

Chapter 51

Classification of Frieze Patterns in Malay Songket Textile

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Abstracts In Malaysia, songket is the most popular hand-woven fabric and is classified as an antique craft. The authentic songket is woven by the Malays especially in the East Coast of Malaysia such as Terengganu and Kelantan. This paper is about the analysis of Malay songket patterns with the use of the method of 2D plane which is frieze patterns (border patterns). This paper is based on the classification of Malaysian songket patterns especially on border patterns (tepi kain, kaki kain, and kepala kain) which are from kain sarung and kain lepas/selendang (shawl), and these are based on their geometric symmetries on the plane. It constitutes an extremely valuable tool for this paper because it enables the characterization of songket patterns into frieze patterns. The benefit of this paper is to be documented and catalogued as useful guidelines for related professions and as database for future reference. It also served as evidence of the existence of geometric and symmetry patterns on Malaysian songket patterns as a useful contribution to the songket design industry and finally to be an example for other Malaysian arts or crafts for making ideas and design in an effective way.

Keywords Songket • Mathematical pattern • Frieze pattern • Symmetry • Geometry patterns • Euclidean transformation

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51.1 Introduction

Varieties of fabric had contributed to the development of textile industries simultaneously and the liveliness of various fabrics where patterns in weaving take place in this world. In Malaysia, the main and popular traditional textile is the kain songket [1]. Most of the Malays called it “kain songket” and kain which refers to the cloth or woven material. The word “kain” also means the sarong, where the Malays used to wear it as clothing during daily or ceremonial occasions such as kain sarung with baju kurung or kebaya [2]. Kain songket is actually in the olden days and was only for the royalties and people of the palace. One of the weaves is often woven to the imperial family called the “tenunan songket benang emas” and “kain limar bersongket.” But nowadays the kain songket is being worn from the ordinary people to the royalties. The songket is expensive, and therefore only rich people could afford them. The best quality in Malay weaving fabrics comes from Kelantan, Terengganu, and Pahang. The techniques and motifs of the Malay weaving could be from the influence of China, Cambodia, India, and Arabia. This condition may be also influenced toward the development of songket weaving in the East Coast of Malaysia. However, this paper only concentrates on the pattern of the traditional sarong songket and to find out the classification of frieze pattern in the songket textile design [3–6].

51.2 Songket

Songket weaving is an extra weft weave where gold threads are inserted into plain weave to create motifs and patterns on the woven fabric. The additional weft threads can be of gold, silver, and metallic-colored threads. In the songket process, there are about 11 steps. The processes of songket start with membasuh benang (clean the threads), mencelup warna pada benang (dyeing), menerai and menganin (warping), mengulung (roll the warps), menyampak (inserting warp through the reed), mengarat (making of shafts), meneguh (tension the warps), gigi belalang (making of tekat 3 or 5), menyungkit (uplifting warps for songket pattern), and menenun (weaving).

There are six basic textile patterns that have been used in creating the structure of songket patterns. The six basic textile patterns consist of full-patterned songket (corak bunga penuh), isolated pattern (songket bunga bertabur), stripe patterns (songket corak jalur berdiri and corak jalur melintang), zigzag pattern (songket corak siku keluang), checkers (songket tapak catur), and songket pucuk rebung. While the motif that is often used in songket weaving is sourced from plants, cosmos, earth, animals, and nature. The design is more focused on geometry, abstract, style, and realism. The structure of the songket fabrics is mainly in sarong and kain lepas (shawls). Therefore, the structure of sarong songket consists of “kepala kain,” “badan kain,” and “kaki kain” which include the “mengapit kepala kain” and the “kendik.” The “kendik” is the smaller board pattern at the “pengapit kepala kain” or at the boarder of kaki kain sarong. The structure of kain songket lepas consists of punca kain, badan kain, and kaki kain.

Structure of Kain Sarong Songket

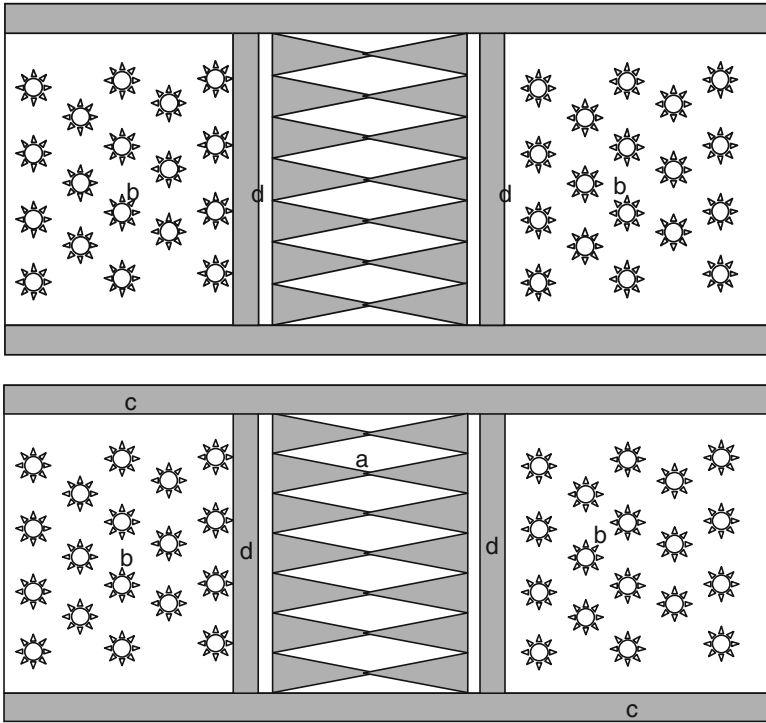


Fig. 51.1 (a) Kepala kain, (b) badan kain, (c) kaki kain, and (d) pengapit kepala kain

Structure of Kain Lepas Songket (Shawl)

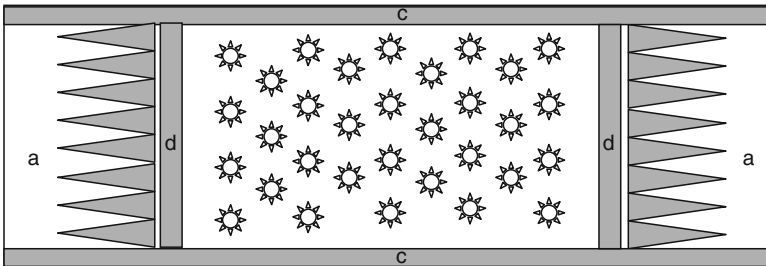


Fig. 51.2 (a) Punca kain, (b) badan kain, (c) kaki kain, and (d) pengapit badan kain

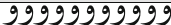
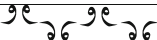

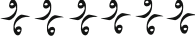



51.3 Related Work

Most work related to classifying pattern in symmetry group is mainly aimed to study the geometric concepts of symmetry and pattern. In Djbril M.O. and Thani R.O.H, the authors propose a general computational model for extraction of the symmetry features of Islamic geometric patterns (IGP) images. In the paper of E. Rokiah (et al.), the authors discussed on the mathematical thinking of the weavers and the process of songket weaving. M.A. Hann, the author, writes on the classification and analysis of regular geometric patterns with particular reference to textiles. For this paper it is based on the traditional Malay songket patterns [7–8].

Geometry, Symmetry, and Frieze Patterns

Geometric motifs or patterns are a motif, pattern, or design depicting abstract, non-representational shapes such as lines, circles, ellipses, triangles, rectangles, and polygons. They are objects that are repeated in an order. While the meaning of symmetry is when one shape becomes exactly like another if we flip, slide, or turn it. In the simple words, symmetry is reflection or mirror. Symmetry is one of the elements in geometry. There are four ways of moving a motif to another position in the pattern or transformations or symmetry operations. The four ways are translation, reflection, rotation, and glide reflection.

A set of all rigid transformations which are symmetries of a pattern has a group structure. This is called the symmetry group of the pattern. Symmetry group consists of three types of periodic patterns which are based on 2D plane (frieze patterns and wallpaper patterns) and 3D plane (crystal patterns) [9–10].

TYPE	PATTERN	SUMMARIZED
11		Translation
mg		A reflection and a half turn
1m		Horizontal reflection
12		Two half turns
mm		Vertical and Horizontal Reflections
1g		Glide Reflections
m1		Vertical Reflection

Frieze Pattern in Songket

(Ruzaika & Norwani 2013)

Fig. 51.3 Seven types of frieze patterns (Ruzaika and Norwani 2013)

A frieze pattern is an infinite strip with a repeating pattern, and it can also be called as border pattern. The term “frieze” is from architecture, where a frieze refers to a decorative carving or pattern that runs horizontally just below a roofline or ceiling. Frieze pattern consists of seven types, and one of these patterns can be found in the border pattern in songket. Before analyzing the pattern in songket, it is essential to understand the shape and terms of design in geometric concepts.

Frieze Pattern in Songket

A frieze is a pattern which repeats in one direction or a line of symmetry groups usually found in border or band patterns. Based on the symmetry properties, mathematical analyses reveal that there are seven different frieze patterns. In *songket* almost all the designs in the *punca kain*, *kepala kain*, *kaki kain*, and *pengapit kepala kain* consist of these frieze patterns with different arrangement of repeats. Frieze pattern can be seen in Fig. 51.1. We can analyze *songket* with frieze pattern in the figures below.

1. Classification of frieze pattern that can be found in songket sarong of full-patterned songket (*songket bunga penuh*)

Example 1:

Fig. 51.4 *Sarong limar bersongket* with frieze pattern at the *kepala kain* and the *pengapit kepala kain* (panel of the sarong)

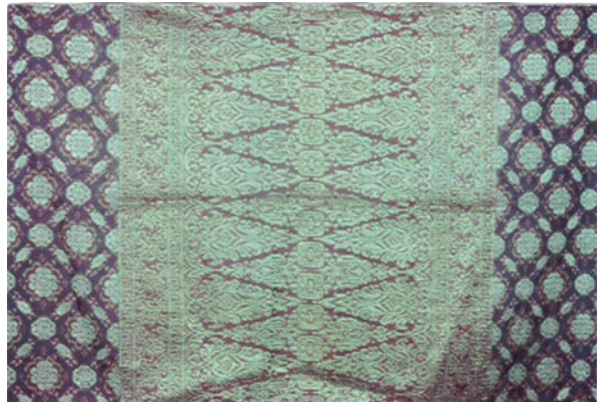


Fig. 51.5 The border pattern in the sarong is motif *bunga ati-ati* in *glide reflection* of frieze pattern

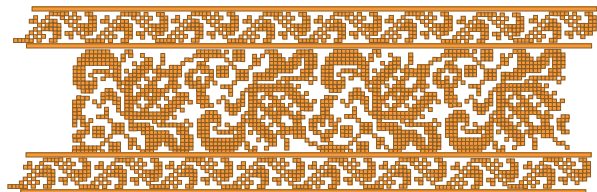
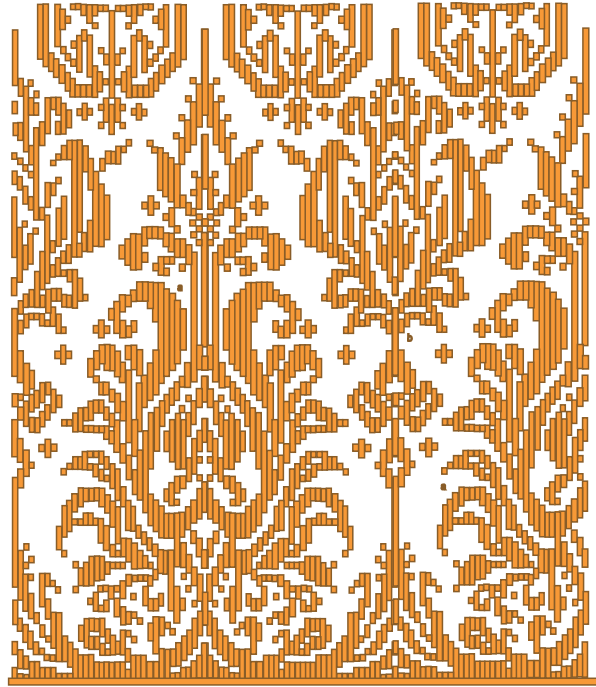


Fig. 51.6 The motif of *pucuk rebung lawi ayam* at the panel of the sarong *songket* shows that the motif is in symmetry and repeated constantly in *translation type 11*



Example 2:

Fig. 51.7 Sarong of full-patterned songket



Fig. 51.8 This is another example of songket that shows *translation* of frieze pattern. The motifs are *pohon rhu*, *bunga tudung celak*, and *bunga pecah empat*, situated at the border pattern (*kaki kain*)

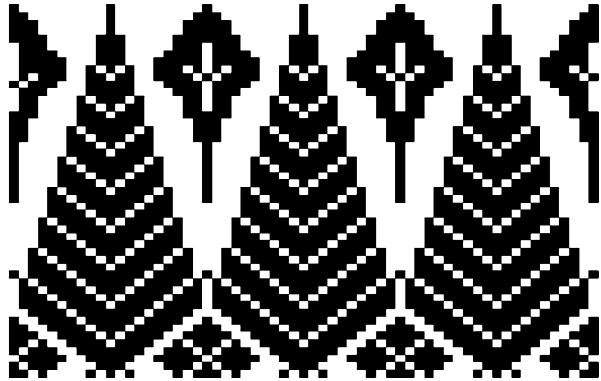


Fig. 51.9 This is also an example of *pucuk rebung lawi ayam* and *bunga bintang* at the kepala kain songket that shows *translation type 11*



2. Classification of frieze pattern that can be found in *songket* sarong of stripe repeats (*songket corak jalur berdiri* and *corak jalur melintang*)

Example 1:

Fig. 51.10 Songket with stripes repeat motifs of *pucuk paku* and isolated motifs of *tampuk manggis* and *buah cermai* and border pattern or *kaki kain* of *awan larat berjuang*



Fig. 51.11 The stripes *pucuk paku* in this songket pattern show *the type 1 g-glide reflection* in frieze pattern, and the other spot repeats of *bunga tampuk manggis* and *buah cermai* represent the *type 11 translation* as it repeats constantly in vertical

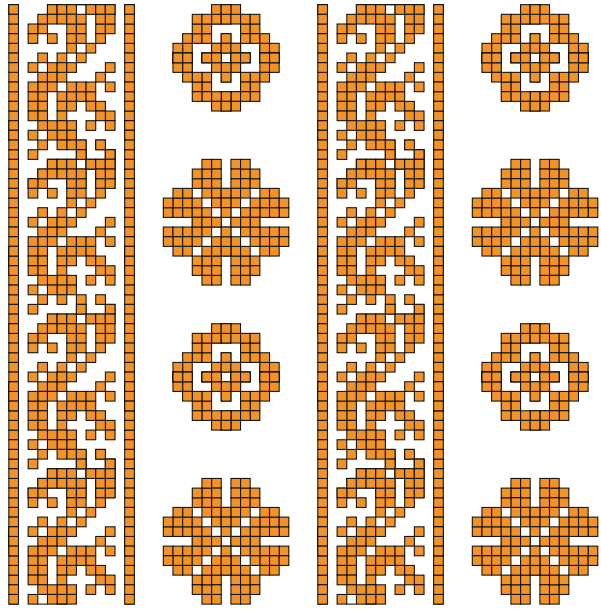
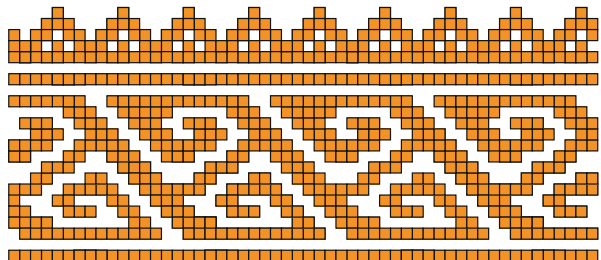


Fig. 51.12 The border pattern of *awan larat berjulang* refers to the *type 11 translation* as it repeats constantly in horizontal



Example 2:

Fig. 51.13 The *tengkolok* (head cloth) is shown here with stripe pattern on the *badan kain*



Fig. 51.14 Stripe pattern on the middle kain. Motif of leave and flower – translation type 11



- ← Motif of *Bunga Pucuk*- Translation type 11
- ← Motif of *Kendik Tali* – Translation type 11
- ← Motif of *Awan Larat* –Glide Reflections type 1g

Fig. 51.15 Border pattern at the tengkolok with motifs repeats in glide reflections and translation type 11

51.4 Conclusion

Based on the analysis of songket patterns, most of the repetition of patterns in songket design especially on frieze patterns is in translation, reflection, and glide reflection. We can see the repetition of translation in Figs. 51.6, 51.7, 51.8, 51.9, 51.10, 51.11, 51.12, 51.13, 51.14, and 51.15. While the repetition of reflection and glide reflection is in Figs. 51.5, 51.11, and 51.15. The analyses of songket patterns had shown the existence of frieze patterns in the Malay traditional songket design. Therefore, the outcome of this paper is a mathematical classification (in terms of symmetry groups) of repeated patterns into finitely countable classes which is very few researchers had studied on the local textile especially in songket. Furthermore, the motifs of weaving songket are traditionally composed of geometric pattern, and the research on geometry of songket textiles is involved with the motif composition. Therefore, it is essential to fill the gap lacking in geometry and symmetry research particularly on the elements of songket pattern design.

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