

# The Automorphism of Amalgamation Polytopes and Tessellation

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## Abstract

Harnessing the properties of a three-dimensional constant-volume strain and the combination and complexity of the polymorphism of amalgamation polytopes and tessellation, the author has derived at a spectacular generation of some 200 genres of fabric that presents an exclusive range of some 6,000 unique design of digital lace patterns, exotic batiks, Oriental silk and more. This paper presents the inherent properties and beauty of the results produced by these strained axes when combined with a whole slew of demiregular tessellation. It presents and demonstrates an orthography of the overlapping demiregular tessellation that spawns polytope vertex whereby the results of more than one transitivity class of vertices lead to an infinite number of possible tessellations.

Keywords: tessellation, demiregular tessellation, polygons, polyhedra, polytopes, amalgamation, polymorphism, automorphism, finite strain, mathematics, art, fabrics

## 1. Introduction

While mathematics abides by order, art responds to spontaneity, they can be connected by a simple or complex algorithm that molds and dies. As mathematics is permeable enough to be bent, art or music created by mathematics can cross the “emotional less” horizontal and vertical limits.

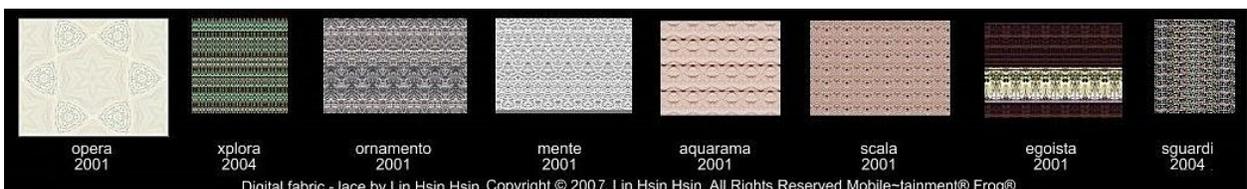
Anchored on the isometries and dilatations of the four basic operations of transformations: translations, rotations, reflections, and glide reflections of Euclidean Plane, aesthetic desires can be shaped and achieved. The intent of this paper is to demonstrate such mathematical capabilities to generate an infinite number of design, as shown in the examples of the digitally woven fabrics and the creation of digital music and sound.

## 2. The Pleasure of Tessellation

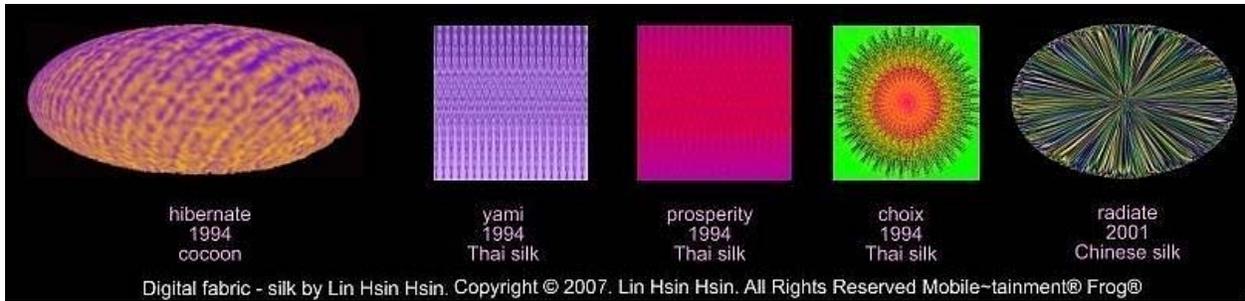
The spectacle of the realization of polytopes as in some two hundred of categories of fabrics, created by the author. Examples herein (see Figure 1 to 5) are five categories of mathematically woven digital fabrics.



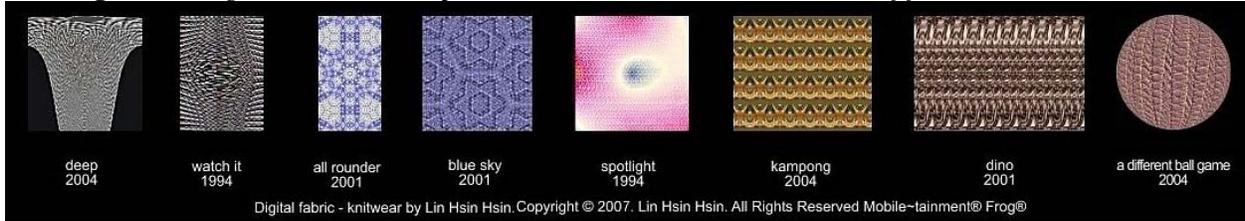
**Figure 1:** *Digital Batik, a 2D manifesto, a union of a South East Asian ethnic culture and mathematics*



**Figure 2:** *Digital Lace, a 2D representation, rekindles the tradition of hedonism in fabric and mathematics*



**Figure 3:** *Digital Silk, a 2-D representation, binds the sensuousness of fabric and mathematics*



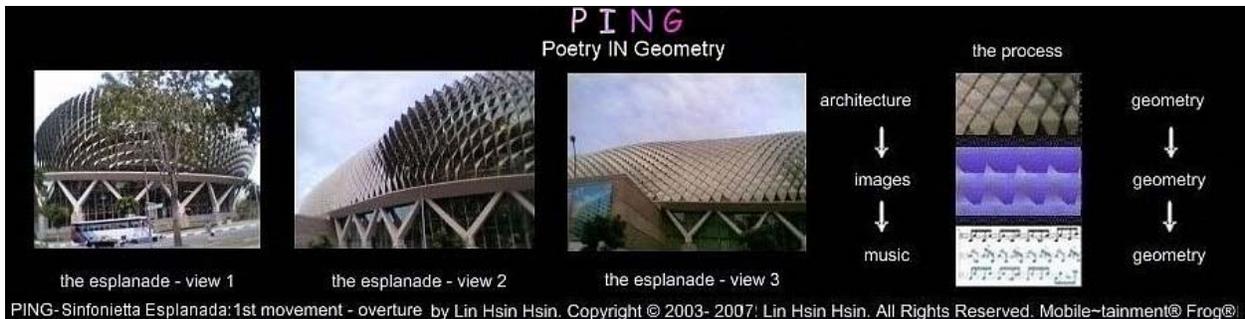
**Figure 4:** *Digital Knitwear -- an example of visible dialogs of the needles and mathematics*



**Figure 5:** *Digital Hand Dye -- an exemplification of organic occurrence of visual rhythm and mathematics*

### 3. Digital Music in Tessellated Architecture

PING (Poetry IN Geometry) is a digital transfiguration of a building geometry, a digital performance that choreographs a Web-enabled mathematically generated moving images with mathematically shaped music.



**Figure 6:** *Digital Music -- The construction process of PING, Music: Sinfonietta Esplanada*

### 4. Conclusion

Examples demonstrated here is viewing the transformations and the intersecting paths of polytopes to create awareness of the presence of the Euclidean Space and yielding a direct experience in aesthetics. In so doing, mathematics has a contribution to the intellectual enthusiasm for articulating those ideas epitomized not only in tessellation, but in the scalable properties of the human mind.

### References

[1] H S M Coxeter, Regular Polytopes, Dover Press, ISBN 0-486-61486-8, 1999.