

Tiling Process of Patterns

Kenji KOHIYAMA

NTT Wireless Systems Laboratories

Basic shapes of tiling consist of few kinds of polygons, such as parallelograms, rectangles, squares, triangles and original hexagon. We can derive various shapes from a polygon by transforming its sides with basic operation (translation, reflection, glide reflection and rotation). These derived shapes can be applied as a part of tiling pattern. Simple techniques to produce the tiling patterns based on squares and isosceles right triangles are described in this paper.

In the square systems (Table1), maximum number of basic shape directions is 8 (4-rotation, 2-reflection). Freedom of producing patterns increases as increasing of limitation. Maximum limitation case is the simple square. In the isosceles right triangle systems, infinity patterns can be produced. Three examples are shown in Table 2.

There have been many works in this field, particularly relating to the M. C. Escher's drawings[1-4]. No new patterns are presented here; this paper is not original in this sense. A good guidance, however, can be found in this paper for those who wish to produce tiling patterns by themselves,

References

- [1] Doris Schattschneider, "Vision of Symmetry", Freeman, ISBN 0-7167-2126-0.
- [2] Caroline H. MacGillavry, "Fantasy & Symmetry", Abrams, ISBN 0-8109-0850-6.
- [3] M. C. Escher, "Escher on Escher", Abrams, ISBN 0-8109-2414-5.
- [4] B. Grünbaum and G. C. Shephard, "Tiling and Patterns", Freeman, ISBN 0-7167-1193-1.

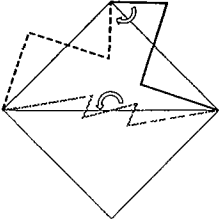
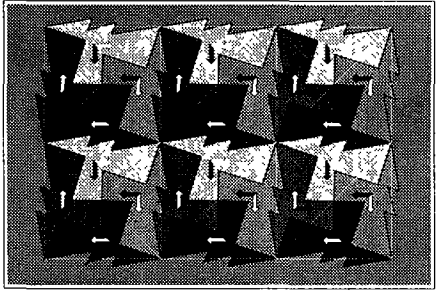
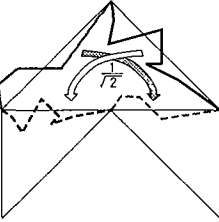
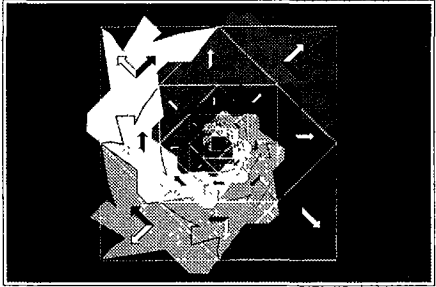
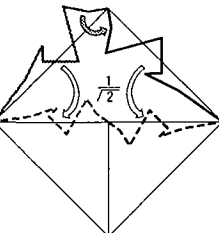
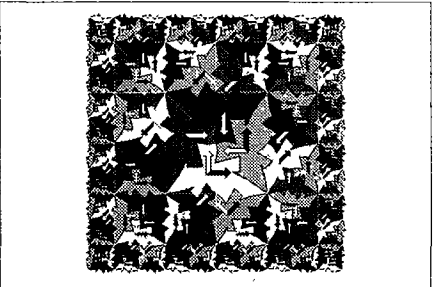
Table 1-1: Square Systems

No. of Basic Shape Direc.	Basic Shape	Pattern	No. of Basic Shape Direc.	Basic Shape	Pattern
Type-A1 1			Type-A4 2		
Type-A2 2			Type-A5 2		
Type-A3 1			Type-A6 1		
Type-A3 2			Type-A6 2		
Type-A4 1			Type-A6 4		

Table 1-2: Square Systems

No. of Basic Shape Direc.	Basic Shape	Pattern	No. of Basic Shape Direc.	Basic Shape	Pattern
Type-A7 2			Type-A11 4		
Type-A8 4			Type-A12 4		
Type-A9 4			Type-A13 4		
Type-A10 2			Type-A13 8		
Type-A10 4			Type-A14 4		

Table 2: Isosceles Right Triangle Systems

No. of Basic Shape Direc.	Basic Shape	Pattern
Type-B1 4		
Type-B2 8		
Type-B3 8		
Type-B4 8	