IDENTIFICATION OF GEOMETRIC PATTERNS IN ISLAMIC ART AND ARCHITECTURE OF THE ABDUL JALIL JATIPURNO MOSQUE, WONOGIRI

Hafidz Mahardika
Program Studi Arsitektur
Fakultas Teknik
Universitas Muhammadiyah Surakarta
hafidzmhdk33@gmail.com

Suryaning Setyowati
Program Studi Arsitektur
Fakultas Teknik
Universitas Muhammadiyah Surakarta
ss207@ums.ac.id

Fauzi Mizan Prabowo Aji
Program Studi Arsitektur
Fakultas Teknik
Universitas Muhammadiyah Surakarta
fmp811@ums.ac.id

ABSTRACT
Islam is a religion that not only brings spiritual and social teachings, but also gives birth to unique artistic and architectural traditions. Mosques as centers of worship, education, and social activities are an important medium in expressing Islamic aesthetic values, one of which is through the use of geometric patterns. These patterns are not merely decorative ornaments, but also have philosophical meanings that reflect the principles of order, unity, and eternity in the teachings of monotheism. This study aims to identify and analyze geometric patterns in the architectural elements of the Abdul Jalil Mosque in Jatipurno, Wonogiri Regency. The method used is descriptive qualitative, with data collection techniques in the form of direct observation, documentation, and interviews. The focus of the analysis is directed at the basic geometric forms, symmetry systems, and the aesthetic and symbolic values of the ornaments used. The results show that the dominant geometric pattern is fourfold symmetry, with basic shapes consisting of circles, rectangles, and repeating star patterns. These ornaments are applied consistently to the facade, mihrab, and other structural elements. This research is expected to become a reference in the development of locally based Islamic architecture and support the preservation of the heritage of Islamic ornamental art.

KEYWORDS: mosque, Islamic architecture, geometric patterns, ornament, Abdul Jalil Mosque

Islam merupakan agama yang tidak hanya membawa ajaran spiritual dan sosial, tetapi juga melahirkan tradisi artistik dan arsitektural yang khas. Masjid sebagai pusat ibadah, pendidikan, dan aktivitas sosial menjadi media penting dalam mengekspresikan nilai-nilai estetika Islam, salah satunya melalui penggunaan pola geometri. Pola-pola ini tidak sekadar ornamen dekoratif, tetapi juga memiliki makna filosofis yang mencerminkan prinsip keteraturan, kesatuan, dan keabadian dalam ajaran tauhid. Penelitian ini bertujuan untuk mengidentifikasi dan menganalisis pola geometri pada elemen arsitektural Masjid Abdul Jalil di Jatipurno, Kabupaten Wonogiri. Metode yang digunakan adalah kualitatif deskriptif, dengan teknik pengumpulan data berupa observasi langsung, dokumentasi, dan wawancara. Fokus analisis ditujukan pada bentuk dasar geometri, sistem simetri, serta nilai estetika dan simbolik dari ornamen yang digunakan. Hasil penelitian menunjukkan bahwa pola geometri yang mendominasi adalah fourfold symmetry, dengan bentuk dasar berupa lingkaran, segi empat, dan pola bintang berulang. Ornamen tersebut diterapkan secara konsisten pada fasad, mihrab, dan elemen struktural lainnya. Penelitian ini diharapkan menjadi referensi dalam pengembangan arsitektur Islam berbasis lokal serta mendukung pelestarian warisan seni ornamentasi Islam.

KATA KUNCI: *masjid, arsitektur Islam, pola geometri, ornamen, Masjid Abdul Jalil*

INTRODUCTION

Islam is a religion that not only brings spiritual and social teachings but also gives rise to distinctive artistic and architectural traditions (Nursalim & Rahayu, 2022). One of the most tangible manifestations of Islamic cultural expression is the mosque (Nurjayanti, 2022). Not only a place of worship, but mosques also serve as centers of education, social activities, and representations of Islamic aesthetic values. Over time, the development of mosque architecture demonstrates an acculturation with local culture,

reflected in the building's form and ornamentation (Safwan, et al., 2023).

One of the prominent characteristics of Islamic architecture is the use of geometric patterns (Nurjayanti, 2023). These patterns are not merely decorative elements but also possess high philosophical value, reflecting order, unity, and eternity as a representation of the concept of monotheism (Syamsiyah, 2020). According to Fitriana (2021), contemporary Indonesian Islamic architecture utilizes the concepts of symmetry and geometry as the basis for forming visual elements. Islamic geometric patterns are formed from a complex blend of

mathematical principles and artistic traditions (Bonner, 2017). Furthermore, a recent study of traditional mosques in Java has shown that these patterns not only present visual beauty but also convey spiritual and educational values, including in ethnomathematics-based mathematics learning (Zuliana, et al., 2023).

Other research also shows that the use of geometric patterns in mosque architecture can be analyzed structurally (Mazloum & Soroush, 2023), such as in a study of the Jamik Mosque in Sumenep. In this study, the ornamentation on the mosque's gate exhibits fractal characteristics that can be understood through the Lindenmayer system approach, illustrating the geometric complexity contained in classical Islamic design that has been adapted to the local context (Wahyuni & Sari, 2022; Alghar & Marhayati, 2023). This demonstrates that geometric patterns are not only a cultural heritage, but also a means of learning and reflection on the order of nature and the greatness of God (Necipoğlu, 1995).

The Abdul Jalil Mosque is one of the largest mosques in Jatipurno District, Wonogiri Regency. Built in 1987, the mosque has not escaped the developments of time and culture, as reflected in its architectural style. To understand how Islamic geometry is applied in the mosque, a study of the geometric patterns in the Abdul Jalil Mosque's architecture is necessary.

This research aims to identify the geometric patterns applied to the Abdul Jalil Mosque in Jatipurno. The benefits of this research include increasing public knowledge about Islamic ornamental art and providing architects with references regarding the use of Islamic geometry in mosques.

METHODS

This research used a descriptive qualitative approach (Creswell, 2014). This approach was chosen because it is appropriate for exploring and understanding the meaning, form, and function of geometric patterns in Islamic architecture in depth, contextually, and interpretively. This research does not aim to test a hypothesis, but rather to identify the geometric patterns found in the architectural elements of the Abdul Jalil Mosque.

Data collection was conducted in a natural setting. Several data collection techniques were used, related to the research aims and objectives, including:

1. Observation: Data collection relies primarily on direct observation. The data obtained consists of actual and factual images.
2. Interviews: Interviews were conducted to obtain information regarding the profile of the Abdul Jalil Jatipurno Mosque.

Once the data is collected, the next stage is data analysis. This stage will identify the geometric patterns found in the mosque's ornaments to determine the basic geometric shapes used.

RESULTS AND DISCUSSION
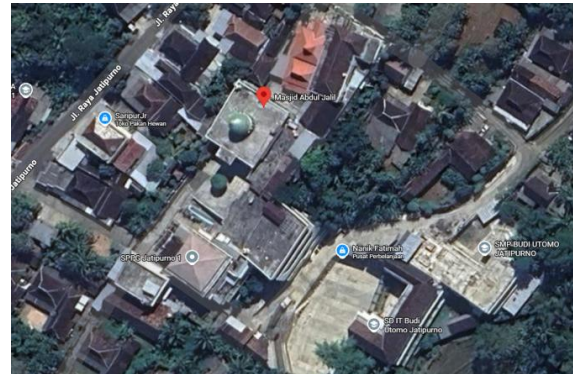
Figure 1. Location of Abdul Jalil Mosque
(source: Google Maps, 2025)

The Abdul Jalil Mosque is located in Pule Hamlet, RT 01/RW 03, Jatipurno District, Wonogiri Regency. Built in 1987 by the Jatipurno LDII PC, the mosque was renamed the Baitushoffa Mosque. In 2021, the mosque underwent renovations to become the Abdul Jalil Mosque, which was completed in 2023. During the renovations, worship services were moved to the Bairuha' Islamic Boarding School hall next to the mosque. In addition to serving as a prayer hall, the mosque also serves as a place for religious study for local residents and for Islamic boarding school activities. Near the mosque, there are also early childhood education (PAUD), elementary school (SD), and junior high school (SMP) under the auspices of the Budi Utomo Jatipurno Foundation.

Figure 2. Façade of Abdul Jalil Mosque
(source: Author's Document, 2025)

The mosque features ornamentation using geometric patterns across nearly the entire facade. Geometric patterns are also found in the design of the mihrab (prayer niche), pillars, and dome, all featuring

similar ornamentation. The ornaments used are manufactured in East Java. The floors and walls are 60x100 granite. Here are some documented photos of the ornamentation at the Abdul Jalil Mosque:

Figure 3. Design of the Mihrab
(source: Author's Document, 2025)

**Figure 4.** Design of the column
(source: Author's Document, 2025)

Figure 5. Design of the facade
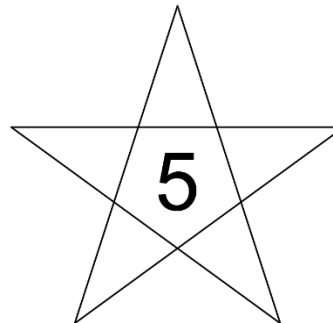(source: Author's Document, 2025)

Analysis

The basic shapes used in creating ornaments are circles combined with squares and circles combined with triangles (Pramono, 2011). Broadly speaking, the three categories of geometric design patterns commonly found in Islamic art are:

1. Fourfold: this is a pattern that can be based on dividing a circle into four equal parts.
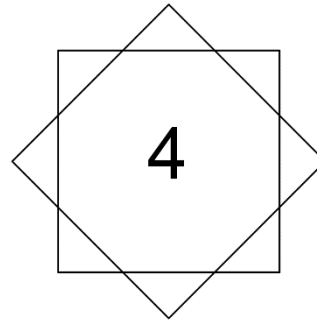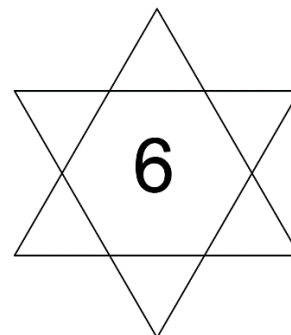

Figure 6. Fourfold pattern
(source: Author's Document, 2025)

2. Fivefold: this is a pattern that can be based on dividing a circle into five equal parts.

Figure 7. Fivefold pattern
(source: Author's Document, 2025)

3. Sixfold: this is a pattern that can be based on dividing a circle into four equal parts.
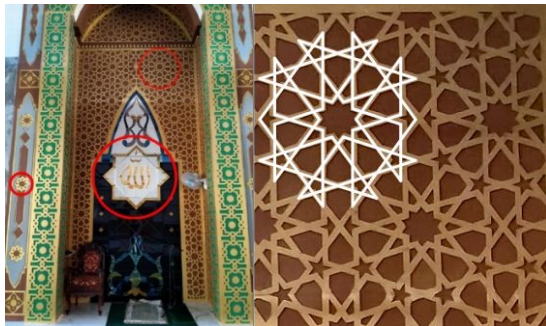

Figure 8. Sixfold pattern
(source: Author's Document, 2025)

In addition to these three categories, there are several others based on the number of division patterns within the circle (Critchlow, 1976). Based on these categories, the author analyzed the ornaments

of the Abdul Jalil Mosque to determine the geometric patterns used in the ornaments.

1. Mihrab Ornaments

In the mihrab, 3 ornaments appear to use geometric patterns.
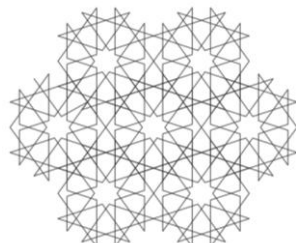

Figure 9. Mihrab Ornaments

(source: Author's Document, 2025)

The ornament above features a fairly complex pattern. Based on the author's analysis, this ornament uses a ***Tenfold*** pattern, with a basic shape consisting of two pentagons. Here's the process of exploring the geometric pattern:

Figure 10. Analysis of the Geometric Patterns of Mihrab Ornaments

(source: Author's Document, 2025)

Figure 11. Example of Pattern Application

(source: Author's Document, 2025)

The other two mihrab ornaments share the same geometric pattern: the **Fourfold** pattern. This pattern

is instantly recognizable because it uses only basic shapes without any other geometrical variations.

Figure 12. Mihrab Ornamental Pattern

(source: Author's Document, 2025)

Figure 13. Mihrab Ornamental Pattern

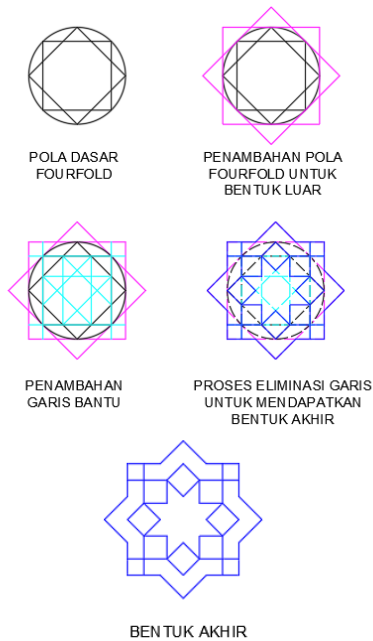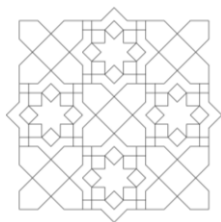(source: Author's Document, 2025**)**

2. Pillar Ornaments

Figure 14. Pillar ornaments pattern

(source: Author's Document, 2025)

The ornamental pattern above is the most common geometric pattern found in most mosque ornaments, especially in decorative elements that emphasize harmony and repetition of form. Based on the author's

analysis, this ornament utilizes a combination of two complementary **Fourfold** patterns, where one pattern is used to form the inner structure and the other is used to strengthen the outer form. The combination of these two patterns creates a stable geometric arrangement while still maintaining visual dynamics. Overall, the process of exploring the shape is relatively easy because the basic structure of the pattern is not as complex as the ornament on the mihrab, which usually has a denser composition and more complex details. Thus, the geometric exploration can be done gradually through repetition of the basic shape, alignment of lines, and adjustment of proportions. The complete process of exploring the geometric pattern is described as follows:

POLA DASAR FOURFOLD — PENAMBAHAN POLA FOURFOLD UNTUK BENTUK LUAR

PENAMBAHAN GARIS BANTU — PROSES ELIMINASI GARIS UNTUK MENDAPATKAN BENTUK AKHIR
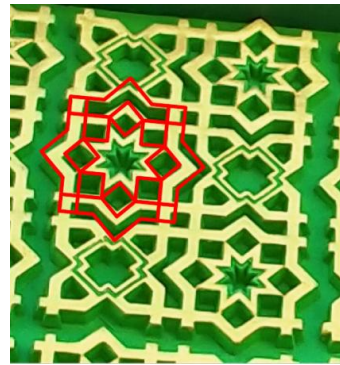
BENTUK AKHIR

Figure 15. Analysis of Geometric Patterns of Pillar Ornaments
(source: Author's Document, 2025)

Figure 16. Example of Pattern Application
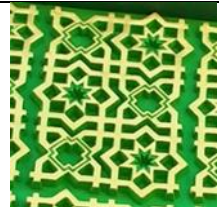(source: Author's Document, 2025)

3. Facade Ornaments

The ornamental forms used on the facade are the same as those on the pillars. The difference is that the facade has gaps or spaces between each ornamental pattern.

Figure 17. Facade ornament pattern
(source: Author's Document, 2025)

From the results of the analysis that has been carried out, the following data was obtained:

Table 1. Geometric Ornaments

Photo	Geometric Patterns
Mihrab ornaments	Tenfold patterns
Mihrab ornaments	Fourfold patterns
Mihrab ornaments	Fourfold patterns
Pillar ornaments	Fourfold patterns
Facade ornaments	Fourfold patterns

CONCLUSION

Based on the analysis above, it can be seen that the ornaments in the Abdul Jalil Mosque have similar geometric patterns and show strong visual consistency across its various architectural elements. The various types of geometry applied are dominated by the use of **Fourfold** patterns, which almost always appear in every ornament, whether on wall elements, room dividers, or other decorative details. The dominance of these patterns indicates an aesthetic preference that emphasizes order, balance, and the principles of symmetry that are characteristic of Islamic geometric art. In addition, calligraphic ornaments are also found in the mihrab area in the form of the phrase "ALLAH" combined with fourfold geometric elements, thus creating a harmony between spiritual expression and visual beauty. This integration between calligraphy and geometry simultaneously emphasizes the artistic identity of the mosque and shows how decorative elements are used not only as visual sweeteners, but also to strengthen the religious values contained within it.

REFERENCES

Alghar, M. Z., & Marhayati, M. (2023). Exploration of fractal geometry in gate ornaments of the Jamik Sumenep Mosque using the Lindenmayer System. *Indonesian Journal of Science and Mathematics Education, 6(1), 20–30.*

Bonner, J. (2017). *Islamic Geometric Patterns: Their Historical Development and Traditional Methods of Construction*. Springer.

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4th ed.). SAGE Publications.

Critchlow, K. (1976). I*slamic Patterns: An Analytical and Cosmological Approach.* London: Thames & Hudson.

Fitriana, I., & Nurlaela, L. (2021). Geometri dan simetri dalam arsitektur Islam kontemporer Indonesia. *Jurnal Arsitektur Pawon*, 5(2), 45–55.

Mazloum, M., & Soroush, S. (2023). Geometrical origin of generative shape grammars for Islamic tectonics. *Nexus Network Journal*, 25, 545–568.

Necipoğlu, G. (1995). *The Topkapi Scroll: Geometry and Ornament in Islamic Architecture.* Los Angeles: The Getty Center for the History of Art and the Humanities.

Nurjayanti, W (2022). Historical, Philosophical, and Contextual Values in Al-Wustho Mangkunengaran Mosque, Surakarta. *Journal of Islamic Architecture.*

Nurjayanti, W (2023). Sustainable Islamic Architecture in Settlements and Their Environment in Surakarta. *Journal of Islamic Architecture*.

Nursalim, M., & Rahayu, S. (2022). Etnomatematika pada arsitektur tradisional Indonesia: Kajian sistematis pada pola dan bentuk geometris. *Jurnal Etnomatematika Nusantara*, 4(1), 30–42.

Pramono, A. (2011). Pola geometri pada seni dan arsitektur Islam di Andalusia. *Journal of Islamic Architecture*, 2(1), 1–8.

Safwan, M., Zulfikar, T., & Ramadhana, M. (2023). Konsep simetri dan geometri pada elemen arsitektur Masjid Harun Keuchik Leumik. *Jurnal Serambi Engineering*, 8(2), 105–113. p/jse/article/view/166

Syamsiyah, Nur Rahmawati. (2020). Kajian perbandingan gaya arsitektur dan pola ruang masjid agung surakarta dan masjid gedhe kauffman Yogyakarta. *Jurnal Arsitektur*.

Wahyuni, A., & Sari, A. R. (2022). Geometri fraktal pada ornamen gerbang Masjid Jamik Sumenep menggunakan sistem Lindenmayer. DEFERMAT: *Jurnal Pendidikan Matematika*, 5(1), 20–27.

Zuliana, E., Suprapto, S., & Afriani, D. (2023). Pola ornamen geometris pada masjid tradisional Jawa dan potensinya dalam pembelajaran matematika. *Indonesian Journal of Science and Mathematics*