

## **A Multidisciplinary Approach for the Carved Fenestration in Floral Design of Malay Vernacular Architecture**

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### **ABSTRACT**

This paper presents an experimental study on complexity of pattern on Malay woodcarving in two samples of ventilation panel from two traditional old palaces in Kelantan and Terengganu. Existing methods of analytical review analysis for carved components rely extensively on interpretation analysis of measured drawing and none has been looking on scientific method as analysis technique. 2D image measured drawings of carving motifs were retrieved from the Centre for the Study of Built Environment in Malay World at Universiti Teknologi Malaysia as a pictorial data source. The data was analyzed using multidisciplinary point pattern analysis. Supported by historical study of carved fenestration, the result suggests that the background of building, status of the owner, the types of character design elements are influencing factors on complexity of pattern on carving pattern. The result implies that these methods are lead to new knowledge in this study, it also will allow architects and craftsmen to be more attentive in sustaining this authentic local architecture embellishment.

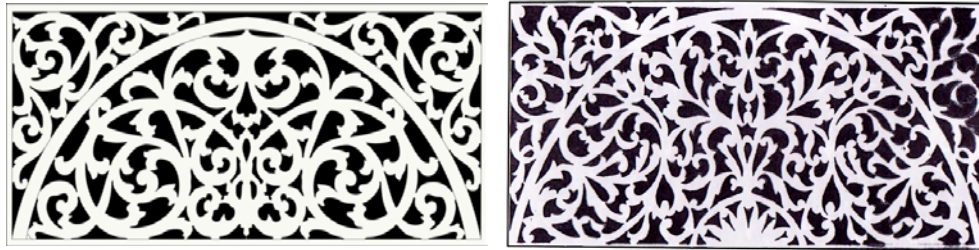
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Keywords: Malay Woodcarving, floral motif, vernacular architecture, carved component

### **1. Introduction**

Since before the arrival of Islam, woodcarving has long been entrenched in Malay Art of traditional vernacular architecture Kelantan and Terengganu (Norhaiza, 2009 and Zumahiran, 2010), the north-eastern states of Peninsular Malaysia and still remains so to this day. The significant physical functions of woodcarving as a vital component are not only served its purposes for ventilation, light and aesthetic value, but also to adapt on thermal requirement of the hot-humid tropical climate (Tajuddin, 2005). There are various major motifs such as floral, geometric and calligraphy which used by craftsmen to express their level of creativity, sensibility and artistry in creating an astonishing masterpiece (Ismail, 2008). From the era of establishment, floral motif is dominating on the carved component in Malay vernacular architecture until present but the complexity patterns were changes until present. The aim of this paper is to identify the changes of floral motif on ventilation panels of traditional vernacular architecture. In this paper, we examine physical character of Malay woodcarving from theoretical aspect and 2 sets of sample ventilation panels measured drawing from The Centre for the Study of Built Environment in Malay World (KALAM). The main purpose of this paper is to illustrate the new analysis techniques of the trend of complexity pattern and factor influences which has taken the way of evident from the past to present. In addition, the authors conducted qualitative, quantitative methods and also personal interview targeted on craftsmen opinion on the change of patterns and motifs in Malay woodcarving from the period of its establishment until now. This paper presents finding of an experimental study of the floral motifs on ventilation panels of traditional vernacular architecture of Kelantan and Terengganu. The major research question is what are the change trend of complexity pattern in floral motifs from 1850s until now that has been sustained in Malay woodcarving.

## 2. Literature Review



Source: KALAM, 2009

Figure 1.0: Samples of ventilation panel of Kelantan (Left) and Terengganu (Right) traditional vernacular architecture which has been retrieved from KALAM.

### 2.1 Ventilation Panel as functional decorative carving

Ventilation Panel or *Sisip angin* is known as one of the strong features which Malay traditional vernacular building in Kelantan and Terengganu share is intensely decorative carving, not only on window but also on the leaves of doors, wall panels, railing of verandahs and g, stringer, and roof (eaves and gable end), likewise most of them are focused on openings. Furthermore, as this paper intends merely focus on the ventilation panels of traditional Malay vernacular buildings as such old traditional palace, traditional mosques, traditional houses and current institutional building inasmuch according to Tajul et al (2005), claim that with many windows and doors in the walls provides good ventilation besides create a comfortable view and cool atmosphere is part of the climatic and cultural influences (Figure 1.2). Indeed, these aforementioned buildings are carefully designed in accordance to counter on the weather, thus provides comfort for the local society. However, Zumahiran (2010) claims that ventilation panels can be found not only on the window but also on the door and the wall. In addition, Lilawati (2005) maintains that those aforementioned building comprises three approaches of ventilation concept as such, (1) Ventilation from Top, (2) Ventilation from bottom and (3) Ventilation on Body Level (Figure 1.3). Apart from that, ventilation on body level is the most essential area for ventilation for comfort. Indeed, windows and doors are specifically designed to allow air movement through the buildings and they are significantly become as important element and parts of the decorative carving in which (Tajul et al, 2005).



Source: Author, 2011

Figure 1.3: Concept of Ventilation for traditional Malay vernacular architecture.

### 3. Methodology

The strategies of this study are based on experimental and interpretative research. This study was conducted in four research tactics including: (1) Re-collection of data on a review of literature and sample ventilation panels Measured Drawings from the reports of 16 traditional vernacular architecture which are located in Kelantan and Terengganu from the Centre for the Study of Built Environment in the Malay World (KALAM) at the Department of Architecture, Universiti Teknologi Malaysia (UTM), (2) Identification and organization of data on background, types of floral motifs and pattern and also period of establishment, (3) Evaluation and analysis on visual pattern, visual description of ventilation panels and interpretation interview data of local craftsmen, and (4) Interpretation results and findings of the data. Furthermore, the study examines the complexity of pattern changed through the era in variety types of traditional vernacular architecture and also the proportion of solid and void of ventilation panels to identify the evolution of floral motifs and pattern on Malay woodcarving (Tariq, 2004). Table 1.0 shows the selected two Malay vernaculars building including the information of types of architecture, year of construction and locations of the architecture. Several factors determine the selection of the architecture which include : (1) the architecture represent the type of dwelling architecture that established the early Malay woodcarving since the arrival of Islam at the east coast region of Peninsular Malaysia, (2) the architecture were decorated with excellent and unique ventilation panels and distinctive in character, (3) the architecture provide a comprehensive collection of ventilation panels which are relevant for visual analysis purposes.

**Table 1.0:** Malay traditional vernacular architecture of Kelantan and Terengganu with ventilation panels

No.	Type of Buildings	Year Built	Location of House
1	Old Palace	1840	Istana Jahar, Kota Bharu, Kelantan.
2	Old Palace	1926	Istana Besar Tengku Long, Kg. Raja, Besut, Terengganu

Source: Author, 2011

### 4. Results and Discussions

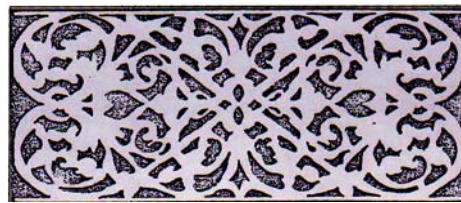
Point Pattern Analysis is a method of techniques which is used to identify patterns in spatial data that is the pattern on the carved components. It is initially related to face recognition method which involves algorithm significance as to easily evaluate the results. But, there are several methods and algorithms that attempt to describe pattern for a collection of points such as (1) Quadrant Count Method, (2) Kernel Density Estimation (K means) and (3) Nearest Neighbor Distance. In this study, we utilized the simplistic algorithm as introductory and to clarify a few mathematical and statistical which was Quadrant Count Method. This Quadrant Count Method is introductory algorithm to Point Pattern Analysis which all the points data will divide into size of quadrant as easily to evaluate the results. In basic terms, Point Pattern Analysis is an investigation focused on finding frequency of patterns in data comprised of points in a spatial region. Figure 3.1 shows the Point Pattern Analysis techniques applied on sample of carved component which comprises Quadrant Count Method and selected algorithm on *Istana Jahar* and *Istana Tengku Long* ventilation panels. There are a few of criteria on the data to determine whether Point Pattern Analysis appropriate to our analysis methods: (1) spatial data must be mapped on a plane which consist latitude and longitude point, (2) study area must be selected and determined prior to the analysis, (3) there should be entire set of data to be analyzed, and (4) there should be 1-1 correspondence between objects in study area and event in pattern.

In producing Variance To Mean Ration (VTMR) of selected samples of carved component in analysis stage, Quadrant Count Method is applied. It is the fourth step applied after point pattern produced by intersection of a single line CADD of samples with 200mm x 200mm grid which covered

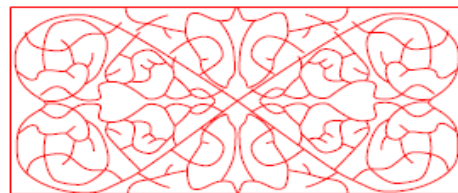
all pattern. All data points in each grid are counted and number of points in the region will be produced. Furthermore, the numbers of quadrants also need to be counted to get the value of Mean. To identify the VTMR also known as frequency of point data in which the total value of Variance can be produce by applying in stated formula. VTMR is then calculated and a histogram of 2 VTMR of ventilation panels Kelantan and Terengganu will be built.

**4.1 Applying Point Pattern Analysis and Quadrant Count Method on Sample**

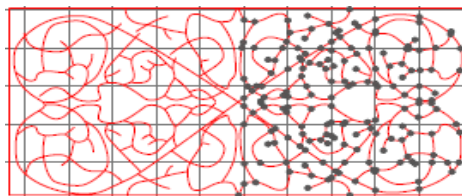
The Computer Assisted-Analysis, CADD and Microsoft Excel, were used to produce the VTMR results. By applying Point Pattern Analysis; Quadrant Count Methods and Algorithm, it is applicable to identify the trend of complexity of the floral motifs and pattern through the era. The figure below shows Point Pattern Analysis and Quadrant Count Method (Tariq, 2004).



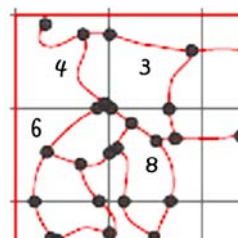
Step 1: 2D image of ventilation panels of Istana Jahar, Kelantan.



Step 2: Transformation 2D pattern of ventilation panel into single CADD line.



Step 3: Point Pattern produced by intersection between single and grid.



Mean = No. of points in the region  
 Mean = No. of quadrants

$$Variance = \frac{\sum x_i^2 - \frac{(\sum x_i)^2}{n}}{n - 1} =$$

$$VTMR = \frac{Variance}{Mean} =$$

Step 4: Calculate the mean, variance and VTMR of point in the sample using mathematical formula.

4.2 Sample Algorithm done on Istana Tengku Long Ventilation Panel.

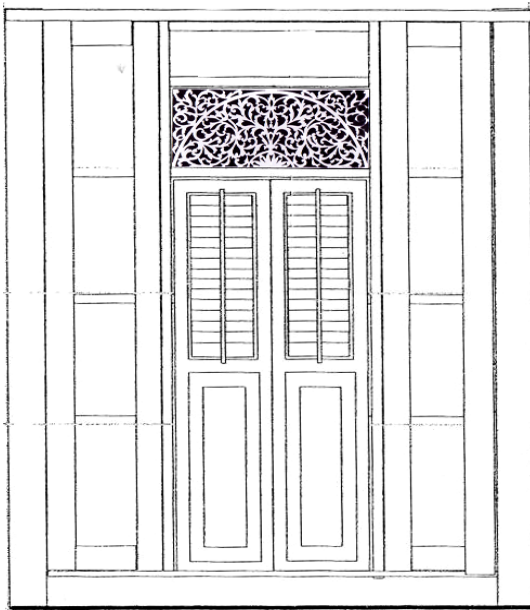


Figure 4.1: Ventilation Panel of Istana Tengku Long located on above door (Body Level)

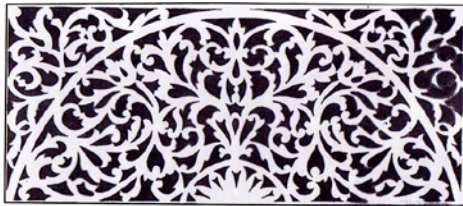


Figure 4.2: A door ventilation panel with floral motifs and design element pattern retrieved from measured drawing.



Figure 4.3: Single line CADD of ventilation panel overlapped with 200mm x 200mm grid and produced point pattern.

The complexity of motifs and pattern on ventilation panels can be produced by using the simple algorithm from Quadrant Count Method formula as Figure 4.4 below.

$$\text{Mean} = \frac{\text{No. of pts. in the region}}{\text{No. of quadrants}}$$

$$\frac{247}{30} = 8.23 \text{ (Mean)}$$

Step 1: Find the Mean value of the sample can be calculated as above.

$$\text{Variance} = \frac{\sum x_i^2 - \frac{(\sum x_i)^2}{n}}{n-1}$$

$$= 9^2 + 24^2 + 12^2 + 13^2 + 9^2 + 11^2 + 2^2 + 8^2 + 11^2 + 10^2 + 10^2 + 12^2 + 4^2 + 10^2 + 7^2 + 12^2 + 7^2 + 16^2 + 3^2 + 11^2 + 13^2 + 2^2 + 14^2 + 7^2 + 6^2 + 5^2 + 4^2 + 6^2 + 3^2 + 5^2 = \underline{2676}$$

Step 2: Let xi be the frequency of points in each quadrant. Then the Variance of the sample can be calculated.

$$= \frac{247 - \frac{(2676)^2}{30}}{28-1} = 4.96$$

$$\text{VTMR} = \frac{\text{Variance}}{\text{Mean}}$$

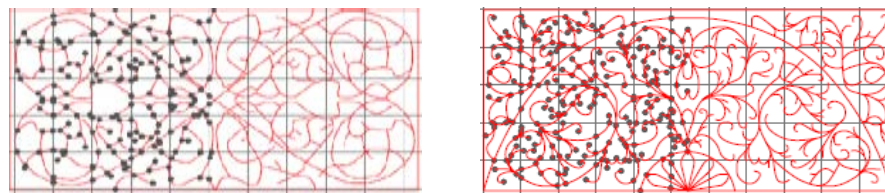
$$\begin{aligned} \text{VTMR} &= \frac{22.15}{8.33} \\ &= 2.69 \times 2 \text{ (both side)} \\ &= \underline{5.38} \\ &= \underline{1.90} \end{aligned}$$

Step 3 : Variance To Mean Ratio (VTMR) is calculated as above.

Figure 4.4: Quadrant Count Method and Algorithm applied to get the VTMR value

#### 4.3 The value of VTMR of Istana Jahar and Istana Tengku Long.

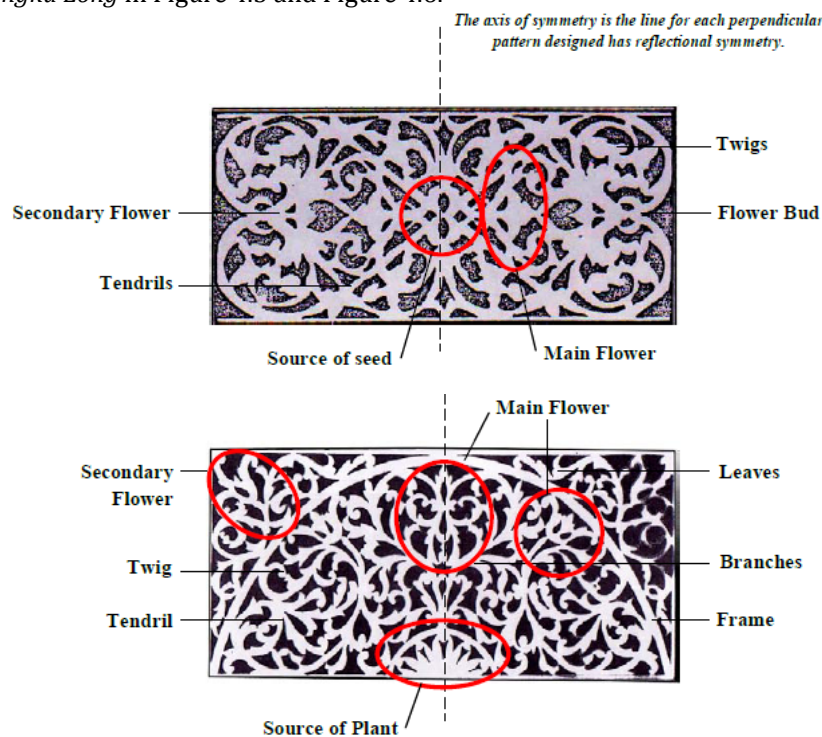
As the strategies of research are based on experimental research and interpretive-historical, the measured drawing of two ventilation panels were analysed in two research tactics which are (1) Visual pattern analysis by using Point Pattern analysis and (2) Visual description in terms of design element of floral motifs. The design elements of floral motifs are comprises source or *Benih / Punca*, branches, twigs, tendrils, flower buds, leaves, flowers, flowers and many more (Sabrizaa, 2009). Detail analysis of both ventilation panels in relation of complexity pattern and design elements are shown in Figure 4.5. Accordance to visual pattern analysis, the value of VTMR of both ventilation panels are allows the result of complexity pattern as *Istana Tengku Long* ventilation panel score higher that *Istana Jahar*. Besides, this visual pattern analysis also aims the frequency used of the point in the quadrant produced by grid size 200mm x 200mm. The more frequency of point in the quadrant, higher the complexity pattern of ventilation panels. As the experimental research, deficiencies of the algorithm on design pattern are needed to be classifying as a new proposed methods.



Source: Author, 2010

Figure 4.5: VTMR of *Istana Jahar* ventilation panel (left) 4.06 and VTMR of *Istana Tengku Long*

Another significant of research tactics, the methods of visual descriptive analysis has been applied to provide the verification information and support the results of VTMR on complexity pattern in the carving motifs and pattern. The analyses identified a composition of design element, types of patterns and design principle reflected in producing a complete floral motifs and patterns on the carved component. Varieties of design elements are shown for both ventilation panels of *Istana Jahar* and *Istana Tengku Long* in Figure 4.5 and Figure 4.6.



Source: Author, 2010

Figure 4.6: Design elements on carved ventilation panels of Istana Tengku Long.

**Table 4.1:** Visual description analysis on single rectangular panel of carved components  
Source: Author, 2010

Table 4.1: Visual description analysis on single rectangular panel of carved

No.	Type of Buildings	VTMR	Types of Pattern	Types of Incision/ Perforation	Design Element	Design Principles
1	<i>Istana Jahar, Kota Bharu, Kelantan. 1840</i>	4.06	Complete Pattern	Direct Piercing non overlapped	Source of seed Main flower Secondary flower Flower Bud Tendrils Twig	2 -Symmetry
2	<i>Istana Besar Tengku Long, Kg. Raja, Besut, Terengganu 1926</i>	5.38	Complete Pattern	Direct Piercing with overlapped	Source of plant Frame 2 Main flower Leaves Tendrils Branches Twigs	2 -Symmetry

## 5. Conclusion

### 5.1 Design character on floral motifs and pattern of ventilation panels.

The most important findings to appear from the data collected is the aforementioned research tactics has identified several attributes serves as defining a physical character in relations between carving motifs and patterns and the value of VTMR that leads to complexity pattern as such (1) the types of motifs and patterns, (2) types of incision or perforation, (3) design elements, and (4) design principles. Accordance to the comparison between both ventilation panels as clearly explained that the *Istana Tengku Long* ventilation panels appeared more complex in term of floral motifs and pattern rather than *Istana Jahar*. Strong evidence obtained from visual description attribute of design element also considered as factors that determine the complexity of the pattern. From the ventilation panels presented above, (Figure 4.3) it appears that the old Malay flower motifs (*Kelopak Maya*) have been applied as the main flower motif and secondary flower motifs. Meanwhile for *Istana Tengku Long* ventilation panels, it appears that Malay motif of Langkasuka has been depicted into two main flower motifs including *Bunga Pecah 5* (below part) and *Bunga Pecah 3* (upper part) as below part and upper part has been separated by semi circle frame. Both motifs and pattern of ventilation panels are designed into complete pattern with direct piercing non overlapped (*Istana Jahar*) and direct piercing with overlapped (*Istana Tengku Long*) in terms of types of incision and perforation. This allows the results the complete pattern of *Istana Tengku Long* ventilation panels look more complex than *Istana Jahar*. There is a possibility that the result is due to the design element of carving motifs itself. The most significant finding obtained from the analysis is the various design elements of floral motifs for both ventilation panels. As for *Istana Jahar* ventilation panel comprises source of seed, main flower motif, secondary flower, flower buds, tendrils and twigs are produced low VTMR value compared to VTMR value of *Istana Tengku Long* which contains more floral elements as such source of flower, semi circle frame, 2 main flower motifs, leaves, tendrils, branches and twigs. These design elements embellished by these both ventilation panels are combined together to form one complete comprehensive pattern which initiated by a indicator point called source as appeared in Figure 4.3 and figure 4.4. According to local scholar and craftsmen, Sabrizaa (2007) and Norhaiza (2009), they claim that the categories of source divided into five types namely source of plant, source of vase, source of secret, source of earth and source of water but both design motifs and pattern in both ventilation panels are illustrated as growing plants and depicted into two-symmetrical design as concurs by Zumahiran (2010).

## 5.2 Discussion

Ventilation panel is vital carved component for ventilation purposes in allowing exchange of airflow in and out of building, (Ismail, 2010). These findings of the analysis are allowed the study to identify the trend of complexity pattern in the carving motifs and explore the results of change of the trends between the periods of era. Furthermore, the significance of the physical character of carvings found on the floral motifs and patterns show the strong factor influence on intricacy complexity of pattern as found on ventilation panels of *Istana Jahar and Istana Tengku Long*. Therefore, it is likely that there is connection between the value of VTMR of point pattern by using the visual pattern analysis and the visual description analysis on physical characters of carving motifs in relation to identify the complexity of pattern. The findings of the study suggest that these tactics may leads to discover the change of the trend of floral motifs through the era. In sum, these findings and results would bring a new knowledge to the subject of Malay woodcarving. Significantly, nowadays, in design perspective Malay woodcarving is showing vitality in our local construction as to sustain it as a Malay art identity.

### Acknowledgement

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### References

Alberto sanfelia (2004). *Proceedings of Progress in Pattern Recognition, Image Analysis and Applications*. 9<sup>th</sup> Iberoamerican Congress in Pattern Recognition, Puebla Mexico.

Che Gu Abas, Personal Communication on Motif and Pattern of Malay Woodcarving, Pasir Puteh, Kelantan, 2010.

Farish A. Noor, and Eddin Khoo (2003). *Spirit of Wood the Art of Malay woodcarving*. Singapore: Periplus Editions (HK) Ltd.

Ismail Said and Zumahiran Binti Kamarudin (2009). *Carving Motifs in Timber Houses of Kelantan and Terengganu*. Universiti Teknologi Malaysia (Unpublished)

Ismail Said, Personal Communication on Function of ventilation panels, UTM Skudai, 2010.

John Shawe Taylor and Nello Cristianni (2004). *Kernel Methods for Pattern Analysis*. Cambridge University Press.

Mohamad Rasdi and Mohamad Tajuddin(2006). *The Discontinued Traditions of Malay Wood Carvings in Modern and Post-Modern Architecture in Malaysia*:. Jurnal Alam Bina, Jilid 8, No.2, 2006. Universiti Teknologi Malaysia.

Norhaiza Nordin, Personal Communication: The Art of Woodcarving, Besut, Terengganu, 2010.

Tariq, Erum (2004). Introduction to Point Pattern Analysis. Undergraduate Research . Schools of Mines and Technology, South Dakota.

Zulkifli Hanafi (2000). *Pola-Pola Hiasan Di Dalam Bangunan Tradisional Melayu. (Decorative Patterns in Malay Traditional Building)*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

Zumahiran Binti Kamarudin (2008). *Principal orders in the composition of Woodcarvings and Its Layout in Kelantan and Terengganu Traditional Houses*. Universiti Teknologi Malaysia (Unpublished).