Modern Interpretation of Banjarese Traditional House Design: A Case Study of Bubungan Tinggi's Model

Nursyarif Agusniansyah * and Gusti Novi Sarbini

Posted Date: 18 June 2024

doi: 10.20944/preprints202406.0186.v2

Keywords: Traditional House; Design; Model; Transformation; Bubungan tinggi; Modern house

Article

Modern Interpretation of Banjarese Traditional House Design: A Case Study of Bubungan Tinggi's Model

Nursyarif Agusniansyah * and Gusti Novi Sarbini

Department of Architecture, Faculty of Engineer, University of Lambung Mangkurat, Indonesia
* Correspondence: arsitekminimalis@gmail.com

Abstract: This the term "*Bubungan Tinggi*" (High Roof) in this study refers to the banjarese traditional house. A significant artifact in South Kalimantan is called Bubungan Tinggi. With its unique typology and anatomy, this particular building has evolved into an iconic structure that symbolizes the collective memory of the Banjarese people. This research aims to showcase the versatility of the Bubungan Tinggi design in modern architecture by exploring different transformation models. By applying various techniques and approaches, the study provides insights into how this traditional Banjarese character can be adapted for new house designs. The Bubungan Tinggi's transformation process reveals characteristics in its fundamental components, which are distinguished by their geometric objects. Experimental design is the methodology employed in this study. This methodology shows that a variety of transformation models may be carried out by introducing and identifying the Bubungan Tinggi, observing objects in case studies, using transformation techniques and their application, and creating transformation models. This research produced a variety of modeling results that illustrated new interpretations of bubungan tinggi's in modern house design. The incorporation of traditional elements like the bubungan tinggi in modern house design can help preserve cultural heritage while also creating unique and innovative architectural solutions.

Keywords traditional house; design,model; transformation; Bubungan Tinggi; modern house

1. Introduction

A reminder of the Banjar region's past, the Bubungan Tinggi demonstrates the sophistication of building methods used during the period. This is a huge piece of labor that deserves to be remembered. It is necessary to conserve the Bubungan Tinggi's features and replace them with contemporary structures like houses. Harmonising art and culture through sustainable, creative, and innovative design solutions is a key aspect of the research findings. The integration of traditional architectural elements with modern design principles is also explored in the study to create harmonious and culturally rich built environments.

One way to preserve the traditional Bubungan Tinggi in modern design is by incorporating its high roof feature into contemporary architecture. By studying the transformation model of the Bubungan Tinggi, architects can adapt its unique elements into modern house designs while still maintaining its cultural significance. This fusion of traditional and modern elements can create a harmonious balance between preserving heritage and embracing innovation in architectural design. By combining traditional aesthetics with contemporary functionality and environmental considerations, architects can create truly unique and impactful designs that stand the test of time

This research aims to showcase the versatility of the Bubungan Tinggi design in modern architecture by exploring different transformation models. By applying various techniques and approaches, the study provides insights into how this traditional Banjarese character can be adapted for new house designs.

This research produced a variety of modeling results that illustrated new interpretations of bubungan tinggi's in modern house design. The incorporation of traditional elements like the

 doi:10.20944/preprints202406.0186.v2

bubungan tinggi in modern house design can help preserve cultural heritage while also creating unique and innovative architectural solutions. By exploring different transformation techniques and modeling approaches, designers can create contemporary spaces that represent the Banjarese character of the past.

Traditional houses can be conserved in modern design by incorporating traditional architectural elements, materials, and techniques into modern structures. This can help preserve cultural heritage and maintain a connection to the past while still meeting contemporary needs and standards. However, it is important to ensure that the conservation process is done carefully to maintain the authenticity and integrity of the traditional house (Miguel, et all., 2015).

Designs can be made contextually by visual use to get characteristics (George, et all., 2019). Will obtain cultural heritage links in the design (Thanasis, 2017). The traditional form must be preserved but in a new form.

Traditional materials can definitely be modernized through innovative design approaches and technology integration (Farran, 2021). By combining traditional craftsmanship with contemporary techniques, new and exciting possibilities can be explored in creating products that are both rooted in heritage and relevant to modern lifestyles. This fusion of tradition and modernity can help preserve cultural heritage while adapting to changing times (Ronja, 2021). It also allows for the continuation of traditional skills and knowledge in a contemporary context, ensuring their relevance and sustainability for future generations.

Modern materials can be made new but the process can cause significant changes in the original design and functionality of traditional structures. New material can be used (Kamarul, 2020; Jiyoung, 2018). New shapes are obtained from specific design elements that reflect cultural character. These include traditional patterns, colors, materials, and motifs with an effort to integrate elements of architectural style and symbols (Marta and Mondini, 2014). Symbols can give more value because they are easily perceived by building observers. Used on a specific scale that's easy to interpret (Daviv, et all., 2020). Symbols are used for communication, indoctrination, and transmission of cultural knowledge from generation to generation (Ifeoma, 2019).

Cultural heritage can be integrated into modern design through the concept of inter-locality (Couvelas, 2020). This effort to preserve the monumental building with restoration, rehabilitation, and conservation in the architectural heritage (Besana, 2019). New materials have been introduced into traditional construction processes (Rožle, 2023; Randolph, 2022). Architecture reflects heritage by embodying historical values and identity associated with monuments. The perception of society plays a crucial role in determining what is considered cultural heritage. The transition from new-build to reuse developments has implications for architectural education, requiring knowledge of both physical qualities and values embodied by buildings (Doğan, 2020; Marieke, 2020).

Because a house is a private structure—one that is owned by an individual—it is referred to as a case. It is believed that this transformative concept, notwithstanding the uniqueness of this private property, can assist homeowners who wish to highlight the distinctive local identity and character of the Banjar neighborhood. The transformation process of the character Bubungan Tinggi serves as the basis for this application. The value and significance of tall buildings must be transferred to contemporary home architecture—of course with new features—in order to practice transformative thinking. Stated differently, high ridges will eventually lose their shape in the absence of deformation.

Rather of remaining eclectic and boring, Bubungan Tinggi is expected to experience new kinds of metamorphosis. Changes in architectural features result in variations in shape, but the anatomical form's typological features—which are most important—stay the same. Transformation is the process of changing and fine-tuning a new construction form's characteristics. The conversion makes an effort to finish the form's application. A new shape that still incorporates the original components has replaced the bubungan tinggi shape. Architectural and geometric (semantic-semiotic) models are employed as design techniques.

 doi:10.20944/preprints202406.0186.v2

1.2. Bubungan Tinggi

The Bubungan Tinggi house, a traditional Banjar house, is a significant cultural symbol in South Kalimantan, Indonesia (Indrawan, 2011). Its unique form and architectural complexity have been preserved for centuries, reflecting the Banjar tribe's local wisdom and cultural identity (Ikhsan, et all., 2022).This house is made of wood, in the form of a stilt with one roof angled upwards. A range of studies have explored the preservation and modern application of the Banjarese traditional house, particularly the Bubungan Tinggi's Form. Saputra (2018) emphasizes the potential for the green building concept in modern designs, drawing on the adaptation to the environment and efficient use of natural resources in the traditional house. Michiani (2017) underscores the need for preservation, suggesting a strategy that integrates the old house with its surroundings.

The Bubungan Tinggi symbolizes local culture and adapts to climatic and geographical conditions. Sustainable materials are used in the construction of the Bubungan Tinggi house, representing the upper world, middle world, and underworld cosmologies (Marwoto, 2016).

The Bubungan Tinggi house, a traditional Banjar house, stands out due to its distinctive architectural elements. Unlike other Banjar houses, the Bubungan Tinggi house is characterized by a high roof, two annexes on each side of the building, and specific lexicons in its construction. Additionally, the house features unique motifs of floral and calligraphic carvings that hold symbolic significance representing the socio-cultural life of the Banjar people (Eka, et all., 2022).

The Bubungan Tinggi house, a traditional Banjarese house, stands out due to its unique architectural characteristics. Unlike other Banjarese houses, the Bubungan Tinggi house is elevated on stilts with a single roof angled upwards, creating a high ridge (Munawir, 2022). Additionally, the Bubungan Tinggi house serves as a symbol of social power and identity (Zohrah, 2019; Janković, 2022). The connectivity and spatial patterns of Banjarese Kampungs, where these houses are found, further emphasize the significance of the Bubungan Tinggi houses within the community (Eka, et all., 2022). It is a representation of a noble spirit, and the symmetrical masses that are visible on building facades are what distinguish the architectural forms of different traditional Banjars from one another. The existence of foundations is the spatial pattern that is discernible from the building's exterior.

1.3. Bubungan Tinggi's Model

Bubungan Tinggi's value transformation is predicated on the presentation of "novelty," or the connotative consideration that incorporates visual, functional, and sympathetic elements that offer the audience fresh chances for reading. It entails introducing a fresh framework that incorporates metaphors, visuals, collective memories, and impressions. Interpretation, reinvention, and even deconstruction can result in the transformation of existing codes into new ones.

The use of complex geometries in building design is a growing trend, with digital tools enabling architects to explore and implement these designs. Geodetic control is crucial in ensuring the accuracy of these designs during construction (Janković, 2022). Physical models are often used to better understand and appreciate the shapes of these complex geometries (Pignataro, 2012). The Geodesign framework, as applied in urban planning, can also be used to ensure that building designs comply with local regulations (Zyngier, et all., 2015; Elipe, 2018).

Geometry tracing plays a crucial role in various aspects of architectural design, including house design. By analyzing the roof geometry, designers can determine the building outline effectively, avoiding design errors and optimizing multi-criteria considerations (Helmut, 2010). Furthermore, the historical relationship between architecture and geometry highlights how geometry influences architectural creative concepts, formal characteristics, structural aspects, and building methods, showcasing the intertwined nature of these disciplines (Cagdas, et all., 2020). In contemporary architecture, the advent of digital design has revolutionized the exploration of free-form shapes, making geometry a key area of research that informs generative approaches and enhances construction awareness throughout the design process (Maja, 2017). Additionally, programming geometry in the digital realm allows for creative play with form, exploration, and the utilization of computing power as a co-designer, facilitating the materialization of complex architectural objects (Maria, 2016).

 doi:10.20944/preprints202406.0186.v2

Chahardoly (2015) and Sully (2018) both emphasize the significance of geometry in traditional and modern house design, respectively. Chahardoly specifically highlights the use of geometry in plan, size, and architectural decorations, while Sully advocates for an organic and human-centered approach to space control. Zankar (2022) and Watts (2015) further explore the challenges and practical applications of geometry in house design. Zankar discusses the design challenges and solutions in circular residential buildings, while Watts presents a case study on the use of Roman geometrical ordering in the design of a new American Prairie House. These studies collectively underscore the importance of tracing geometry in the formation of house design.

A number of methods, including rotation, translation, embossing, and following, were employed to facilitate the geometric transformation process. Rotation is a technique used to change the angle at which design elements revolve. a method of displacement applied to produce unusual shapes. Footprints are the result of the impact a foot makes on the ground and the resulting change in the ground's shape. Print-related traces are those that are still discernible in the absence of the generated object. By doing this, we hope to release architectural form from the limitations imposed by its structural purpose logic. In other words, architectural aspects like form, function, structure, location, meaning, and so on can be classified as texts, while non-texts are those that don't exist (traces are always references to non-original material, even when they are present in the form of something else).

2. Methods

Qualitative research was done using design experiments, which were then presented in a three-dimensional design model and characterized in descriptive terms. 1) Introduction and identification of the Bubungan Tinggi; 2) Case study object observation; 3) Transformation approach; 4) Application of transformation approaches; 5) Model of transformation results; and, lastly, 6) Conclusions and recommendations. These are the stages of the research. To find elements that can be changed, the Bubungan Tinggi is introduced and identified through literature research. Using typology and anatomy mostly derived from the features of the roof shape, the transformational approach is used to address the geometric aspect of the Bubungan Tinggi. A geometric examination of the Bubungan Tinggi's usual shape was carried out in order to ascertain the character of the Bubungan Tinggi during the transformation process.

Modern houses have changed in shape, but the resulting geometric character is meant to hold special significance and serve as a collective memory of Bubungan Tinggi. To perform observation on the case study materials, modern houses that have undergone renovations were selected. The chosen household items are ones that possess a specific mass form and are malleable, like roof components that can incorporate Bubungan Tinggi-style parts. The chosen modern houses are thought to embody a number of typical circumstances. The transformation approach is applied during the implementation stage by coming up with preliminary concepts for the transformation notion that will be put into practice.

There will be a lot of preliminary ideas. Geometry techniques, particularly tracing and other advanced techniques, are used to execute these notions. It is anticipated that the transformation results in the model stage will manifest as a modern-day adaptation of the Bubungan Tinggi transformation concept.

3. Results and Discussion

3.1. Bubungan Tinggi's Model Processing

This transformation was carried out by analyzing the conceptual study of the Bubungan Tinggi object. Bubungan Tinggi's stand against the different types of traditional Banjars is a great part of defining the era. This made Bubungan Tinggi the mascot of the Banjar region (Figure 1). Psychologically and as a source of memory, the memory of Bubungan Tinggi would eventually be linked to the memory of the Banjar region. It states that Bubungan Tinggi is a collective memory and

 doi:10.20944/preprints202406.0186.v2

provides a conceptual foundation. This basic ideological concept forms the collective memory of the Banjar people. Although it is far from the village, its shape reminds me of Bubungan Tinggi.

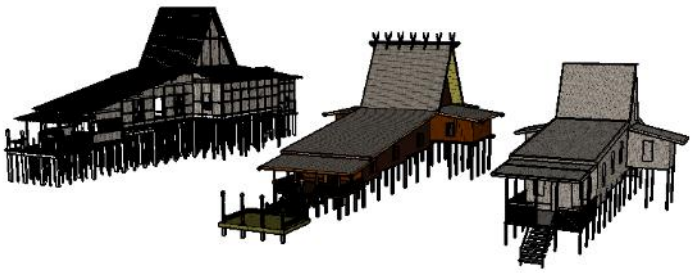


Figure 1. Bubungan Tinggi.

The presence of Bubungan Tinggi in its current location is a masterpiece of a destruction site (artifact). As a legacy that shapes the times. The several states and forms of Bubungan Tinggi that are still preserved, protected, and part of the cultural heritage serve as a reference for the basic forms to be conceptually treated. Bubungan Tinggi is famous for its towering roof shape. And this roof shape is easy to visually understand in both three-dimensional (3D) and two-dimensional (2D). This 3D-to-2D formation, or referring to a 3D shape when viewed in 2D, is a way to memorize and trace a known shape.

According to various research data, there is always one dominant and unchanging (similar) element in several variations of Bubungan Tinggi. It is the towering roof of . The characteristics of Bukittinggi can be analyzed by describing its geometric structure using typology (Figure 2). The roof part is divided into several elements. Get basic geometric shapes.

The analysis of Bubungan Tinggi shapes continues by creating basic geometric shapes in a spatial typology. Multiple spatial geometries or elements called "anjungs" appear (Figure 3).

Additionally, a geometric analysis of the main roof was performed after trying to explain the spatial typology with several geometric shapes. The aim is to preserve the impressive and monumental basic shape of the Bubungan Tinggi roof (Figure 4).

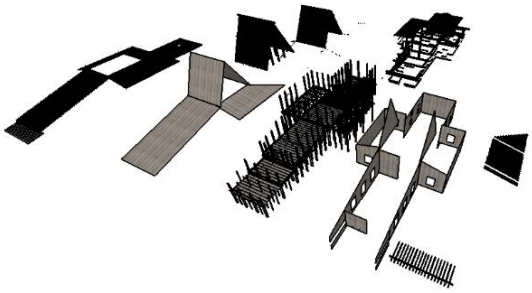


Figure 2. Bubungan Tinggi Elemental Breakdown.

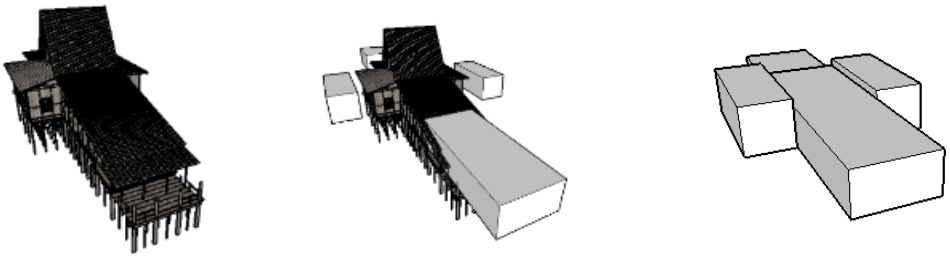


Figure 3. Bubungan Tinggi Typology in Geometry .

 doi:10.20944/preprints202406.0186.v2

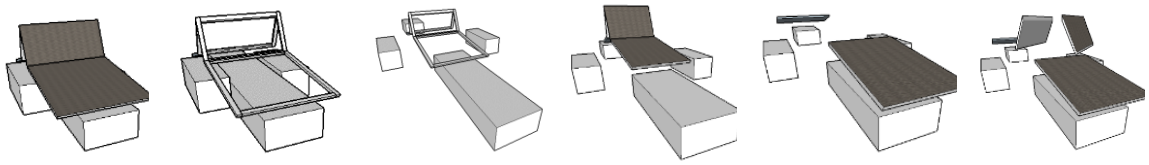


Figure 4. Bubungan Tinggi Typology in Geometry.

Bubungan Tinggi's towering roof features a geometric pattern in the form of an inverted V-shaped peaked roof. This character is a trademark of Bubungan Tinggi. This image aims to become a symbol that gives meaning and significance to the users of the building in relation to Bubungan Tinggi and forms a collective memory.

Deconstruction techniques allow us to decipher geometric symbols by separating existing configurations and finding new ways to combine them to create a new unity and order. Shapes can be separated with different properties while retaining their original properties. The importance of the Bubungan Tinggi shape in this process of change lies in its "rising" form.

3.2. Conceptual Study

The original concept for this transformation was to geometrically apply Bubungan Tinggi's character elements using tracing techniques. Figures 5, 6, 7, 8, and 9 are variations of the different concepts applied. As shown in Figure 5, the visual appearance of the Bubungan Tinggi geometry can be obtained through 2D or 3D facades and 2D or 3D side views.

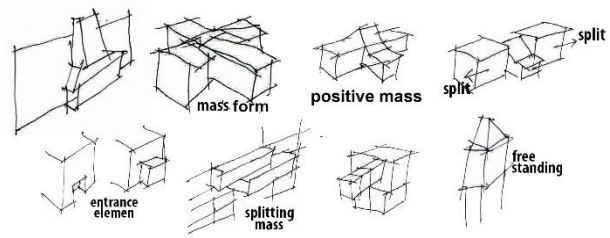


Figure 5. Visual View of Bubungan Tinggi Geometry.

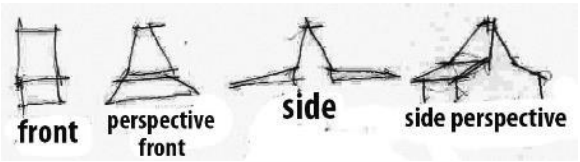
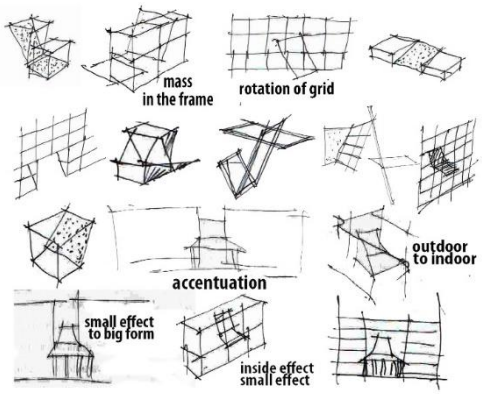


Figure 6. Form Processing.



 doi:10.20944/preprints202406.0186.v2

Figure 7. Geometry Transformation Technique.

In Figure 6, the concept of Bubungan Tinggi transformation features is treated by separating (splitting) the building blocks by accentuating their shapes and with an aggregation pattern corresponding to the Bubungan Tinggi typology obtained by performing. Some concepts that can be used for geometry, especially for Bubungan Tinggi roof forms: Example corner to corner shaped elements, half shapes, or full shapes (Figure 7). Further concepts include splitting, rotation, flipping, tilting (stretching), optical illusion, 3D printing on 2D, and negative mass.The transformation process can be done by emphasizing (stressing) some characteristics of the shape, as in the concept of Figure 8. The transformation is also based on the unique idea of modifying the shape to better express the characteristics.

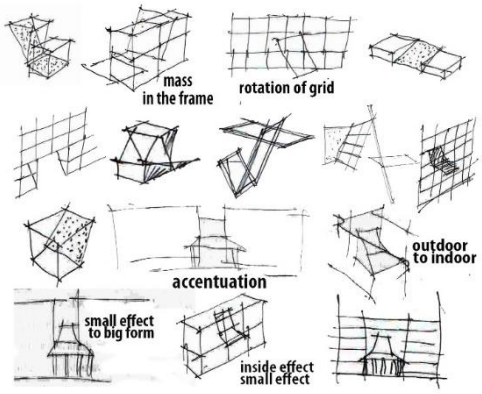


Figure 8. Accentuation Technique.

The form of the Bubungan as shown in Figure 9. The characteristic of the roof will dominate, giving rise to the idea of some new variations.

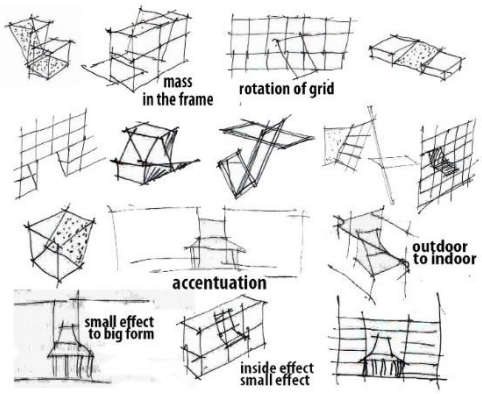


Figure 9. Mass Processing Technique.

3.3. House Transformation

House transformations were carried out to emphasize the shape and character of Bubungan Tinggi. Various samples were taken from house buildings and these samples were analyzed to support the changes. The samples taken for support were uniquely designed houses and new shapes and styles with 2 (two) floors to maximize the results of the changes. House buildings usually have a roof, so this becomes the foundation in the renovation process. The right and appropriate house for the alteration test is the house that continues at the analysis stage.

The initial concept was derived from several sketches of the conversion model. This concept was then analyzed using three-dimensional processing. The resulting target transformation model is a final model with a new formation that is different from the two (2) original forms, both traditional

 doi:10.20944/preprints202406.0186.v2

and modern, but this new form still shows the characteristics of each character in a balanced manner. Visually, there should be a picture/ image/ impression that it is a new form, but its characteristics can appear and show its origins. Both visually, in terms of shape or geometry, and also in terms of materials. In buildings, of course, the functional aspects and even the style of the building. An analogy that can explain this is when there is a marriage between 2 (two) people who come from the local area (adat) with someone who comes from outside the region or even internationally. For example, a Banjar and a European. Each has certain characters and characteristics that are very different. These two people come from different origins and cannot be physically related to each other. But when there are other forms, such as the birth of one's own child, then of course new characters can emerge, but the child still has the elements of the character, which come from both sides simultaneously in proportion. Some characters come from one parent and other characters come from the other parent. However, it is clear that the origin of the character is still strong. For example, the skin color traits of the elders in the area and the nose shape traits of other sages.

The essence of Bubungan Tinggi was tried to be integrated into the form by using 3D processing building techniques. The treatment is done by using the main Fig of the Bubungan Tinggi to explore the changes in the settlement. There are two (2) concepts attempted in addressing the form, namely: adding a modern form to the Bubungan Tinggi model and incorporating the character of the Bubungan Tinggi into the modern form. These two (2) concepts are expected to produce a transformation model (Figure 10)

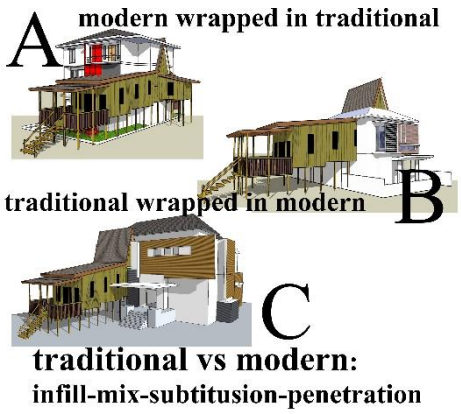


Figure 10. Initial Concept of Transformation in a House.

Concept A tried to build a modern house in the Bubungan Tinggi building. By maintaining the geometric shapes on both sides, it was found that the modern building has a different character, so the traditional Bubungan Tinggi building cannot necessarily be changed. In contrast, Concept B applies the process of building Bubungan Tinggi which is not necessarily closed to the construction of modern houses. So in concept C, we can combine the two sides of the concept, both modern buildings and the Bubungan Tinggi with a balanced proportion of both sides. This means that the complement-mix-substitution transition process between traditional and modern is part of the transformation process.

 doi:10.20944/preprints202406.0186.v2

3.4. Transformation Model for House Design

The application of conversion has been investigated on several house models, i.e., houses on small/ narrow lots become 1 building area, corner (hook) lots become 2 (two) building areas, and open/ large lots become visible. massing can be viewed from various angles. The first is to examine large plots and corner plots with large land areas (Figures 11, 12, 13). This is to gain flexibility in the transformation process. In this case study, we hope to get a good transformation model.

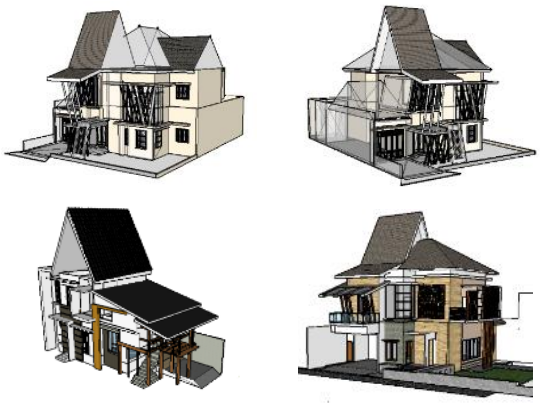


Figure 11. Facaded Buildings on Corner Lots 1.

Figure 12. Facaded Buildings on Corner Lots 2.

Figure 13. Models of Tranformation on Large Parcels of Land.

The second is an exploratory study of the application of transformation on a narrow parcels of land (Figure 14). The geometry of the Bubungan Tinggi shape, i.e. the shape of the roof, is displayed with a rotation technique so that visually the focus is on the shape (focal point). You can see the results based on the results of some of the models above. About the process of transforming Bubungan Tinggi into a modern house.

 doi:10.20944/preprints202406.0186.v2

Figure 14. Facaded Building in Narrow Parcel of Land.

4. Conclusions

The results of the transformation model obtained, initially tried to get a new form and not a form that seemed pure eclectic and monotonous regionalism. An attempt to solve the application of the Bubungan Tinggi form in the result of a new form containing old elements was made. The Bubungan Tinggi is suitable for transformation model because the Bubungan Tinggi is a strong artifact, has character and can be transformed to produce new objects that still have a common thread with the traditions and collective memory of the Banjar region. For 2 (two) storey houses, the free form means that buildings on large plots of land so that the mass of the building is more varied, can use the geometry of the Bubungan Tinggi as a whole but need proper processing so that the new form is not limited to eclectic. The corner piece (hook) also shows the conversion model. A house located on a narrow plot of land has only one surface. And this makes it difficult to apply transformation. However, the use of circular techniques can help further accentuate the character of Bubungan Tinggi. And the maximum result is the design of house buildings with large lots and free-form house masses in the sense that they do not resemble the mass (*eclectic) of the original spatial typology of the Bubungan Tinggi.

Bubungan Tinggi Conversion Modern house buildings certainly cannot leave the dominance of the roof shape, because 2 (two) storey houses that are still on the roof also dominate functionally. But functionally, the house building with modern activities today is different from the function of the original Bubungan Tinggi building, and the spatial pattern is also very different. That could be the basis of one of the "news". In addition, the style of today's house building that uses the minimalist trend model is different from the original traditional style of Bubungan Tinggi. When new materials are used in the application of the Bubungan Tinggi roof, it strongly supports the result of the change. The collective memory of the Bubungan Tinggi character is also visually captured when the transformation model is seen in the building with a new form. Not all original concepts and geometric techniques can be applied to one object. Further research with more house case studies can be conducted to obtain more accurate transformation results to make the conceptual technique of applying Bubungan Tinggi geometry more versatile.

Author Contributions N.A..: Conceptualization, Resources, Methodology, Validation, Formal analysis, Investigation, Writing - Original Draft, Visualization, G.N.S.: Conceptualization, Methodology, Validation, Formal analysis, Review, Writing - Original Draft. All authors haveread and agreed to the published version of the manuscript.

Funding There are no funding enabled.

Ethics Statement As researchers responsible for this research, we declare that the related activities occurred during the workshops in a larger academic event pre-approved by the Institutions. Therefore, all participants agreed previously with their methodology at the moment of the submission and the sharing of their results exclusively in the context of the workshops. For the purpose of this research, we excluded their names, preserving their identities.

Conflicts of Interest The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

 doi:10.20944/preprints202406.0186.v2

References

Miguel, A., et al. (2015) Agronomy for Sustainable Development 35 No. 3, link.springer.com/article/10.1007/s13593-015-0285-2.

George, E., et al. (2019) Journal on Computing and Cultural Heritage JOCCH 12 No. 1, dl.acm.org/doi/abs/10.1145/3292057

Thanasis, Daradoumis. (2017) Analyzing the Educational Design Use and Effect of Spatial Games for Cultural Heritage a Literature Review. Computers education 108, 2017,
www.sciencedirect.com/science/article/pii/S0360131517300076

Farran, Hani Khalil. (2021) "The Intelligent System of Role of Cultural Heritage in Promoting Intellectual Trends of Contemporary Interior Design. Journal of Information Science Engineering 37 No. 6, search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=10162364&AN=153803303&h=Xp%2BRhymhkDEhHf%2B1VLNUa8RRcD8rBD5cgQWHW66ia5Vnje4ZSLhwzjWfOGO1SbPpksIRh4xTMjOrgpMaKb2AwA%3D%3D&crl=c

Ronja, Utescher, and Ulutas Aydogan Selda. (2021) Digital Topics on Cultural Heritage Investigated How Can Datadriven and Dataguided Methods Support to Identify Current Topics and Trends in Digital Heritage. Built Heritage 5.
link. springer.com/article/10.1186/s43238-021-00045-7

Kamarul, Syahril, et al. (2020) 1012. archscience.org/wp-content/uploads/2014/08/ANZAScA2004_Kamal.pdf.

Jiyoung, Park. (2018) "Phase Change Material (PCM) application in a modernized Korean traditional house (hanok). Sustainability 10 No. 4, www.mdpi.com/2071-1050/10/4/948.

Marta, Bottero, and Mondini. (2014) "Decision making and cultural heritage: An application of the Multi-Attribute Value Theory for the reuse of historical buildings Giulio. Journal of Cultural Heritage 15 No. 6, www.sciencedirect.com/science/article/pii/S1296207414000041

David, Gareth, et al. (2020) 874881. Berlin Heidelberg Springer Berlin Heidelberg, link.springer.com/chapter/10.1007/11788713_127.

Ifeoma (2019). "The significance and use of cultural symbols in the contemporary African society: Igbo symbols as a paradigm. Mgbakoigba Journal of African Studies 8 No. 1, 2019, www.ajol.info/index.php/mjas/article/view/187377.

Couvelas, Agnes.(2020). Modern Architecture and Cultural Heritage. In Transdisciplinary Multispectral Modeling and Cooperation for the Preservation of Cultural Heritage First International Conference TMMCH, link.springer.com/chapter/10.1007/978-3-030-12960-6_8.

Besana, Daniela. (2019) Cultural Heritage Design Theories and Methods for the Project Complexity Management. EGE Revista de Expresin Grfica en la Edificacin, riunet.upv.es/handle/10251/142361

Rožle, Bratec, and Gašperič. (2023) "Traditional and modern cartographic materials for geography teaching: From Blaž Kocen to the present Primož. Acta Geographica Slovenica 63 No. 2, ojs.zrc-sazu.si/ags/article/view/11625.

Randolph, Langenbach. (2022) "The earthquake resistance of traditional timber and masonry dwellings in Turkey. In 13th World Conference on Earthquake Engineering Vol. w.conservationtech.com/RL's%20resume&%20pub's/RL-publications/Eq-pubs/2004-13WCEE/GULKAN-LANGENBACH.pdf.

Doğan, Huriye Armağan (2020) "Perception of the modern movement in architecture as cultural heritage. Art History Criticism 16 No. 1, 2020, sciendo.com/pdf/10.2478/mik-2020-0004.

Marieke, Kuipers, and Stroux. (2020) "Embedding built heritage values in architectural design education Sara. International Journal of Technology and Design Education 30 No. 5, link.springer.com/article/10.1007/s10798-019-09534-4.

Indrawan, D., & Wahyudi, A. (2011). SPACE FUNCTION AT BUBUNGAN TINGGI HOUSE IN CULTURAL OUTLET OF SOUTH KALIMANTAN IN TAMAN MINI INDONESIA INDAH, JAKARTA.

Ikhsan, M.R., Sia, M., Siska, M.O., Hidayah, N., Rizali, M., & Halimah, M. (2022). Solar Geometry Factor in the Traditional Banjar "Bubungan Tinggi" House. International Journal of Education, Science, Technology, and Engineering (IJESTE).

Saputra, M., Cahyandito, M.F., & Kurnani, T.B. (2018). Green Building Concept of Banjar Traditional House in Kalimantan Selatan. Ecodevelopment.

Michiani, M.V., & Asano, J. (2017). A Study on the Historical Transformation of Physical Feature and Room Layout of Banjarese House in the Context of Preservation.

Marwoto, I. (2016). The 19th Century Traditional Houses Of The Banjar Islamic (Muslim) Community: A Display Of Power. WIT Transactions on the Built Environment, doi: 10.2495/IHA160181

Eka, Suryatin., Derri, Ris, Riana,, S.S.., Rissari, Yayuk., Nfn, Jahdiah., Budi, Agung, Sudarmanto. (2022). Leksikon, bentuk dan fungsi ruang, serta makna ornamen rumah adat banjar "bubungan tinggi". Naditira Widya, doi: 10.24832/nw.v16i2.507

 doi:10.20944/preprints202406.0186.v2

Munawir, Ikhsan., Muhammad, Rizali. (2022). Solar Geometry Factor in the Traditional Banjar "Bubungan Tinggi" House. International Journal of Education, Science, Technology, and Engineering, doi: 10.36079/lamintang.ijeste-0501.372

Zohrah, Laila. (2019). Evolving connnectivity patterns of banjarese kampungs and rumah bubungan tinggi (high ridge-house) in south kalimantan river networks. doi: 10.25105/LIVAS.V4I1.4625

Zairin, Zain., Uray, Fery, Andi. (2020). The intangible characteristics of the two indigenous traditional dwellings in West Kalimantan. doi: 10.5505/ITUJFA.2019.97720

Janković, V., Vasiljević, S., & Božić, B. (2022). GEODETIC CONTROL OF GEOMETRY OF ENGINEERING FACILITY DURING CONSTRUCTION – CASE STUDY RESIDENTIAL–BUSINESS FACILITY IN SRBAC. САВРЕМЕНА ТЕОРИЈА И ПРАКСА У ГРАДИТЕЉСТВУ.

Pignataro, M.A. (2012). Geometrie complesse e modellazione fisica per la costruzione dell'architettura.

Zyngier, C.M., Masala, E., Pensa, S., Magalhães, L., & Borges, K.A. (2015). Geodesign Process Model: the Role of Visualisation in Feasibility Study of Urban Parameters.

Elipe, M.D., & Díaz, J.A. (2018). Review of contemporary architecture projects based on nature geometries. Revista De La Construccion, 17, 215-221.

Helmut, Pottmann. (2010). Architectural Geometry as Design Knowledge. Architectural Design, doi: 10.1002/AD.1109 —-Geometry tracing in house design enhances generative approaches, construction awareness, and digital workflows, enabling intricate and innovative architectural forms through the utilization of digital tools and complex geometries.

Cagdas, Tuna., Antonio, Canclini., Federico, Borra., Philipp, Götz., Fabio, Antonacci., Andreas, Walther., Augusto, Sarti., Emanuel, A., P., Habets. (2020). 3D Room Geometry Inference Using a Linear Loudspeaker Array and a Single Microphone. IEEE Transactions on Audio, Speech, and Language Processing, doi: 10.1109/TASLP.2020.2998299

Maja, Dragisic., Andjelka, Bnin-Bninski. (2017). The application models of the topological principle of continuous deformation in the architectural design process. Facta Universitatis - Series: Architecture and Civil Engineering, doi: 10.2298/FUACE161115035D —-Geometry influences house design through continuous deformation principles, transitioning from mathematical topology to architectural form, enabling complex spatial logic and flexibility in creating diverse architectural variations. —PDF dah download

Maria, Helenowska-Peschke. (2016). Programming geometry as creative play with architectural form.

Chahardoly, H., & Moradi, M. (2015). Role of Geometry in Formation of Traditional Iranian Houses. European Online Journal of Natural and Social Sciences, 4, 554-561.

Sully, A. (2018). Geometry and Space. The Estate House Re-designed.

Zankar, R., El-Kaaki, L., & Fares, J. (2022). DESIGN CHALLENGES OF SOLVING CIRCULAR GEOMETRY IN RESIDENTIAL BUILDINGS. Architecture and Planning Journal.

Watts, D.J. (2015). The Praxis of Roman Geometrical Ordering in the Design of a New American Prairie House.