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Algorithmic Zellige: Digital Preservation and Creation of Geometric Heritage

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Abstract

Moroccan zellige mosaics are based on crystallographic symmetries [1], but their beauty lies in the balance between strict geometric constraints and artisanal choices related to colors and the visual hierarchy of patterns [2]. These micro-decisions, specific to each regional school, escape purely mathematical models and constitute the signature of the master craftsman [3].

We propose an algorithmic framework that distinguishes between hard constraints, ensuring topological consistency, and soft parameters, which can be optimized according to aesthetic criteria such as balance and contrast [4]. Validated on a corpus of historical patterns, this framework makes it possible to quantify styles, generate hybridizations, and design interfaces for artisan-algorithm co-creation. Computational analysis reveals links between topology and color, suggesting an implicit visual grammar of Islamic patterns [5].

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References

- [1] Hankin E. H., The Drawing of Geometric Patterns in Saracenic Art, *Memoirs of the Archaeological Survey of India*, 15, 1925, 1–40.
- [2] Kaplan C. S., Salesin D. H., Islamic Star Patterns in Absolute Geometry, *ACM Transactions on Graphics*, 23, 2004, 97–119.
- [3] Lu P. J., Steinhardt P. J., Decagonal and Quasi-Crystalline Tilings in Medieval Islamic Architecture, *Science*, 315, 2007, 1106–1110.
- [4] Aboufakil Y., Thalal A., Raghni M. A. E., Classification of Moroccan Zellige Patterns Using Crystallographic Groups, *Journal of Mathematics and the Arts*, 7, 2013, 119–134.
- [5] Thalal A., Aboufakil Y., Raghni M. A. E., A Computational Approach for Generating Zellige Patterns, *Symmetry*, 12, 2020, 952.