

# Grid Method Classification of Islamic Geometric Patterns

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## ABSTRACT

This paper proposes a rational classification of Islamic Geometric Patterns (IGP) based on the Minimum Number of Grids (MING) and Lowest Geometric Shape (LGS) used in the construction of the symmetric elements. The existing classification of repeating patterns by their symmetric groups is in many cases not appropriate or prudent [Joy97]. The symmetry group theories do not relate to the way of thinking of the artisans involved, and completely has ignored the attributes of the unit pattern and has focused exclusively on arrangement formats. The paper considers the current symmetric group theories only as arrangement patterns and not as classifications of IGP since they have a "global approach" and have failed to explore the possibilities in the construction elements of IGP. The Star, a central Rosette, which is the most important element of IGP, forms the core of our study. The paper proposes new nomenclature to be used in the description of the unit pattern based on the MING and LGS used in the construction of a Star/Rosette pattern that can be used to achieve the final design. We describe and demonstrate procedures for constructing Star/Rosette unit patterns based on our proposed classification in a grid formation dictated by the final design of the unit pattern.

**Keywords :-** IGP, MING, LGS, Grid, Classification, Group Theory, Star/Rosette.

## 1. INTRODUCTION

Islamic artisans began to adorn the surfaces of palaces, mosques and minarets with IGPs more than thousand years ago [Sai76]. The geometric designs consistently filled the surface planes with star-shaped like regions that resulted in very highly visual symmetric patterns, which would henceforth be referred to as "Islamic Geometric Patterns". These geometric patterns have often presented a long-standing historic awe to group theorists who have endeavoured to present a prudent classification of these structures. Many attempts that have been made to classify the Star/Rosette patterns have resulted in a wide variety of construction groups and classifications. Grünbaum and Shephard tried to decompose these geometric patterns by their symmetry groups after obtaining the base region,

which they had used to arrive at the properties of the original pattern [Gru92]. European group theorists like Denodney have proposed a classification based on reflecting lines off to periodically placed circles [Den93]. Lee has presented simple constructions for the common features of IGPs but has failed to present a benchmark classification theorem [Lee95]. Also one important aspect of IGPs that has failed to attract any kind of classification is the naïve extension of lines into interstitial regions. We have had a good look into the existing complexity to the inferred geometry in order to describe the relation of the extension region with the unit pattern. S.J. Abbas and A. Salman in their landmark thesis on *A Symmetries of Islamic Geometrical Patterns* were of a firm opinion that no worthwhile classification of IGPs has been taken up to this day with specific focus on their construction [Abb95]. This paper presents an argument that popular and existing symmetry groups like the "7-fricce groups" and the "17-wallpaper groups" are purely base models. A more finer and refined classification based on the study of the construction of the unit pattern is required with specific focus on the gridding system of the unit pattern. The accomplishment of the unit pattern by the MING, LGS and the infinite number of possibilities this classification presents by way of permutations and combinations of the grids are huge.

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