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Symmetries of odd and even in African mat weaving - An example from the Lower Congo

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The option for an odd or even number of plant strips or twines in basket making or mat weaving is often influenced or even dictated by aesthetical values and considerations of stability and symmetry (cf. Gerdes, 1990, 1998, 1998a; Gerdes and Bulafo, 1994; Ismael, 1994). In this paper I present decorative designs on plaited mats from the Lower Congo area, and analyze why some designs have odd by odd and others even by odd dimensions.

Among the ethnographic collections of the Royal Museum of Central Africa (Tervuren, Belgium) is a series of richly decorated, plaited mats, acquired by the museum before 1909, coming from the lower Congo river area in today's southwestern Congo / Zaire (Coart, 1927). These mats display attractive geometrical designs with various symmetries. The designs were produced by a well thought-out variation in the interweaving of the naturally colored, 'white' strands in one direction (vertical in our reproductions) with the artificially colored (mostly black) strands in the other direction (horizontal in our reproductions). The external form of most of the designs is that of a 'zigzag square' or 'toothed square' — a square with adjacent, congruent teeth on its sides (see the example in Figure 1). We may call the numbers of strands in both directions to produce a toothed square design its <u>dimensions</u>. In this way, the dimensions of the toothed square design in Figure 1a are 27 by 27: twenty-seven white vertical strands and twenty-seven black horizontal strands are needed to generate one copy of this design. As the individual white and black strands are not very visible looking from some distance to a mat, the design in Figure 1a may be represented simply as a black-and-white design (see Figure 1b). Using this representation, the design has four axes of symmetry (Figure 1c).

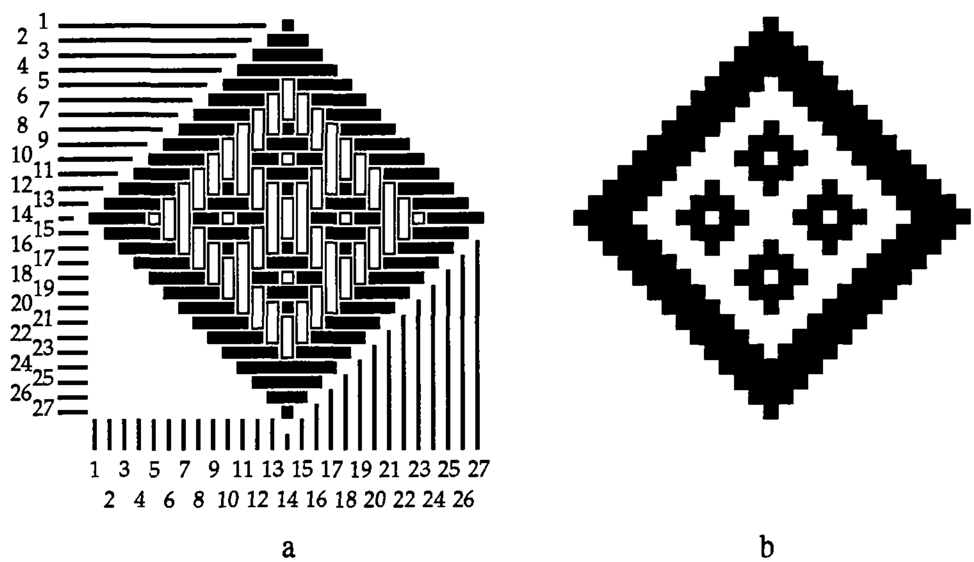

Figure 1

The dimensions of the toothed square designs that appear on mats collected, according to Coart (1927), from Luvituku and near the cataracts (about 75 miles upwards from the Congo mouth), are always odd numbers. Using the simplified black-and-white representation, most of these toothed square designs have four axes of symmetry like the examples in Figure 1 and 2a. The toothed square design in Figure 2b has a fourfold rotational symmetry.

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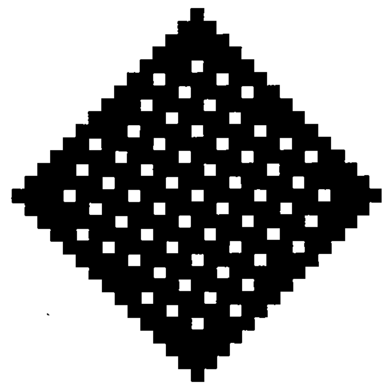
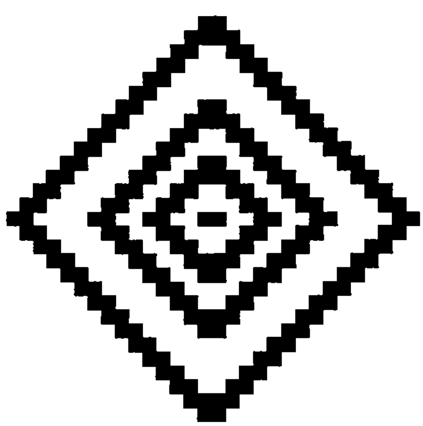
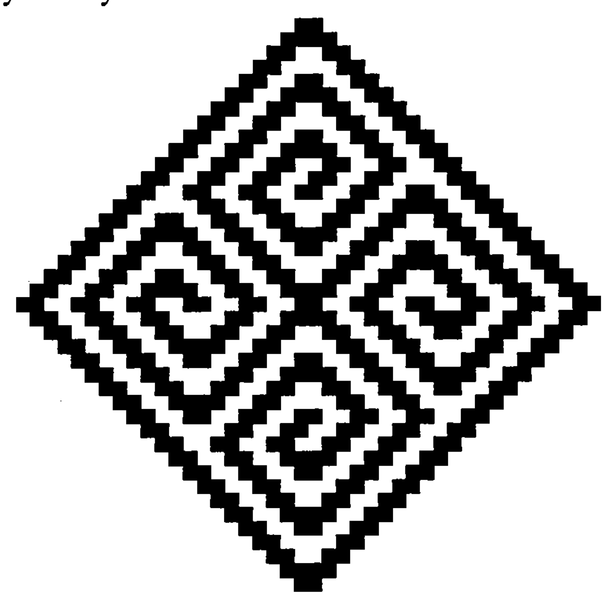


a (dimensions 65x65) b (dimensions 29x29)

Figure 2

The deçorated mats that display toothed square designs with even by odd dimensions have a different provenience from those with designs of odd by odd dimensions. These mats were collected, according to Coart (1927), in Banana at the mouth and in Boma at the head of the Congo delta. As the two dimensions of the toothed square designs on these mats are different numbers (even and odd), their decorative designs cannot have neither four axes of symmetry nor a fourfold rotational symmetry. Figure 3a presents an example of such a toothed square design with two axes of symmetry. In Figure 3b an example is displayed with two-fold symmetry, although it gives almost the impression of having fourfold symmetry.

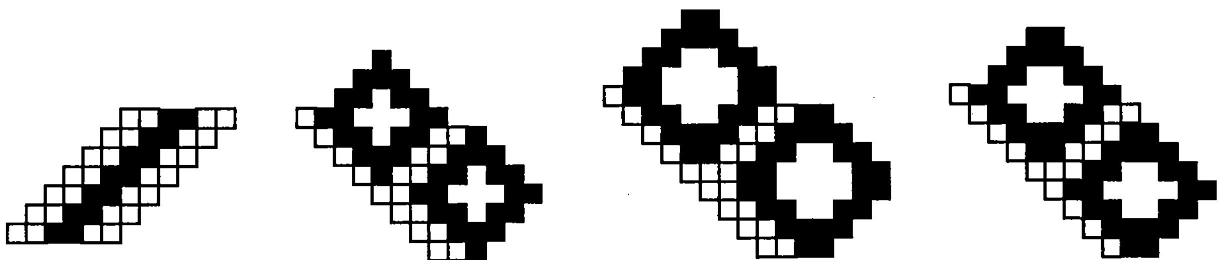




a (dimensions 30x29) b (dimensions 42x41)

Figure 3

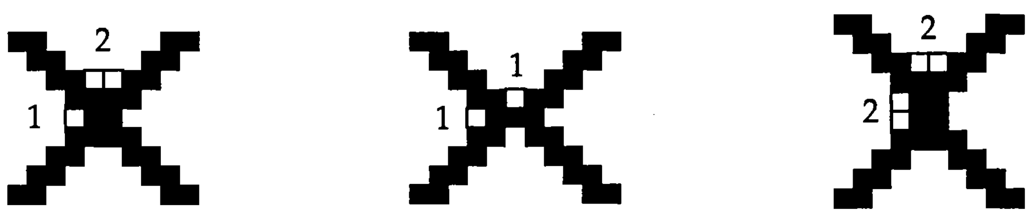
When analyzing these toothed square designs, I was puzzled by the question why did the artists involved invent these toothed square designs with dimensions even by odd. Why did they not create designs with odd by odd (or even by even) dimensions, which would have displayed more symmetries? Were they less interested in symmetry than the artists whose mats were collected near the cataracts and Luvituku? Or do there exist other reasons for their option?
On the one hand, on the mats where the decorative designs with dimensions even by odd appear, the toothed squares are almost touching each other instead of widely separated from each other as happens on the mats with odd by odd toothed squares. On the other hand, the mats with toothed squares of dimensions even by odd are more densely decorated in the sense that in a given area more zigzag lines appear: oblique toothed lines with a width of two unit squares have been heavily preferred; zigzag lines with a width of three unit squares almost do not appear.
When several toothed square designs are combined on a mat in such a way that they are separated by oblique toothed lines of width 2 (see Figure 4a), there are several implications. Several situations would obviously be ugly: neither the odd by odd toothed square designs (4b) nor the even by even toothed square designs (4c) would be nicely aligned along an oblique zigzag line. Toothed square designs of dimensions even by odd are the solution found by the artists to align toothed squares as illustrated in Figure 4d.



Oblique zigzag line of width 2 — a
Odd by odd — b
Even by even — c
Even by odd — d

Figure 4

Furthermore, when two oblique toothed lines of width 2 are crossing (see Figure 5a), immediately left of the crossing there is an opening of height 1 for a vertical white strand to pass over the central black strand, and immediately above the crossing there is room for two white strands to pass over the black strand. In an odd by odd or even by even crossing context (see Figure 5b and 5c), each of the oblique toothed lines is displaced by one unit square before and after the crossing, what would have given an 'ugly' result. It becomes in this way understandable why these mat weavers created even by odd toothed square designs.



a b c

Figure 5

If, nevertheless, the mat weavers would also have admitted toothed lines of width 3, as their colleagues (see Figure 1) both odd by odd and even by even crossings with a fourfold rotational symmetry would have been possible (see Figure 6). However, in that case, they would not have been able to weave such intricate designs, as for instance the one in Figure 7, within the same available space on the mats. Although toothed square designs of even by odd dimensions cannot have a fourfold rotational symmetry, the mat weavers discovered that by increasing the dimensions they could create the impression that the whole design had such a symmetry.

a b

Figure 6

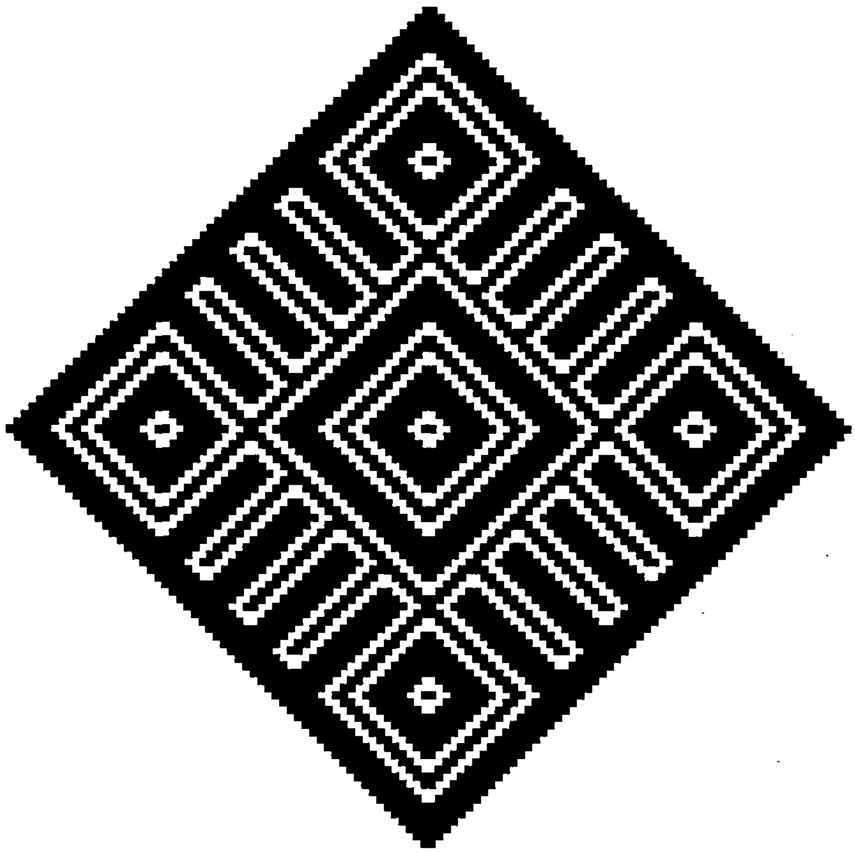


Figure 7: Dimensions 114x113

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