratio that is equivalent to 1.618. In another word, the regular universe and the balanced presence are not created in vain, but they are created according to one specific system indicating the greatness of Allah (Moran, F., 2023). It can be seen in the creations of human and animal's body. The muslims then further applied it in the creation of the dome and the mosques (Salamah, 2019).

A study done by group of researchers, (Kusno, Setyaningsih, & Kusuma, 2022) found that at Baitu Usyaqil Qiran Mosque in Banyumas Regency Indonesia the prayer rugs, mosque reliefs and covers of manuscripts contains various transformational geometry concepts such as symmetry, reflection, translation, rotation and dilation (Pramudita & Rosnawati, 2019).

As a continuation of the knowledge that have been revealed we plan to conduct research on the design of the mushaf in the Holy Quran, as an example of a clear implementation of the line symbols that have been recorded, in the hope that in the future of this work will be further studied by others to increase faith in Allah, The Almighty.

Literature Review

Al Quran is the central holy book of Islam. It is the word of Allah that has been revealed to prophet Muhammad to be spread to all Muslims around the world. It has been written and read only in Arabic for more than 1400 years. There are 30 parts of al Quran which make 114 suras(chapters), where each sura has a different number of verses. 87 of these suras revealed in Mecca and 27 suras revealed in Medina.

The verses of al Quran speak about many different topics. the topics are the Islamic law and the role of humans as caliphs on earth, the history of bani Israel, legal law related to women, faith in Allah, proof of the monotheism of Allah, prophet hood ,the hereafter ,the story of the prophet and their people, spoils of war, the nature of hypocrites, the principle of monotheism and belief in polytheism, the story of prophet Hud and his people, the story of prophet Yusuf, the thunder ,the preaching efforts and the attitude of the prophets when facing their respective peoples, the pressure of muslims enemy in Mecca ,Allah's gift and the obligation to be grateful, the knowledge and the creation of Allah to show his greatness.

The Holy Quran mentioned mathematics, an abstract science of number, quantity and shapes or geometry which stands on its own or can be applied to other fields. Geometry deals with shapes, angles, dimensions and sizes of a variety of things in everyday life. The shapes of geometry are circle, rectangle, triangle, ellipse, square, parallelogram, rectangular, cone cylinder, star, trapezoid, rhombus, cube, pentagon, hexagon, heptagon, octagon and decagon (Dafrina, Fidyati, Abadi, & Lisa, 2022). The angle of geometry is a geometrical figure formed where two rays meet at a common point called vertex (Pimm et al., 2007).

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(Umar Farookh, n.d.) concluded that Muslims has turned the revelations of the holy Quran to the practical sciences which would yield them an immediate profit either in private individual life or in religious life of the community such as mathematics, science and astronomy. The science of mathematics was required because it enabled them to calculate inheritances and prepare calendars (Fakharany, 2024). The geometry Is needed because all the mosques in the world are oriented towards the Qibla, the mehrab or prayer niche in mosque indicate direction of qibla (Risdiyanti et al., 2024). Islamic tradition further prescribes that person who recite Quran, announcing call to prayer or azan and the ritual slaughter of animal for food should stand in the direction of Qibla.

In al Baqarah 2:144:

'Now shall we turn thee to a Qibla' that shall please thee turn the face in the direction of sacred mosque'

And the words of the Holy Prophet are:

'When you stand for prayer, first make wudu' and stand facing Qibla'

(Sahih Muslim, Kitab-U-Salat)

The Muslims were bound to inquire into geography, mathematics, geometry and spherical trigonometry to determine the direction of Qibla for religious purposes. (Dallal, 1995) has done a study on finding the direction of qibla by calculation. He found that muslim scholars, Ibnu Al Haytham treatise on finding the azimuth of Qibla' by calculation. He provides a universal method for finding the direction of the qibla at any location on the surface by using spherical trigonometry and accurate calculation.

Geometry deals with shapes, angles, dimensions and sizes of a variety of things in everyday life (Pritchard, 2003). Islamic architecture has turned sacred geometry concepts based on aesthetic proportion in nature to the art of Islamic architecture and decoration. The research done by Prof Dr Hayam Mahdy Salama (2019) found that Islamic architecture and decorations are all based on the golden ratio (with the value of 1.618) of mathematical and geometrical basis which is connected to universal sacred geometry and makes it harmonious with the surrounding universe.

Few scholars have studied the sacred geometry architectural buildings such as mosque that have their own values and philosophy. They have made an exploration on a mosque building and its ornaments. The research location was the great mosque of Cimahi. The results show that the ethnomathematical concept on the mosque building is related to geometry and algebra (Purniati et al., 2020).

Another study carried out by Brunei scholars to explore the mathematical elements in the architectural design of Sultan Omar Ali Saifuddin Mosque. They found some interesting elements of characteristic mathematical patterns in the architecture of Sultan Omar Ali Saifuddin Mosque.

Later on (Kusno, Setyaningsih, & Kusuma, 2022) has studied the Baitu Usyaqil Qiran Mosque and Pesantren Darussalam Banyumas regency. They studied the materials from objects around

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the mosque like rugs, mosque reliefs and covers of the quranic manuscripts. The result showed the prayer rugs mosque reliefs and covers of manuscripts contain various transformational geometry concepts such as symmetry, reflection, translation, rotation and dilation.

(Awan N.M., 2009) studied the sacred geometry in the Holy Quran and found that few geometrical elements stated.in the Holy Quran there is the determination of sacred direction of Qibla whose goal is in specific direction. He found that an Islamic mathematician, Al Biruni, had extended the research following with what has been mentioned and wrote it in Fi Tariq Ul Asmaili Muarifa Simit E Qibla Waghera (the determination of direction of qibla. (Dallal, 1995) further the study on azimuth of the qibla by calculation. He used spherical trigonometry and accurate calculation.

An exploration on gate ornaments of The Sumenep Jamik Mosque has been carried out by Muhamad Zia Alghar and Marhayati (2023). They found that Jamek Sumenep Mosque was built to emphasize the acculturation of Chinese, Islamic and Madurese Cultures. The length and size of the ornamental parts form the basis of fractal geometry in the mosque gateways ornamentation.

(Shahbari & Daher, 2020) carried out an ethnomathematical study on Islamic ornamentation. The main result indicated that the students succeeded in constructing the Islamic ornaments by using the concept of congruence and congruent triangles.

Methodology

This research aims to identify sacred geometry in the holy Quran. A design of mushaf Al Quran Ressam Uthmani has been chosen. A visual analysis of the design was made. It was followed by an interview's session with lecturer in the Faculty of Islamic Contemporary on the philosophical value of designed. The input obtained was analyzed to understand the geometrical characteristic of the mushaf Al Quran.

Result and Discussion

The objective of this study is to identify sacred geometry in the Holy Quran. Hence qualitative study method is used. Data analysis gathered from the triangulation method of observation and analysis of Mushaf Al Quran Rassam Uthmani that has been illustrated in the Holy Quran. Then an interview session was held to gather in depth information about the design.

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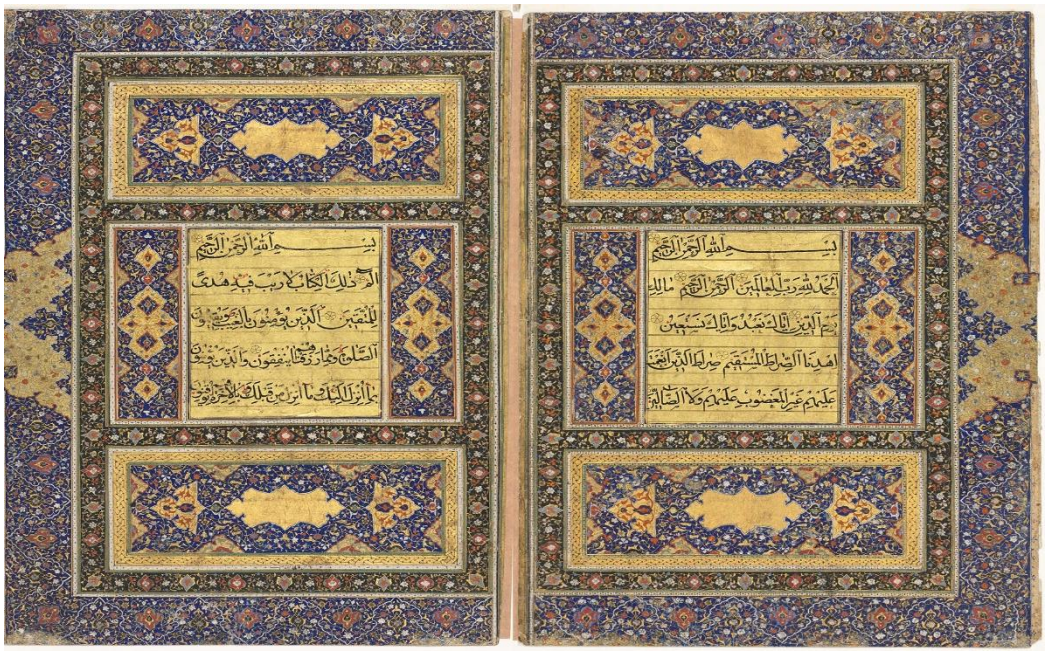

Figure 1: Full View of Mushaf Al-Quran Rassam Uthmani

Mushaf Al Quran Rassam Uthmani is a version of Al Quran published by Uthman Ibnu Affan. 'Mushaf' means the cover of a book but in this context, it refers to the whole Quran. When the Syams and Iraq united to conquer Armenia and Azerbaijan, Hudhaifa bin al Yaman met with Uthman Ibnu Affan because he was afraid of the difference in the way of reciting the Quran between the Syams and Iraq. Therefore, Uthman Ibnu Affan sent a message to Hafsa saying "Send the suhuf to us so that we can complete the materials of the Holy Quran in a perfect copy, and we will return the manuscript to you".

After the manuscript was received Uthman ordered Zaid Bin Thabit, Abdullah Azzubair, Said Bin Al Has, Abdul Rahman Bin Hari bin Hisham to rewrite the manuscript in a perfect copy. The full view of mushaf al Quran Rassam Uthmani shows that the design of the illustrations is divide into three parts.

Figure 2: First Part of Mushaf Quran Rassam Uthmani

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The first part of Mushaf Quran Rassam Uthmani is built by the design of a rectangle, which is a quadrilateral with 4 right angles of 90 degrees. The opposite sides of the rectangle are parallel and equals and diagonals bisect each other. The philosophy that lies in the creation of rectangle is related to peace. tranquility, stability and honesty.

The rhombus is arranged symmetry in vertical and horizontal. The character of rhombus can be seen by the opposite sides which are parallel and equal. All sides of a rhombus are equal in length and the diagonals bisect each other at right angles. The philosophy in the design of rhombus is about helping each other in a community.

Another special character is the triangle. The triangle is a polygon with three sides having 3 vertices. The sum of the interior angles of a triangle is equal to 180 degrees. The philosophy that lies in the design of triangle is related to the discovery between self and revelation.it also shows the balance between the law of knowledge and religion.

The design of the flowers is spiral which is a curve that emanates from a point moving farther away as it revolves around the point.it is a subtype of whorled patterns, a broad group that include concentric objects. The design of spiral has its own philosophy that means the eternal concept of Allah where there is no beginning and no end.

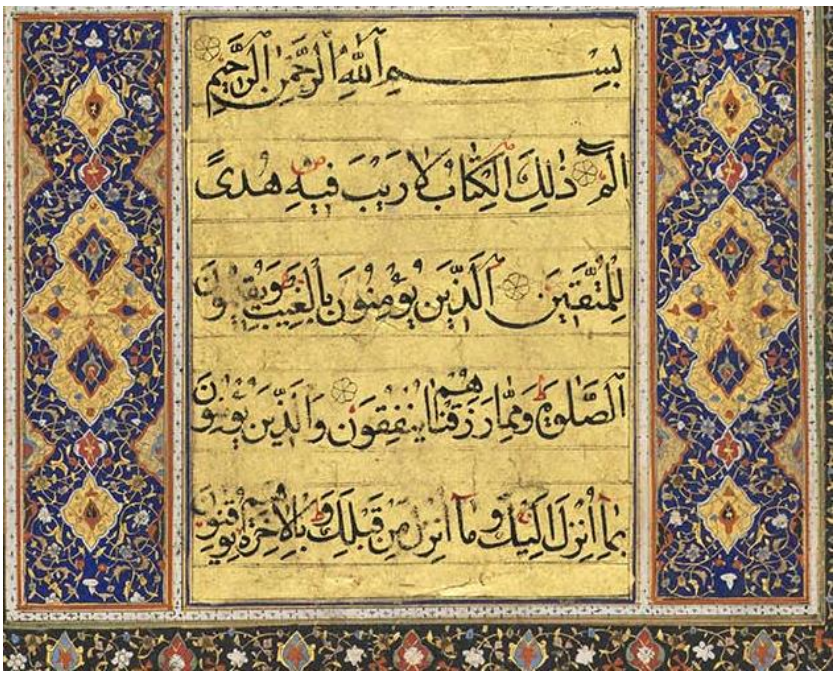

Figure 3: Second Part of Mushaf Quran Rassam Uthmani

The second part of Mushaf Quran Rassam Uthmani is the kite shape. The kite shape in geometry refers to a 2-dimensional shape formed by 2 pairs of sides that are each of the same length and form angle with each other. The rhombus is arranged in reflection. The rhombus is a quadrilateral parallelogram that has 4 sides, and the opposite sides are parallel to each other.

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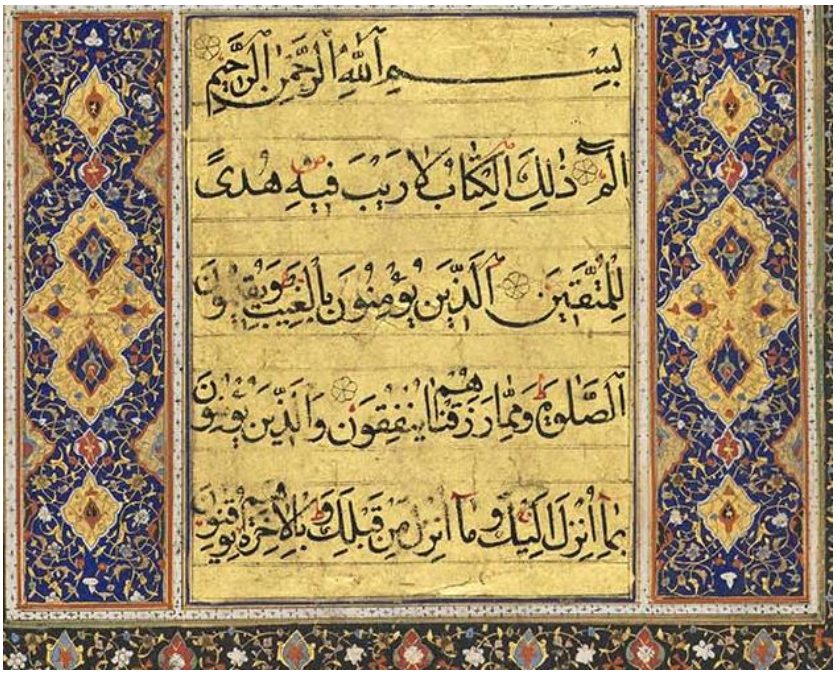

Figure 4: Third Part of Mushaf Quran Rassam Uthmani

The third part of Quran Rassam Uthmani is the same as the first part where it has rectangle, rhombus, triangle and spiral shapes. The rhombus is arranged in symmetry vertically and horizontally while the spiral is arranged in tessellation.

Conclusion

Sacred geometry in Islam which is a certain geometric shape that is associated with the belief of divine creator of the universal that is Allah can be seen in many creations. The mushaf al Quran Rassam Uthmani is the holy book of the Muslims that has the illustration of shapes that is related to Allah. The mushaf al Quran Rassam Uthmani has been analyzed and a few shapes found. They are rectangle, triangle, spiral and kite shape. The designs have their own character and arrange in tessellation and reflection. The philosophy that lies in the creation of the shapes are stability, discovery between self and revelation, eternity and upgrading the knowledge in the world and hereafter.

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Volume: 10 Issues: 69 Special Issue [January, 2025] pp. 60 - 69
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