SPACE AND CULTURE USING SPACE SYNTAX FOR THE TENGANAN PAGERINGSINGAN HOUSING OF BALI, INDONESIA

Aryani, Ni Putu*, Potangaroa, Regan**

*) Freelance Architect, E-mail: niputuaryani@gmail.com
**) Associate Professor, School of Architecture, Unitec, New Zealand, E-mail: potangaroa.regan54@gmail.com

ABSTRACT

Is there a connection between space and the culture that it seemingly contains? Does the space define the culture, or does the culture define the space or is it some combination, working at perhaps different hierarchies?

This paper outlines the preliminary findings of a study of Tenganan Pageringsingan traditional housing using Space Syntax; and in particular an isovist field approach. As a Bali Aga village, Tenganan Pageringsingan have a linear pattern along a North-South axis. They are located in the mountainous areas of Bali Island and apply a “Tri Mandala” arrangement. Spatial areas are divided into three hierarchies of space, namely: Utama (sacred), Madya (social area) and Nista (profane).

The paper reports the findings from an analysis of 7 houses, which have differences of building plan, door location, window positions and function. The Spatial Syntax showed that there is a connection between space and culture. Culture could show in a complex idea of the human mind, which is the basis of the formation of space.

Keywords : Tenganan Pageringsingan, Space Syntax, Tri Mandala.

INTRODUCTION

Balinese architecture has seemingly develop from the “Balinese ways of life, their spatial organization, their communal-based social relationship, as well as philosophy and spirituality influenced its design with much to Balinese Hinduism” (wikipedia 2014). These are apparently based on following “patterns”:

- Tri Hita Karana: the concept of harmony and balance consists of three elements; atma (human), angga (nature), and khaya (gods);
• Tri Mandala: the rules of space division and zoning. Tri Mandala is spatial concept describing three parts of realms, from Nista Mandala — the outer and lower mundane less-sacred realm, Madya Mandala — the intermediate middle realm, to Utama Mandala — the inner and higher most important sacred realm.
• Sanga Mandala: also the rules of space division and zoning. The Sanga Mandala is the spatial concept concerning with directions that divide an area into nine parts according to eight main cardinal directions and central (zenith).
• Tri Angga: the conception of hierarchy from microcosm, middle realm, and macrocosm.
• Tri Loka:
  • Asta Kosala Kosali
  • Arga Segara or Kaja Kelod

With the Tri Mandala perhaps being more evident than the others for the TengananPageringsingan Housing of this study.

At a settlement level, Tenganan Pageringsingan Housing is regulated by Tri Mandala along the Kaja – Kelod (North – South) axis. The traditional housing is connected by an Awangan (common plaza) that exercises functions of the village which is divided into three Banjar, namely West Village (Banjar Kauh), Central Village (Banjar Tengah) and East Village (Banjar Kangin or Banjar Pande).

Figure 1. The Village Structure and Tri Mandala Rules
While at a housing level, the Tri Mandala has zoned the house into Utama, Madya and Nista. The Utama is designated for worshipping activities, sleeping for the elderly and storage for Sacred Artifacts. Meanwhile, the Madya is designed for sleeping the unmarried girls, birth ceremonies, death ceremonies, meeting guests, and weaving. Lastly, the Nista is designated for services such as cooking, toileting and pig farming (Aryani N.P., Tanuwidjaja G., 2013). These two are shown in figure 1 above and in figure 2 below.

**Figure 2. The House Structure and Tri Mandala Rules**

**LITERATURE REVIEW**

In order to find out the connection between Culture and Space, Rapoport states five elements of approach and understanding of the patterns of use of the space:

1. Human activity space, the common boundaries consist of several settings or locations,
2. Core, an area of human activity spaces that are most commonly used, understood and directly controlled by the residents.
3. Territory, an area that is closely related to privacy and personal space, together with personal space, territorialitas is also the embodiment of the ego that does not want to be bothered with other worlds and embodies privacy.
4. Area controlled (Jurisdiction), is an area that is controlled or temporarily controlled by a group of settlement dwellers.

5. Personal Distance (personal space), is an area with a distance at which intervention by others will feel disruptive. In contrast to the above four elements that tend to physical limits, personal distance usually does not have a clear physical appearance.

Space Syntax

Space Syntax (Hillier and Hanson, 1984) is a set of techniques for representation, quantification and interpretation of spatial configuration in buildings and settlements. Configuration is defined in general as the relation between two spaces taking into account a third, and as the relation among spaces in a complex taking into account all others spaces in the complex. The three basic conceptions of Space Syntax could be representing the spatial structure of a layout by using three types of syntactic maps (Convex map, Axial map and Isovist map). Isovist map depicts the areas that are visible from convex spaces or axial lines and can be transformed into graphs for purpose of analysis.

The spatial syntax approach starts by applying a grid layout to the area of concern, which is then analyzed. This analysis is based on the notion that spaces can be broken down into components, analyzed as networks of choices, and then represented as maps and graphs that describe the relative connectivity and integration of these grid spaces. It rests on three basic conceptions of space (Wikipedia, 2009):

1. An isovist space is the total area that can be viewed from a point. (Benedikt, 1979)
2. An axial space or line is the longest straight line that can be walked from a grid point (Hillier & Hanson, 1984)
3. Convex space is the space where no line between two grid points crosses the perimeter (Peponis et al, 1997). For example, if the space were modeled as a wire frame diagram then no line between two of its points goes outside the perimeter of the wire frame. All points within the polygon are visible to all other points within the polygon.

The 3 common analysis methods used are as follows:

- Integration measures how many turns or changes of direction one has to make to move from one space to another using the shortest path/s. The term used is “Depth” and the spaces requiring the least average number of turns to reach all other spaces are the most integrated while those with the most are segregated. Integrated areas are mapped as red (hot) and can be characterized as public, busy and community focused. Segregated areas are mapped as blue (cold) areas and are characterized as private, quiet, secluded and out of the way.
Choice is a measure of the “flow” through a space and can be visualized as a water source at the start point diving equally at each spatial intersection.

Depth Distance is a measure of the overall depth of one space of concern to all other spaces. It is usually shown by a justified graph where spaces 1, 2, 3, 4… depths away are shown on levels 1,2,3,4 respectively. When the mean depth is high resulting in a tree like structure the system is described as deep and the spaces as far or distant. Where the mean values are low will give a bush like structure and the system is described as shallow and the spaces are near.

For this study an isovist map approach was used with an integration analysis using the space syntax software called DepthMap. Such an approach is useful in quickly establishing common spatial patterns.

**METHODS**

The method used was to measure 7 houses plans in the village of Tenganan Pageringsingan that were selected as being “good” examples of the local architecture. This was tempered to an extent by access and expediency. The measured drawings were then inputted into DEPTHMAP software and an isovist approached used to produce the maps shown below. These were reflected upon in the light of the traditional design patterns outlined above to see firstly if there was support for such values: and secondly to what extent that could be seen in these maps.

**RESULTS**

The results from DepthMap are the isovist maps shown in figure 3 (Visibility Graph Analysis) below. These are based on the house plans (7 layout plans) geometrically measured in the field (shown as black lines) and consist of colour coded contour maps with the most visible areas being red and the most “invisible” being dark blue. Between these two colours are varying grades of visible/invisible represented by the changing colour spectrum. The supposition is that red areas are “public” while blue are “private” areas.

Each house has 8x15 square meters of space, and has different entrances locations. The house (called Pekarangan) has several buildings placed in accordance with the rules of Tri Mandala.