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A comparative structural module study of Balla Lompoa and Ba'anjung

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ABSTRACT

The phenomena of modernization have questioned the world of architecture due to the occurrence of generic design. One of the adaptive solutions to internationalization and standardization without losing architectural roots is to develop architecture by using vernacular modules. This alternative may be suitable to address the stagnancy issue which is still a common problem in developing architecture beyond tradition, including cases like Balla Lompoa and Ba'anjung. The research aims to present a creative fabric by comparing both modules while understanding their pattern and possible connections. Typology is used as a method to raise the pattern, using the grid as the instrument for the case study. The steps are 1) Architectural redrawing, 2) Module extraction, and 3) Algorithm pattern. The output is an architectural algorithm as the patterns. The finding is the similarities and differences in their structural modules. The research novelty is a module guideline for modernizing Balla Lompoa and Ba'anjung, stimulating the development of a hybrid between the two.

Introduction

Modernization has affected global development tremendously. From standardization to internationalization, these influences have resulted in generic design and dominant styles around the world. Traditionality and vernacularity are often marginalized, some are static, waiting for architects to inspire local architecture to prosper (Lianto, Trisno, et al. 2021). A similar situation happens in most developing countries. Westernization brings tremendous influences in various fields including architecture (Lianto, Husin, et al. 2021). Most new developments in Indonesia have been greatly overwhelmed by global trends, including Kalimantan and Sulawesi as one of the most strategic islands for future Indonesian development. To encourage modernization based on traditional architecture as the inspiration, a flexible guideline based on vernacular precedents shall contribute locality to the new developments, some most effective instruments are developed based on modular comparison and variation.

The research presents a modular study to simulate a development based on traditional buildings while embracing modernity. It encourages the modernization of both vernacular houses instead of surrendering to the stagnancy of the tradition. The comparative study aims to reveal the modular pattern for the typological structure rather than dimension comprehension, thus the overall module of the type can be understood. Despite acting as a guide, the structural module is fundamental for understanding vernacular architecture as commonly applied as direct physical implementation. Thus, a comparison may provide an overall idea of the typical development of both

houses, while representing different cultural and geographical situations.

Two of the most targeted islands for Indonesian future developments are Kalimantan and Sulawesi, where new capital and infrastructure will be focused on the center of the archipelago. Soon or later, the two will face various influences likewise modernization and global trends (Lianto, Husin, et al. 2021). Balla Lampoa is a traditional house of South Kalimantan, while Ba'anjung represents a vernacular house of South Sulawesi. Although both may not be popular inspirations for current local development trends, these two houses should be a priority to be taken into consideration for research urgency as sharing a long history and cultural value to their local contexts (Manor 2024).

Despite both being located in the central part of Indonesia, nearest to the Wallace line, and sharing the southern part of Kalimantan and Sulawesi, both Balla Lampoa and Ba'anjung may not be directly related or share the same origin (Paris and Wahyuda 2022). It is diversity in Indonesia that is considered rich (Yuniar, Tiyas Amanda Saputri, and Mellania Novea Rahmasari 2022), which makes variation becomes prime in its vernacular architecture (Liritantri et al. 2022). The two may soon be urgently taken into consideration for project development inspiration as the government is currently stimulating locality into design consideration. That is why, the research aims to extract the modular pattern of the two as the novelty of the research, while presenting the comparison for research productivity, following by the algorithm of the module as the state of the art.

1. Balla Lampoa

Balla Lampoa was Makasar King's residence (Rachmah 2018), and serving as the center of ethnic community activities (Asmuliany and Amalia 2020). Located at the center of Sungguminasa, Gowa Residency, South Sulawesi (Manor 2024). The building serves as Museum Gowa (Purnamasari and Makmur 2022) located at Sultan Hasanuddin Street No. 48, within an area of 3 ha. Built in 1936 (Purnamasari 2019), this traditional Bugis-Makasar is a platform house made from ironwood (*ulin*) (Raodah 2012). The Lianto, Trisno, et al. (2021) overall development size is about 60 x 40 meters, and its body is heightened by 2 meters from the ground, supported by a column, and served by a staircase. Balla generally consists of 3 parts: the front part (*paddaserang ri dallekang*) for welcoming visitors and the throne location, the middle part (*paddaserang ri tangngah*) with 3 rooms: for heirloom/relics, main bedroom, and living room; the back (*paddasirang riboko*) ladies' room and service.

2. Ba'anjung

Ba'anjung is a Banjar traditional style of architecture adopted from the king's residence from the old kingdom. It is a popular house type around the South including around the border of Central and East Kalimantan (Yuniar, Tiyas Amanda Saputri, and Mellania Novea Rahmasari 2022). It serves as a main coat of arms and a symbol for the rich (Liritantri et al. 2022). Banjar house is a platform house made of iron wood (*ulin*) with high 45º ridged roofs (Seman 1982) and often occupied by royalty, nobility, and state officials (Fadhilah, Breeze Maringka, and Redi Sigit Febrianto 2022). The overall development size is around 35 x 15 meters, its body is heightened by 2 meters from the ground. Ba'anjung consists of 4 parts, respectively from front to back as follows: 1) terrace (*plataran*) consists of 3 parts: frontage (*muka*), middle (*tengah*), inside (*dalam*), 2) reception room (*tamu*) consists of 4 rooms foyer (*antara*), waiting room (*tamu kecil*), parlor (*tamu tengah*), salon (*tamu utama*). 3) stay consists of the living room, main bedrooms, and kids' room; 4) service consists of the pantry, dining room, kitchen, and storage (Paris and Wahyuda 2022).

3. Structural module

A module is a set of standardized parts that is used to construct a complex structure (Charleson 2005). Module in typology is used to form a typical unit as the smallest cell of a building. The structural module is part of the construction composition for building spatial experience (Lianto, Trisno, et al. 2021). Its principles control repetition, rhythm, proportion, and composition as a design tool (Yuniar, Tiyas Amanda Saputri, and Mellania Novea Rahmasari 2022). A structural module is often implemented as a direct guideline to position structure as the most fundamental element (Virgilio 2023) like dictating the location and dimension of foundation, column, beam, and roof construction (Petrović and Isidora Ilic 2021). In the case of housing, the structural module reflects the concept of oikos, as a basic unit of a society

(Martin Dominguez 2022). It reflects community contexts based on family, economy, and social-cultural matters (Desiyana 2022). The structural module contains the ideology, architectural traits, and mathematical reasoning of housing layers and processes (Yuniar, Tiyas Amanda Saputri, and Mellania Novea Rahmasari 2022).

Methods

Typology is used as the research method for comparing and extracting structural modules of Balla Lompoa and Ba'anjung as the case study. By focusing of the building form, the typology assists extraction of the grid as the development instrument (Shtepani and Klodjan Xhexhi 2023), dimension is extracted and grouped from the layout and section to raise patterns of algorithm based on the unit types of the rooms from both houses. The algorithm of the pattern is arranged respectively to understand the mathematical logic (Yuniar, Tiyas Amanda Saputri, and Mellania Novea Rahmasari 2022) behind structural modules (Ariffin, Md Mizanur Rashid, and Nurul Hamiruddin Salleh 2013). Both modules are later compared to emphasize the replication formula, including highlighting the similarities and differences between the two (Husin, Josef Prijotomo, and Bambang Sugiharto 2021).

Results and discussion

Both Balla Lompoa and Ba'anjung are traditional Indonesian houses typically found at similar locations, the heart of the Indonesian archipelago, despite being separated by the Wallace line. Although this faunal boundary line is believed to contrast the species collection between two islands which is Borneo and Celebes, in fact, the collection of the house shares similarities in terms of architectural type. The complexity of the geographical landscape and the difference in cultural diversity presumably influence the overall shape and appearance of both houses, resulting in a variation between the two. Remarkably distinct from those in the Asiatic realm, the two strongly demonstrate the dominant tropical influence of Southeast Asian houses like Malaysia, the Philippines, and Thailand rather than Austronesian or Far East. This may have happened due to the geographical proximity and greater historical influence since the ancient times.

Both Balla Lompoa and Ba'anjung share a typical platform house with similar silhouettes though presented in different shapes. Lifted from the ground, the underneath is a functional extended space for storage, cattle, and service activities and acting as a protection or immediate shelter. The body is typically long, wide-span, open, and connected. It has typically a longer public area, main privates serve by wings, and shorter service at the back of the house. Generally, the interior architecture looks like a very long or grand hall with chambers rather than a compilation of unit types served with a single corridor. The body of the house is a continuous, connected, and single gesture rather than seen as a multiple mass despite being dictated by structural modules and elevated floor in terms of zones and strata. The roof is typically a triangle shape and commonly consists of a variation of degrees, differentiating the hierarchy of the house while providing spatial experiences. The roof is grand, leading, and dominant, while its variation provides gestures and signage.

Regardless of the potency, both Balla and Ba'anjung face stagnancy in the design. Recent development has added a fierce competition to general traditional building, resulting the vernaculars are being neglected, replaced by westernization. Modernization of the two may offer an alternative to stimulate traditional inspired design without compromising the fundamental structural form of the house. One of the instant instruments is the module as a development tool. In addition, despite the common similarities, there are fundamental differences found in module structures. The extraction of modular grids from both houses based on typology guideline shows different algorithm. Balla Lompoa demonstrates an overall body length of 30 meters, a width of 15 meters, a tail of 6 meters, a height of around 10 meters, and underneath of 2-3 meters (figure 1). The module extraction shows a smaller foyer called a baruga of 6 x 5 m, a reception area of 9 x 6 m, a living room of 10 x 4 m, 4 bedrooms with various dimensions, they are 6 x 6 m and 3 sets of 5 x 4 m, a dining room 9 x 6 m and kitchen of 6 x 4 m (table 1). There are variations of even and odd numbers found in the development of the house, the modular algorithm is arranged respectively as 4, 5, 6, 9, and 10 (figure 2). Thus, more variation of modules has resulted in a gradation of sizes and

shapes from the entrance at the frontage area to the service area at the back of the house.

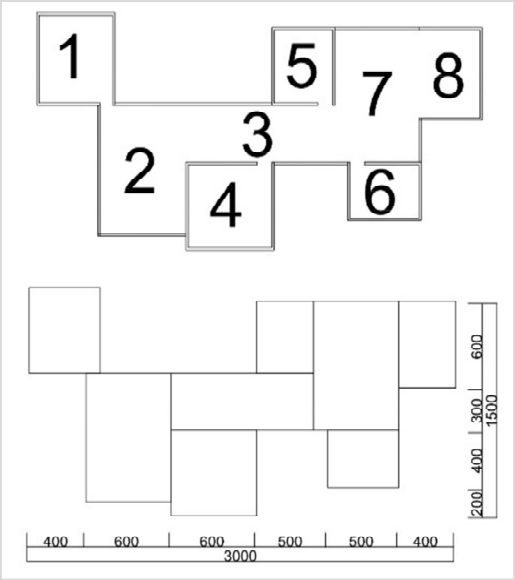

Figure 1. Balla Lampoa layout and module

Tabel 1. Module dimension of Balla Lampoa

No.	Room	Dimension (m)
1.	*Baruga*	6x5
2.	*Sitting room*	9x6
3.	*Family room*	10x4
4.	*Master bedroom*	6x6
5.	*Middle bedroom*	5x4
6.	*Bedroom*	5x4
7.	*Dining room*	9x6
8.	*Kitchen*	6x4

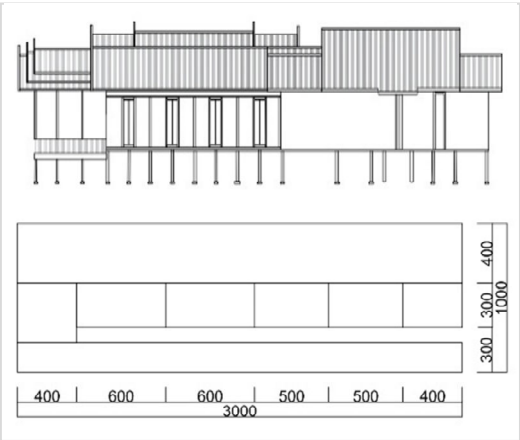

Figure 2. Balla Lampoa elevation and module

On the other hand, Ba'anjung presents an overall body length of 31 meters, a width of 17 meters, and wing width of 5 meters, height of around 15 meters, underneath 3-5 meters (figure 3). Module extraction shows a more typical module, such as terrace as 7 x 3 m, reception area as follows as 7 x 3 m, 7 x 5 m, 7 x 5 m, living room as 7 x 7 m, dining of 7 x 5 m, kitchen of 7 x 3 m, living room of 7 x 7 and bedrooms of 7 x 5 (table 2). There are pure odd numbers found in the development of the house. The modular algorithm is arranged respectively as 3, 5, and 7 (figure 4). Thus, typicality is found with consistency rather than variation yet gradation. The same module and dimension are used for different functions and strata, despite being differentiated by location, orientation, and configuration of the room.

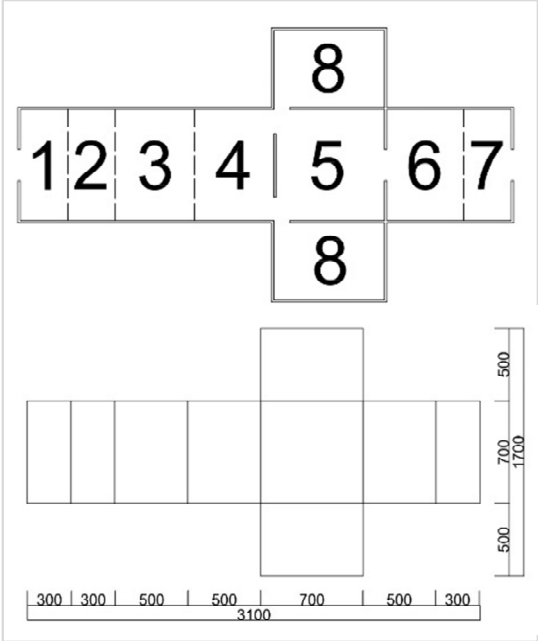

Figure 3. Ba'anjung layout and module

Tabel 2. Module dimension of Ba'anjung

No.	Room	Dimension (m)
1.	*Palatar*	7x3
2.	*Panampik kacil*	7x3
3.	*Panampik tangah*	7x5
4.	*Panampik basar*	7x5
5.	*Palidangan*	7x7
6.	*Panampik dalam*	7x5
7.	*Padapuran*	7x3
8.	*Anjung*	7x5

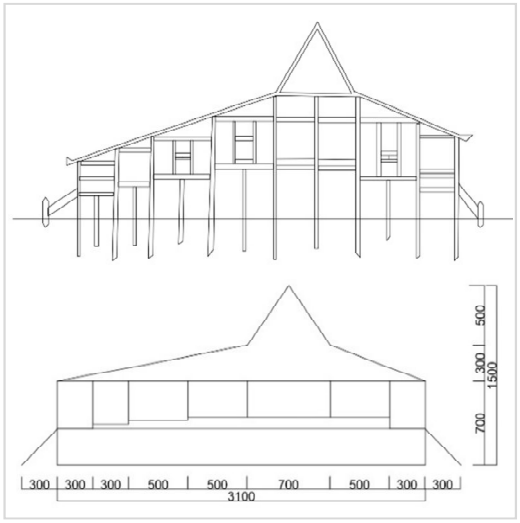

Figure 4. Ba'anjung elevation and module

While Balla Lampoa shows a variation of 4, 5, 6, 9, and 10 algorithms, domination of 4 x 5 as the module, yet a combination of even and odd numbers as the main pattern; Baanjung illustrates a combination of 3, 5, 7 algorithms, domination of 5 x 7 module and odd numbers. The Balla presents a hybridity in terms of numbers while Baanjung has a pure combination. If the Balla Lampoa shows richness and diversity in terms of module and configuration, the Ba'anjung tends to show more efficiency, productivity, and consistency. The contrast between the two may be included into a consideration for developing a modernization of both houses whether to prioritize cultural richness or economic reasons without losing its original guidelines.

Despite differences, both presents a great influence on rooms as the main unit type. Room type controls the overall module of the house rather than providing a specific type of module only for serving as a corridor. Circulation is merged into a communal room, using the room module as a benchmark for replication; resulting in the usage of a typical number of rooms for module proliferation in a building. This fact influences the overall planning of the building structure to consider the rooms as truly the module prototype. It opens up the possibility of converting private space into communality. By expanding the idea of the corridor from function as pure circulation to the development of a multi-function room with various possibilities, both houses stimulate the idea of blending private life and community in the formation of the house.

In the end, the study found a similar morphology and typology presented by the two houses even if demonstrating specific development of unit module and building styles. These two have shown possible different influences even if they share the same platform traits. While Ba'anjung clearly shows a pure cross-type, Balla Lampoa strongly presents an asymmetrical version of the same type. This means Ba'anjung may demonstrate a more common, original, or typical prototype structure while Balla may present a modification, hybrid, or informal style of a type though may not be related to the strata, function, or audience of both houses.

Conclusions

In the case of Balla Lampoa and Baanjung, there is a contrast between the two. While Balla Lampoa is dictated by a combination of even and odd numbers, Baanjung is controlled by odd prime numbers. In this sense, Balla Lampoa shows a tendency of a combined module while Ba'anjung shows a more consistent algorithm. In addition, the comparison shows a tendency as a cross-type house, a typical standard module of room types as the main consideration for building the house both for Balla Lampoa and Ba'anjung. At the end, the research suggests a consideration of replicating rooms as a modernization process in building a house for both cases and as an extended space for the community, while the overall shape can be adjusted depending on the neighboring context.

Acknowledgments

This research is funded by LPPM UNTAR. The module structure in this paper is regarded as an architectural instrument, and investigated as part of the grid. As vernacular houses were made of wood and built traditionally by using depa (similarly to fathom), the unit measurement for formulation has been converted into meters and has been rounded to the nearest formal dimension commonly used in the architecture field for international audiences. The architectural diagram is redrawn based on a comparison between the precedents and other previous research and taken as an artist's impression.

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Author(s) contribution

Fermanto Lianto contributed to the research concepts preparation, methodologies, investigations, data analysis, visualization, articles drafting and revisions.

Denny Husin contribute to the research concepts preparation and literature reviews, data analysis, of article drafts preparation and validation.

Rudy Trisno contribute to methodology, supervision, and validation.

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