

## **Parametric Design Algorithms and Their Impact on modern Lightning Units Design**

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### **Abstract:**

The main objective of this research is to introduce parametric design algorithms and mathematical tools derived from them, which had a great impact on modern technology tools such as engineering drawing programs used in the design and output of geometric decorative patterns under study and it helps future designers in understanding and absorbing these programs for use and benefit from them in their design work, To do this, we will be interested in this research by first defining the parametric design and clarifying its characteristics and formal and functional features to clarify the difference between them, and this is followed by the definition of the methodology used to apply parametric design, and because this study is mainly concerned with geometric motifs in parametric design, we will be interested in scarcity and study of geometric patterns and their form, then the definition of algorithms used in parametric design and benefit from them in the introduction of methods drawing decorations in modern engineering programs, in addition to that definition of the types of basic engineering algorithms used in drawing parametric patterns, and we started first by explaining the Voronoi algorithm, which is the most widespread type of algorithms and studying and clarifying the illustration scheme for the way it was drawn, and the Delaunay algorithm is an illustration scheme for the method of drawing, which is also one of the most algorithms used in drawing parametric decorations, and even extended until they combined them as the two most used types and the combination of the two schemes to add diversity to the inferred decorations with clarification in steps How to use and integrate these methods together , then study the algorithm of swarms and their elements, how to study them, the steps of their application, and finally the algorithm of genes and its elements, as these algorithms are the most studied algorithms and used in modern technology tools, and thus included in computer programs to create patterns of parametric geometric motifs.

**Research Problem:** The research problem stems from the student's desire to expand the study of parametric design and introduce future designers to how this trend arose and the definition of its work steps and mathematical and engineering algorithms that contributed to its spread, which aroused the interest of technology designers and thus the innovation of technological engineering programs and mathematical tools for drawing and computer manufacturing, in addition to benefiting from these studies and algorithms and introducing them into the process of designing and innovating engineering decorative motifs in Islamic art and integrating the algorithms for building these shapes and direction Parameters and try to take advantage of them and subject them in the creation of new decorative units for lighting units.

**Research Importance:** The importance of this research lies in the definition of parametric design algorithms and their work steps and modern mathematical and technological tools and benefit from them in influencing the analysis and innovation of designs of geometric decorative patterns and adapting them into new lighting units and This goal achieved will be through the development of mathematical models of different historical decorative patterns, and the transformation of those models into computer programs that can produce designs within those patterns and we will try to clarify and analyze the principles and techniques that can be applied in general to parametric decoration patterns through these algorithms, and the roles played by psychology, mathematics and computer in creating and the formation of these patterns.

**Research Methodology:** Descriptive method, Deductive method.

**Research Results:** Parametric design depends on mathematical and engineering algorithms in analyzing environmental and natural shapes and building decorative patterns and benefiting from them in design processes. Definition of algorithms and their concepts helped athletes in the development of engineering drawing programs using the computer and enrich the engineering tools used in these programs, which is what this research addressed to introduce future designers to these tools and facilitate their perception of these tools and enrich their perceptions to be used in innovation and design processes. The great convergence between the engineering algorithms that benefited from the parametric design and the engineering and mathematical methods invented by the Islamic artist from thousands of years and explain the aspects of convergence and how to benefit from them.

### **Keywords :**

Parametric design algorithms, pattern algorithms, parametric pattern constructions.

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### ***Paper History:***

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