

Spatial Configuration on Colonial-Style Dwelling in Kidul Dalem Malang

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Abstract— The occupation of Dutch in Indonesia for around 350 years has left a strong influence on architecture of buildings in Indonesia, especially in Malang. This architecture is well known as Dutch colonial-style. The colonial-style can be found easily in the government buildings or dwellings that built in that period of time. This study discussed about space configuration of dwelling with colonial-style in Kidul Dalem, Malang. Spatial configuration was used to identify relations of inter spaces that formed by the flow of circulation. This spatial configuration could show the spaces that had shape and high influence against the other spaces. The result of spatial configuration could be used as reference in designing of spaces and dwelling by considering the ease of inter-space reaching. Analysis of the spatial configuration conducted by using space syntax methods with a specific analysis on the Visibility Graph Analysis (VGA) aspect. The VGA analysis was conducted to identify configuration of the spatial formed that covered connectivity, integrity, and intelligibility. Results of the study showed the spaces in the studied building which had high connectivity were circulation area, living room, and yard. Some spaces with high connectivity value coincided with its integrity. Correlation of the both aspects showed that buildings with symmetrical shape had the best intelligibility. As one of colonial-style building characteristics, the symmetrical shape offered a good space configuration with easier inter-space access.

Index Terms— architecture, colonial-style, dwelling, spatial configuration, space syntax.

1 INTRODUCTION

The occupation of Dutch in Indonesia for around 350 years, which is well known as colonial period, contributed a lot of influences on Indonesia in several aspects. Architecture was one of aspects that received great influence from the Dutch. This fact can be seen from the existence of colonial-style in government buildings and also residential dwellings that built in that period of time.

Colonial-style that brought by Dutch to Indonesia was initially applied in accordance with what was in its origin. The shape of building that applied in the earlier of colonial period was not suited for the climate and condition of Indonesia. Later, the colonial-style was modified to be more adaptable to tropical condition, by applying a slope roof that was steep, wider eaves, and more aperture. Adaptation of the colonial-style to local condition, was the reason for the rapid development of the style in the 19th century (Pane, 2008; Titisari, 2008). Besides that, the use of colonial-style in building and dwelling, was believed that could increase the social status of the building owner, especially for native.

Malang was one of the cities that once occupied by Dutch in a very long period. Since the Dutch took over the government system of the city, the influence of the Dutch culture and colonial system increased significantly. Central government of Malang City in the earlier of occupation was in "Alun-Alun Kotak", or now it is well known as "Alun-Alun Merdeka" or "Merdeka Square". This square was the center of city life, such as central of government, trading and settlement.

Since they dominated government system of Malang City, colonial influence spreaded over central area of government, included in Kidul Dalem dwelling area. Kidul Dalem was one of the closest dwelling area to the central of government of Malang. Kidul Dalem area was populated by native who worked in government office. Besides of the area was very close to the central of government, the people who worked in

the government office also contributed to the increase of colonial influences on every aspect of life in the city.

Developing of colonial-style in Indonesia, had been presented in several studies. The developing of colonial architecture in Indonesia was divided into several types (Handinoto, 1996):

1. Colonial architecture in 1870 – 1900.

Colonial building in this period commonly used Indische Empire Style. The character of building used thick wall with a symmetry plan, high ceiling, and marmoreal floor.

2. Colonial architecture after 1900.

Colonial-style that developed in this period was Amsterdam School style, and mostly used in government building and public. Character of colonial-style was showed by using of sculptural ornament.

3. Colonial architecture after 1920.

Character of building with colonial-style in this period used characteristic of Indisch. This building style showed that there was combination of colonial-style and traditional-style of Indonesia. In this period, had done a lot of building style adjustment with the climate of Indonesia.

Colonial-style application that found in Kidul Dalem dwelling area, could be seen from façade display. The characters of building façade of colonial-style were, (Handinoto, 1996; Kariszta, 2008):

1. Tower element;
2. Dormer element;
3. The using of gable;
4. *Windwijzer*;
5. Balustrade; and
6. The using of double door.

The building façade could show architecture-style that used, but the character of the owner and resident could be seen more deeply on the inner aspect of space. Study about space in

building, especially on colonial dwelling, had been conducted several times on aspect of the physical order of space, change, and factors that caused the change (Amiuzza, 2006; Purnamasari, 2010; Wardani, 2004). Besides the physical order of space, another aspect that showed character and application of architecture style was spatial configuration.

Spatial configuration considered relationship of inter-space aspect that formed in building, which was based on the proximity and the ease of reaching the space. Such that, it needs to be investigated deeply on inner-space aspects to know application of colonial-style and characteristics of the residential. Spatial configuration was conducted by using space syntax methods, that was assisted by Depthmap software.

This study discussed about space configuration of dwelling with colonial-style in Kidul Dalem, Malang. Spatial configuration was use to identify relations of inter spaces that formed by the flow of circulation. This spatial configuration could show the spaces that had shape and high influence against the other spaces. The result of spatial configuration could be used as reference in designing of spaces and dwelling by considering the ease access of inter-space.

2 RESEARCH METHODS

Space syntax was study methods that was used to measure, count, and describe space configuration into three kinds of diagram (Darjosanjoto, 2006; Maina, 2014). Space syntax methods used analysis in concept of depth topology and dimension of space (Siregar, 2014). Space syntax was conducted to understand about space theory and combine descriptions computerized, and observation of spatial pattern, that linked in statistical calculations (Hillier, 1984). Interconnection between spaces will be measured based on the ease of reaching and circulation based on the concept of distance. Implementation of space configuration analysis by space syntax methods was helped by using Depthmap X program.

Depthmap X program was software that specially designed to know and measure inter-space correlation. In this study, spatial configuration aspect that studied was how linkage relationship inter-space in the building. So, analysis used was Visual Graph Analysis (VGA), that conducted to know relationship between points on spatial network.

VGA analysis was conducted on the configuration aspect, which covered space connectivity, integrity, and correlation of both that was intelligibility. This analysis was conducted by identifying inter-space visual acces in building.

Analysis by using depthmap program, was based on the depiction of two-dimension shape of building layout. Layout that was drawn by Autocad program, imported into Depthmap, then visibility analysis was conducted. In its analysis, VGA would show graph of space depiction that seen easily among other spaces, locally and globally.

Graph resulted in VGA analysis will show depiction of depiction of reaching space by using color symbol. Colour symbol used was blue colour that meant the space had low visibility

into red colour that had high visibility as introduced in Figure 1.



Figure 1. Color Symbol on VGA Analysis

When result of VGA depiction was received, conducted some measures that based on formed visibility graph. This measure was conducted into two types, locally that covered visual access interconnection between one space with the surrounding space, and globally that covered visual access interconnection between one space with the entire space in the building. This measure was conducted based on mathematical value, then conducted a simple analysis by Depthmap program.

3 RESULT AND DISCUSSION

Study was conducted in Alun – Alun Merdeka, Malang, that was part of Kidul Dalem area. This dwelling area directly adjacent to the regent office and shopping center area. The study about spatial configuration was conducted on the chosen samples which satisfied the following requirements:

- The function of building as dwelling that used colonial-style;
- The age of building was over 50 years;
- There was not significant change in the whole part of building, or no changing in the original structure of the building.

In Kidul Dalem area, there were seven buildings of dwelling in colonial-style, that could be analyzed in their space configuration (Table 1, Figure 2). In all dwelling cases, conducted data collecting of inner-space, then analyzed of configuration was conducted. Space configuration analysis was conducted by using space syntax methods.

Table 1 : The Case of Colonial-Style Dwelling in Kidul Dalem

No.	Case Name	Address
1	K-1	Jl. Aris Munandar I / 1006
2	K-2	Jl. Zainul Arifin VI / 981
3	K-3	Jl. Zainul Arifin VI / 818
4	K-4	Jl. Zainul Arifin VI / 856
5	K-5	Jl. Zainul Arifin IV / 39
6	K-6	Jl. Zainul Arifin Gg. Kabupaten no. 3
7	K-7	Jl. Aris Munandar no. 38

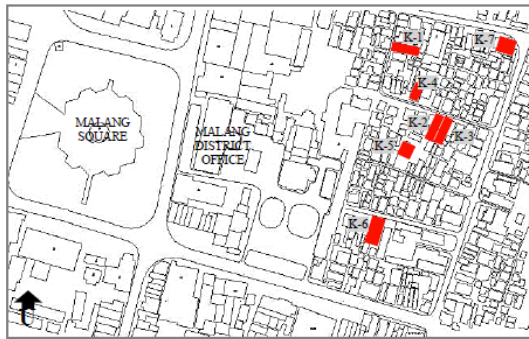


Figure 2. Location of Colonial-Style Dwelling in Kidul Dalem

3.1. Connectivity

Every layout in the dwelling cases was identified based on its space function, and then was analyzed by using VGA methods with Depthmap program. The first analyses of the VGA methods was obtaining diagram of easiness access in a building that called by connectivity. The highest value of connectivity was identified by red colour space symbol (Figure 3). Based on analysis for all cases, space symbol signed high connectivity value was in the front yard or back yard, and circulation node of space connector. Variation of shap of the dwelling house, also influenced the mapping of connectivity level analysis. It caused by an adjustment with the size and the shape of the area. In the dwelling that had large lots and had a possibility to have yard, the highest connectivity space was in the yard. The shape of yard dwelling that had high connectivity value was the yard that surrounded by spaces, with direct access that directly proportional to the width of yard.



Figure 3. Results of Connectivity Analysis

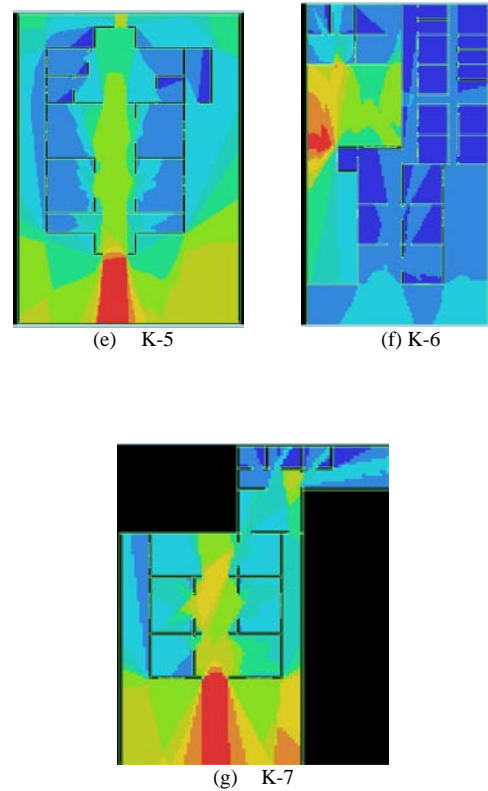
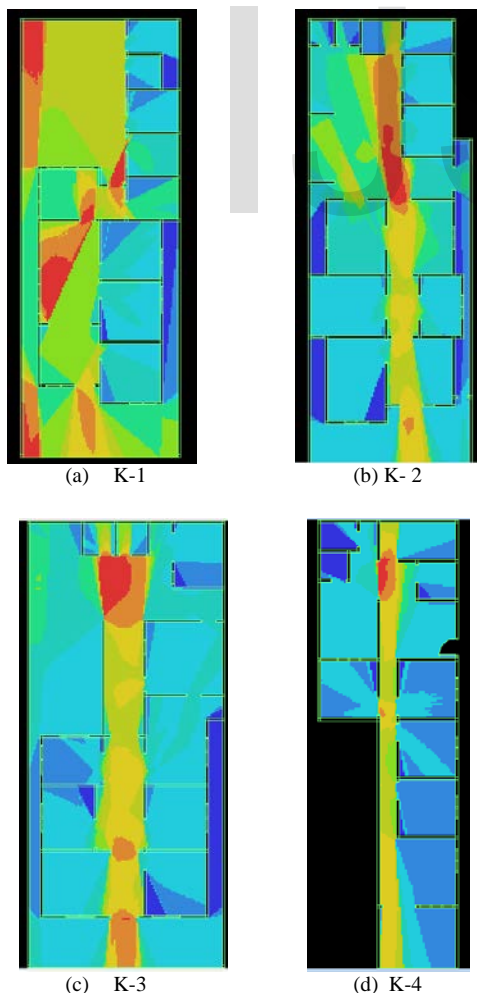
In the case number 1, 2, 3, 5, 6, and 7, the spaces that had high connectivity were front yard or back yard. In the case of number 1, 2, and 3, there were two yards, front and back. In that case, the back yard was larger than the front yard and directly connected to the surrounding spaces. Hence, the highest connectivity in the dwelling was reaching in the back yard. In the case number 4, there was dwelling that didn't have yard in too large size, the highest connectivity was at the circulation node. Connectivity value was decreasing according to color changing that showed by Depthmap analysis. Living room, that commonly used as main space for family activities, was not always had high connectivity value. In the case number 1, living room had high enough connectivity value compared with among living room in the other cases. It was due to relations

between living room and the surrounding spaces. In the case number 1, living room directly connected to guest room, two bed rooms, and dining room, while in other cases were not. In the bed room and space that only had one connection with surrounding spaces, had low connectivity which was represented by blue colour.

3.2. Integrity

Integrity value of space in a building showed position and space connection against all of spaces in the building. Integrity value calculated direct and indirect connection inter-space compared to all of spaces. The highest integrity from the analysis indicated by red scale (Figure 4). Space that had high integrity was the space equipped with many pedestrian movement.

Analysis result of integrity showed there were red nodes distribution, whereas in some cases looked coincide with connectivity. In the case number 2, 3 and 7, integrity aspect distribution of space looked coincide with connectivity, but the node was smaller. This caused comparison of space for integrity analysis was bigger than the connectivity. In the case number 1, integrity node distribution was larger than the connectivity node, which existed at yard and dining room. In the case number 4, 5, and 6, integrity node distribution was smaller than the connectivity node.



Gambar 3. Result of Integrity Analysis

Spaces that had high integrity value were living room and yard. It meant that, the yard and living room were the spaces that easy to reach than other spaces. Bed room and circulation gang on the side of building had low integrity value.

In the case of building that had symmetry shape with tight divider place, the highest integrity value was located along the symmetry line in the middle of building. In the case number 1, symmetry building had the highest integrity value along the symmetry line in the middle of building. This was caused by less divider space that made a larger space and had a good connection. In the case number 6, the building was combination of cluster in the front and the back of building, and tight divider space, the space with high integrity was found in the back yard. Analysis result of integrity node showed that the building shape and tightness of space of divider space influenced integrity value of the space.

Integrity value was in numerical calculation that presented in Table 2. Integrity value of the case number 1 had the lowest value, that was 8,4128. The highest integrity value of inter-space was the case number 5, that was 10,8274.

No.	Case	Integrity Value	
1	K - 1	8,4128	Very Low
2	K - 2	10,1998	Very High
3	K - 3	10,4498	Very High
4	K - 4	9,9901	Low
5	K - 5	10,8274	Very High
6	K - 6	9,7259	High

7	K - 7	8,8970	Low
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Parameters:
 Very High : 9,8751 - 10,500
 High : 9,2501 - 9,8750
 Low : 8,6251 - 9,2500
 Very Low : 8,0001 - 8,6250

The case number 5 was the building that had the highest integrity and had space configuration that easy to reach by other spaces in spatial. Based on analysis result of integrity distribution, red node only found at the front of the middle of the building (entrance). The red node started at the middle of building, then ended at the entrance, which graded from yellow into green (inside of building).

The case number 1 was the building that had low integrity, in which its space configuration was not easy to reach inter-space in the building. There were some red nodes in the distribution of integrity node. In the case number 1 there was some areas that had high integrity, they were the entrance, living room, yard, and transition space of dining room and back yard. The nodes had high integrity, but if compared to other building, with the shape and spatial system, its integrity was low. There was indentation in spatial that made inter-space could not be reached easily.

The spaces that had high integrity value, didn't mean that the building had a good space configuration. This was related to the building space and circulation arrangement. In the whole building cases, a high integrity value was found at symmetry building that had circulation flow in the middle of building. In other symmetry building cases (case number 2, 3 and 7), their integrity values were lower than the case number 5. Building shape in the case number 2, 3, and 7 were symmetry in the middle of building, but there was indentation that made some spatials were not symmetry. Those spatials made the flow of circulation turned down and reduced the circulation access.

Integrity value determined by the easiness of inter-space reaching of the buiding. In determining that value, required to consider the shape of the building, spatial room, and number of space that was connected by the circulation flow. The higher integrity value of a building could be met, if the easier circulation flow could be reached.

3.3. Intelligibility

Intelligibility was correlation analysis between connectivity and integrity aspect. Intelligibility calculated the unity of space configuration in a building structure. In this analysis, conducted adjustment and calculated of connectivity and integrity that presented in regression graphic, that named scatter plot (Figure 5). This graphic illustrated relationship of x axis (connectivity) and y axis (integrity).

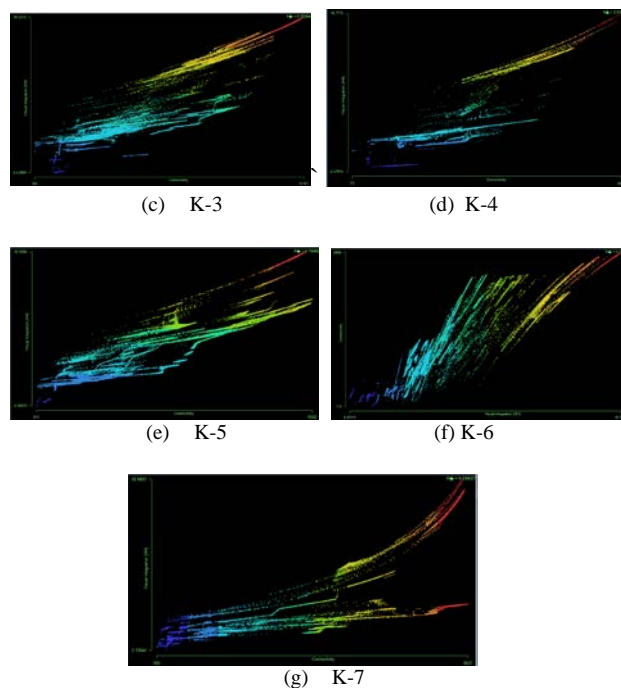
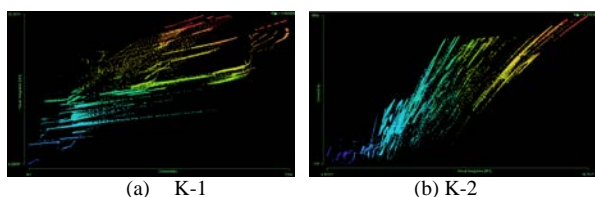


Figure 5. Scatter Plot of Intelligibility Analysis

This scatter plot graphic showed there was relationship between x axis (connectivity) and y axis (integrity), that brought up regression value (R). In this step, there exist an understanding that the higher value of space connectivity and integrity was the higher value of R. It showed that in the higher value of R, intelligibility aspect was also higher. Intelligibility was presented in unit of numbers that was the value of R (Table 3). Value of R in Table 3 showed that there was high correlation between connectivity and integrity. Value of R distribution in the whole of dwelling cases, showed that the lowest R was in the case number 7. In the case number 7, intelligibility value was low, due to the building shape that caused by building symmetry shifting (between the front and the back of the building). Distribution of connectivity node and integrity were low. It showed that space configuration of the building was bad due to the building shape shifting. There was possibility that householder would be difficult in accessing inter-space or got lost in that space system.

Table 3. Intelligibility Value

No.	Case	Intelligibility Value	
1	K - 1	0,693695	Low
2	K - 2	0,778349	Very High
3	K - 3	0,755844	High
4	K - 4	0,816287	Very High
5	K - 5	0,790802	Very High
6	K - 6	0,778349	Very High
7	K - 7	0,594027	Very Low

Parameters:
 Very High : 0,775 - 0,850
 High : 0,700 - 0,774

Low : 0,625 – 0,699
Very Low : 0,550 – 0,624

The highest intelligibility value was found at several sampels, they were case number 2, 4, 5, and 6. It showed that those buildings had good space configuration. Their spaces had high connectivity and integrity, and accessed easily. Hence, the building was suitable for gathering. Building shape in the case that had high intelligibility value was a symmetry building. There were variations in building that had symmetri shape, they were spatial room in the right and left side of symmetry axis. In integrity aspect, an imperfect symmetry building had low value. When this aspect was combined with connectivity aspect, there was a high intelligibility value. It showed that symmetry building made the householder accessed the space easily.

In the case of number 6, with cluster shape had high intelligibility value, there was opened space inside of building, which was used as gathering place that accessed from other spaces easily.

Symmetry shape style and circulation space in the middle of building was one of colonial-style characteristics in some dwelling area in Indonesia (Hartono, 2006; Wihardyanto, 2010). Based on the results of analysis on the dwelling in the area of the study, there were found some symmetry buildings which had good space configuration. The symmetry buildings were equipped with circulation flow in the middle of the building with great intelligibility values, which indicated their connection inter-space could be accessed easily.

4 CONCLUSION

A study on spatial configuration of dwellings with Dutch colonial-style architecture in Malang had been done succesfully. Analysis on configuration of the spatial covered connectivity, integrity, and intelligibility aspects. Connectivity aspect of the colonial-style was at the knot of movement, a yard, living room, and circulation space of the building. While, the integrity aspect was coinciding with the connectivity aspect. In other case, there was an integrity node appeared in a different form from the connectivity node. This was caused by the difference of space comparator between those two aspects. Building shape and intensiveness of the space influenced correlation level between the connectivity and the integrity in units of the space intelligibility. Symmetrical shape buildings with an organized space and circulation flow in the right and left sides had a higher intelligibility. Symmetry space in the colonial-style dwelling had a good configuration that easy to reach inter-space. As one of colonial-style building characteristics, the symmetrical shape offered a good unity of space configuration. This was due to the systematic spatial arrangement with placement of circulation in the middle of building that could connect inter-spaces of the building easily.

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