Quilts Inspired by Mathematics

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Abstract

The following is an explanation of different mathematical ideas can be turned into quilts. This is taking a concept to a diagram, to a design, and finally, to a real world object.

Why do quilts based on mathematical designs? Since a mathematical understanding is needed to do designs, they are more of a challenge than traditional quilts. Why these designs? The people who created these designs asked if I could make quilts and here they are.

1.1 TILINGS

I was there at Paul's talk about Spiral Tilings at Bridges 2000. He said, "I don't know why quilters don't make quilts out of tilings." I responded, "Quilters don't like some of those acute angles and set-in-points."

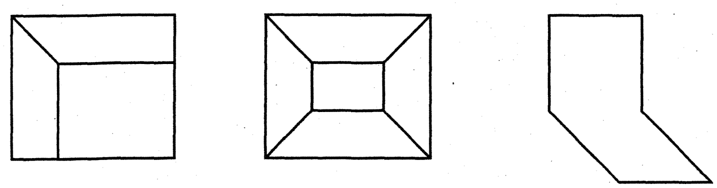

Figure 1 Acute Angles and Set in points

However the designs based on the *Versitile* program were compelling and I took another look at his article to see if there was any way to ease the construction of quilts using these designs [1]. While he constructs 16 different possibilities, the smallest designs found in figures 7 and 13 looked to be the easiest.

1.2 HEXAGONAL. In the program, a polygon is overlaid by itself and a tile is formed. This tile is two 60-degree diamonds joined. Paul was discussing how many different tilings could be formed and what do they look like. The black area is the tile.

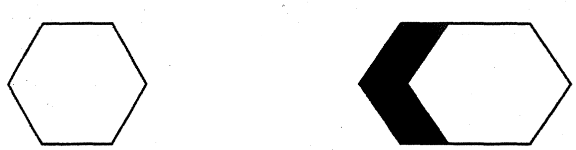

Figure 1a A Tile from a hexagon

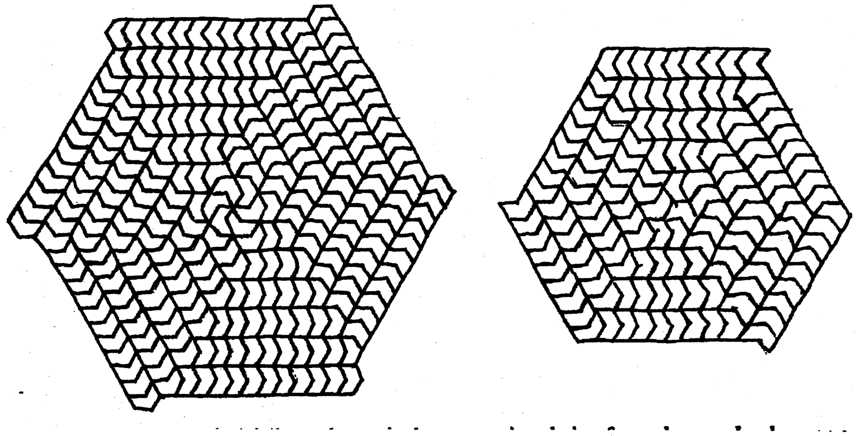

Figure 2 Hexagonal Tilings (Figure 13)

1.2 HEXAGONAL. I was reminded of a quilt called Tumbling Blocks or Baby Blocks. It consists of a parallelogram of equal sides and a 60-degree angle being the acute angle. But every piece meets in three of the 120-degree or 6 of the 60-degree angles. This is not what is going on in figure 13. I looked in several books and was reminded that most objects with a hexagon base can be constructed using strips. Construction resolved itself into a matter of color choice.

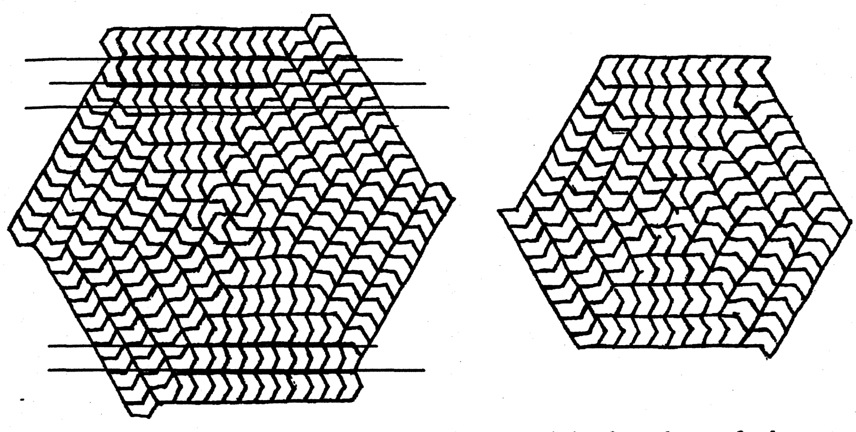

Figure 2a Hexagonal Quilts Assembly Diagram

1.3 OCTAGONAL. The tiling was constructed from an octagon. Octagonal medallions are sewn from one-eight parts to one-quarter to one half to the whole. I deconstructed the figure into eight parts but was not content to see a lot of set-in seams to get to one-quarter part. A bit of sewing I did recently gave me a clue how to do this easily. Most quilts are sewn from the inside out. If I seam this from the outside in, all of the seams are straight lines and it's assembled in quarters of a circle.

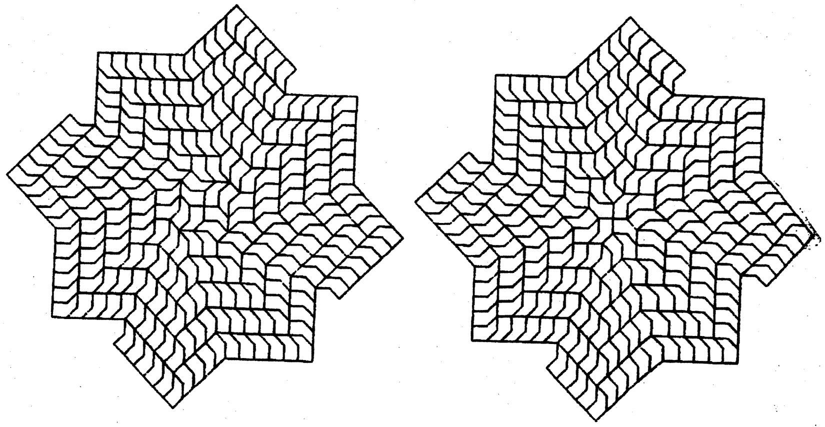

Figure 3 Octagonal Tilings

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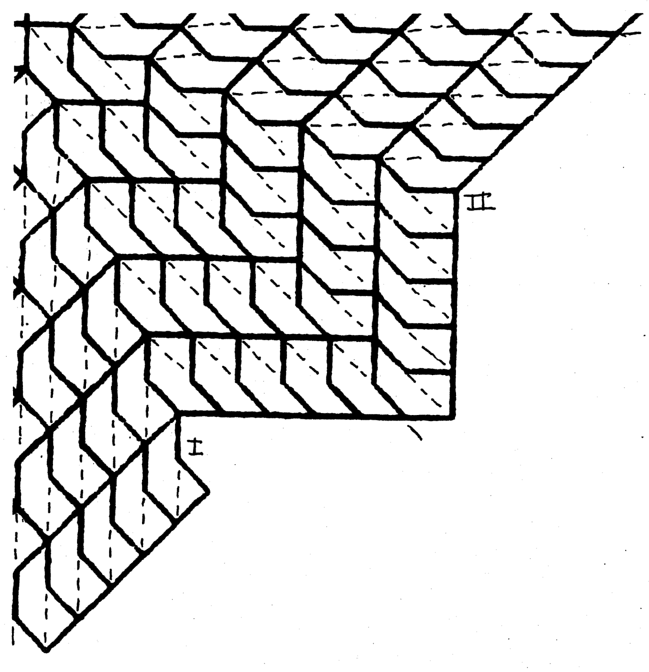

Figure 3b Seams from outside in

The starting place for each seam is marked at II and I. The dotted lines indicate strips.

2.1 PARABOLIC CURVES

While John Sharp and I had great success with ParaStar4 (the yellow and blue quilt) and ParaStar6 (the green and blue quilt) [2]; I felt we could go further. We had taken John's GridWarps and made a quilt pattern of it.

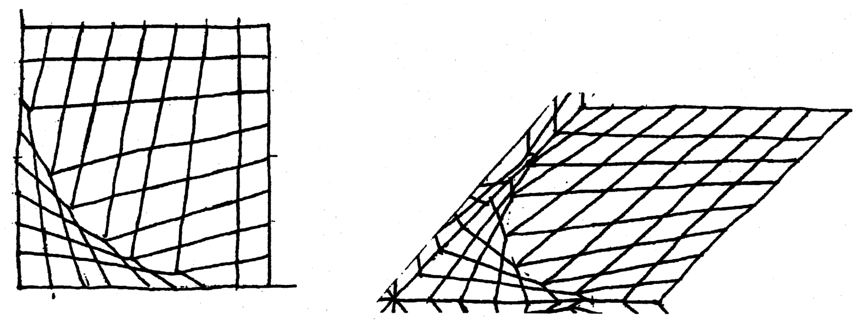

Figure 4 Grid Warps

Rather than keeping the same layout for the blocks, I wanted to modify it. I thought of an eight-pointed star. This is an easy pattern to assemble. It includes deforming the block into a 45-degree rhombus. I tried to get my computer quilt program to do this. After figuring out the deficiencies of the program, I drew it by hand. I will repeat the method of last year, but play with the colors.

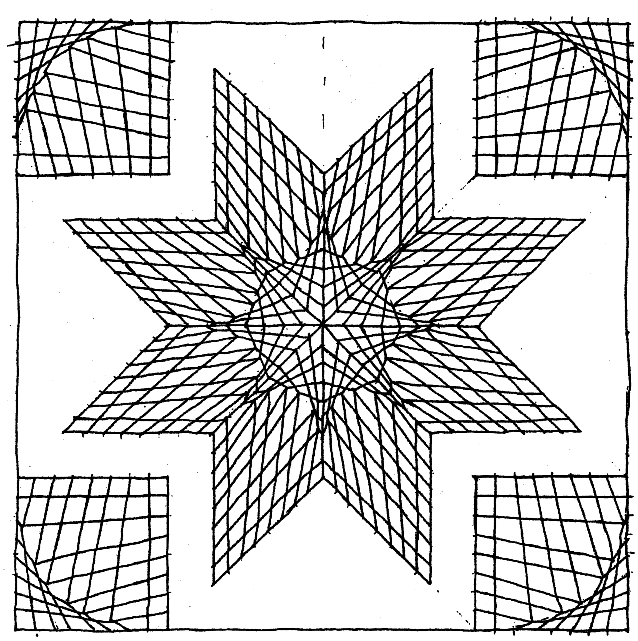

Figure 5 ParaStar8 Quilt as a design

3.1 COMPUTER GRAPHICS

I met Steve Whealton at Bridges 2002. He had several prints of computer images based on trigonometry to determine pixel color. He was most interested in my expertise. We've communicated through e-mail. He sent me a disc with about 250 images for me to choose an image. I started with 63 possibilities and narrowed it to two. I will discuss them each separately. [3]

3.2 TRIG007. Steve has described how this image is formed mathematically and stated that it is comprised of 2,259,000 pixels. If each pixel was a one-inch by one-inch square, the resulting quilt would be 120 feet by 180 feet. Since it took me 168 hours to quilt a four feet by four feet quilt, this would take me 189,000 hours. I decided that a different size was needed and wanted it square so I modified the dimensions to 31 inches by 31 inches. I changed the resolution of the image to eight per block rather than finer for seaming purposes. I followed the colors of the original image.

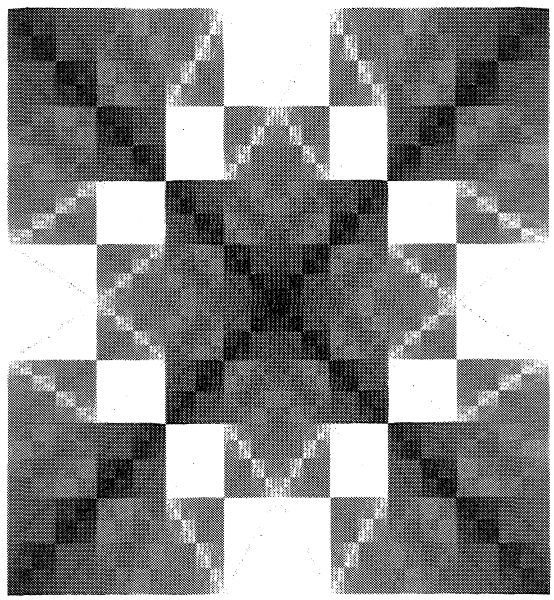

Figure 6 Trigonometry 95

Assembly was done as follows. I cut strips of the fabric of each color and sewed them to the appropriate next strip. I cut it into a bicolor piece, turned a piece around and sewed them together. This gave me little squares, which is a basis for the quilt. Or I could sew four strips together in two sets of color orders and then cut and resew, rotate 180-degrees and resew.

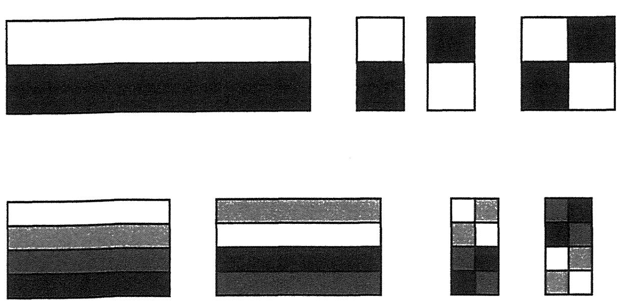

Figure 7 Easy Squares

After sewing the whole quilt top, I basted it with the batting and back. I decided to quilt using several colors of thread to accent the design. Since each 'square' is an eight pieces by eight pieces and there are sixty-four 'square' blocks, there are sixty-four squared pieces in the quilt or 4096 little pieces in this quilt.

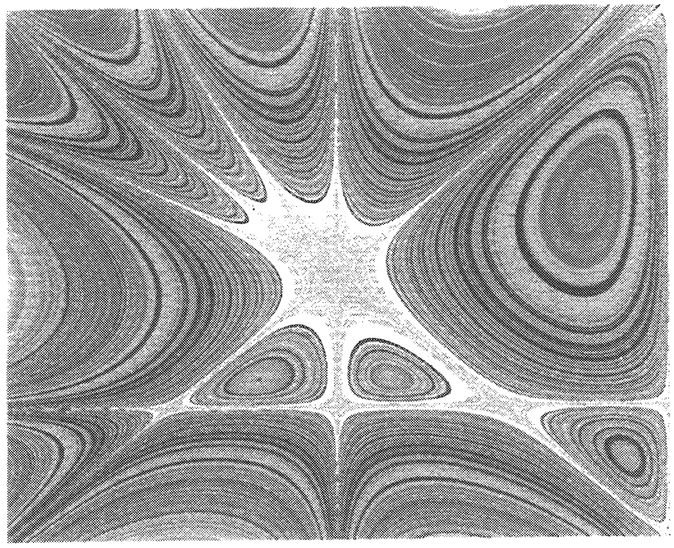

Figure 8 Trigonometry 95

3.3 TRIG0095. This one is done using bargello technique. Bargello is a needlepoint craft but it has been adapted to quilting. Here you cut strips, sew them, recut them reseam them while shifting them. The width of the strips and amount of shift along with the color of fabric determine the pattern.

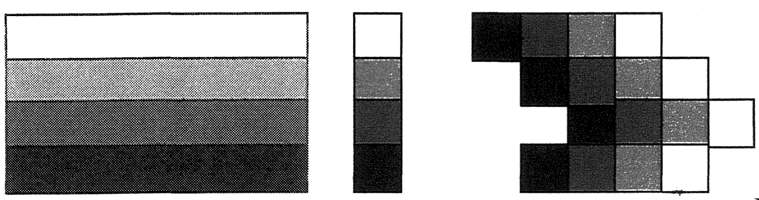

Figure 9 Bargello

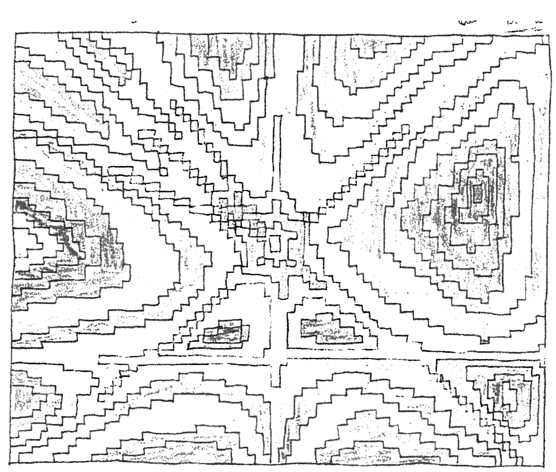

Figure 9 Trigonometry 95 Quilt Design

Recognition

Thank you to my mother, Eleanor Pickett and her stitch group, Jody Littrell, Beverly Beeman, Mary Jenkins and my sister Christine Pickett, who now calls me a masochistic quilt designer

References

[1] Paul Gailiunas, "Spiral Tilings". *Bridges Mathematical Connection in Art, Music and Science Conference Proceedings, 2000*

[2] John Sharp and Mary Williams., "A Collaborative Parabolic Quilt". *Bridges Mathematical Connection in Art, Music and Science Conference Proceedings, 2002*

[3] Stephen Whealton. Private communications