Analytical Study of Muqarnas Formations in Islamic Architecture According to Digital Simulation

Dr. Ola M. Mohammed Ahmed

Interior architecture department - Faculty of fine arts, Alexandria University

FA.OLA.MOHAMED@alexu.edu.eg

Abstract

The history of Islamic architecture gives great features to the rich Islamic heritage through muqarnas, which formed interior spaces with their intricate and brilliant architectural ornaments. Muqarnas plays a central and vital role in aesthetic architecture, an element, which belongs to architecture and ornamentation. The geometric and ornamental analysis of Islamic art raises new interest in digital and algorithmic modeling, as well as new horizons in muqarnas formation. Muqarnases incorporate among their elements harmonious blocks and lines, and mathematical design, which perform a specific architectural function and an aesthetically ornamental role. The research seeks to link the originality of the past and the modernity of the future, in addition to studying the role of digital design, algorithmic systems, and various generative geometries in the evolution of the muqarnas, which is one of the progressive features of Islamic architecture. This study attempts to translate it into a modern language with innovative patterns and the effectiveness of their connection with digital and algorithm architecture. The paper presents an analytical study of traditional muqarnas patterns in Islamic art and their evolution by determining the logic and rules of muqarnas patterns using digital algorithms through digital design. In addition to controlling classical ornamental patterns of muqarnas by coding and programming in computational design. Thus, overcoming the gap between classical ornamental patterns and the flow of the digital design. The main concern is digital software which can be used to facilitate the design process and visualization of virtual models of muqarnas. The formation of three-dimensional muqarnases may provide new insights for mathematics to analyze the shape and create innovative patterns in the digital age.

The problem with the study is that it does not clarify modern methods of digital algorithms in the discovery of a modern architectural style for Islamic art, which contributes significantly to enhancing muqarnas. This analysis encompasses the studies of muqarnases through concept and historical evolution as well as structural and algorithmic analysis, on the other hand.

The research supplies a new approach to the characteristics of muqarnas through computational logic and establishes digital modeling of muqarnas through digital algorithms to produce different design patterns. The main concern of the research is to study the theoretical principles of digital algorithms for the identity of muqarnas through algorithmic rules and digital patterns. Therefore, we conclude the value of analyzing digital algorithms, which are often used to develop muqarnas, since Islamic architecture has endless possibilities for future design innovations. Therefore, this study firstly reviews earlier approaches to the analysis of geometrical and conceptual principles of muqarnas.

Secondly, the research interprets the recommended scheme through a series of digital experiments and algorithmic forms. During these experiments, this study asks whether mathematical and algorithmic equations contribute to developing muqarnas. It can also be influential in the transfer and revival of Islamic structural philosophy to other civilizations'

countries. It is therefore very important to stimulate the geometric approach of traditional Islamic architecture with modern digital tools in order to keep up Islamic heritage with the evolution of computational design thought and adapt it to reality.

Keywords