Visual and spatial changes of the Batak Bolon House as the adaptation of its people’s lives in Gurgur Aek Raja village of Toba Samosir Regency

Y A Yusran* and D Dirgantara
Department of Architecture, Universitas Brawijaya, Jl. MT. Haryono 167, Malang, East Java, Indonesia 65145

*yusfan@ub.ac.id

Abstract. Traditional people always adapt to settle. Along with the time, the traditional houses have changed adaptively to human needs. One example could be found in the Bolon Toba house around the Toba Lake area. Many of the Bolon houses adding some new structures that make the visual form change. This research studied phenomena of the Bolon House changes in Gurgur Aek Raja village to find out visual and spatial variations as the adaptation of its people’s lives. Descriptively, Bolon House in Gurgur Aek Raja village is described and compared with the original shape of Bolon House in the TB Silalahi Center. The changes were studied using the exoskeleton adaptation concept in the building. Based on the result of the analysis, changes in the Bolon Houses of Gurgur Aek Raja village are dominantly affected by the economic aspect, the way in accommodating new needs, and lifestyle that keep up with the times.

1. Introduction
Vernacular architecture is an architectural masterpiece with specific characteristics that uses local materials and knowledge. In its development, vernacular architecture was established as experimental result of the custom society, or trial and error. Vernacular architecture closely relates to custom society and culture in the community. Along with the time passing by, the traditional houses have changed as the adaptive form to human needs.

Adaptation form to these houses can be seen on the visual and spatial aspects. One of traditional houses that have been changed, for example, is Bolon Toba in Toba Samosir district, North Sumatera. Bolon House is traditional house of Batak Toba tribe, one of Batak sub-tribes who live around Toba Lake.

One of districts in Toba Lake where Bolon Toba house is still existed and inhabited is Gurgur Aek Raja in Tampahan Subdistrict, Toba Samosir Regency of North Sumatera. Therefore, this study took some houses that still have specific characteristics of the original Bolon house, but both visual and spatial shapes have been modified. As comparison, Bolon house that belongs to Marpaung clan in the museum of TB Silalahi Center is used as reference of the original Bolon house in order to observe any changes in visual and spatial aspects of the Bolon house in Gurgur Aek Raja village.
2. Literature review

2.1. Bolon Toba House
Bolon Toba is the traditional house of Batak Toba’s people who live near Toba Lake and Samosir Island. At first, Bolon house was dedicated to the King of Batak Toba, but today, it has been used by common people in order to show their identity as Batak people and to carry on its cultural heritage. Bolon Toba House was created from cultural concept of Batak tribe ‘Dalihan na tolu’ [1]. Such concept arranges the kinship system of Batak custom that develops into element, which forming the Batak’s cultures and one of them is Bolon Toba house and the Bolon House complex based on the clan that so-called Huta.

Broadly speaking, visual aspect of Bolon Toba House is divided into three parts based on the custom cosmology, such as Banua Gijang, Banua Tonga, and Banua Toru [2]. Banua Gijang (the top world) is the top part of the building, with massive triangle shape which shows that the part is the sacred place for God and ancestor of the Batak’s people. The sacredness is represented by the function of Banua Gijang as the place to keep the most valuable things and offering to the ancestral spirit. Banua Tonga (the middle world) is the middle part of the building as the activities center of the inhabitant. Meanwhile, Banua Toru (the bottom world) is the cellar or basement, the space beneath the building, to keep woods and cattle. Among those three parts, there are some elements that forming the Bolon Toba House, such as roof, wall, and foundation [3,4]. Roof or Urur is the element that forming the top part where Buatpara lies as a place to keep the offerings. Wall of the building is divided into two parts, the front wall is so-called Dorpi and the sidewall is so-called Pandindingan. Moreover, the house is supported by pillars (Basiha) that stand above the pedestal stone (Ojahan). Other visual focus of Bolon Toba House is the ornaments at the front part of the house (Gorga) (See Figure 1).

![Figure 1. Bolon Toba House](5)

2.2. Adaptive building exoskeletons
Adaptive building exoskeleton is an adaptive construction change, particularly exoskeleton of the building as a result of building use development [6]. Broadly speaking, such adaptation shows some changes on social housing, particularly the cultural heritage building along with better performance, so that it will adaptively support activities of the user. In this theory, there are two categories of changes, addition and substration, along with eight classifications of each change (See Table 1).
3. Methodology
In this study, direct observation was conducted at Gurgur Aek Raja village in order to find out condition of the object for the research. Results of observation including measurement, early sketch, and documentation were processed and translated descriptively for further analysis. Reimaging was done digitally in accordance with the data in the field to facilitate identification of visual and spatial adaptation of the Bolon House. The same procedure was also conducted on Bolon House that belongs to Marpaung clan, as reference, in the Museum of TB Silalahi Center. Based on results of identification in the field, five Bolon Toba Houses were selected as object of the research in Gurgur Aek Raja village. In this stage, the Bolon House’s owners were interviewed to figure out the extent of exoskeleton adaptation on their houses. In the analysis stage, data that concern with the changes of visual spatial aspects on Bolon Toba houses in Gurgur Aek Raja village was compared with Bolon Toba House, which was used as reference, following the exoskeleton adaptation concept of the building.

4. Results and discussion

4.1. General description of Gurgur Aek Raja village
Gurgur Aek Raja village is selected because this village still has Bolon Toba houses, which are still inhabited. This village is one of villages, which is occupied by sub-tribe of Batak Toba Somanimbil (Siahaan, Simanjuntak, and Hitagaol clans) and Sonakmalela (Simangunsong, Marpaung, and Napitupulu), so that in relation to Bolon Toba House which is used as reference in this research is the Bolon Toba House belongs to Marpaung clan that had been translocated to museum of TB Silalahi Center. Based on results of the survey, five Bolon Toba Houses are still occupied and can be observed in Gurgur Aek Raja village. Locations of these houses are spread over some districts in Gurgur Aek Raja village. These houses belong to the families of Hajuruan Simanjuntak, Sugiono, Roy Simanjuntak, Leo Simanjuntak, and Binsar Simanjuntak (See Figure 2).

![Figure 2. Research object location.](image)

1. Hajuruan Simanjuntak’s family house
2. Sugiono’s family house
3. Roy Simanjuntak’s family house
4. Leo Simanjuntak’s family house
5. Binsar Simanjuntak’s family house

4.2. TB Silalahi Center’s Bolon Toba House (Reference)
T.B. Silalahi Center is one of Batak’s museums in Toba Samosir Regency. This museum keeps various collections of Batak’s culture, and one of them is Bolon Toba House. Collections of the Bolon Toba House were placed at the backyard of the museum in the form of small settlement of Batak’s people,
called Huta. There are seven buildings of Batak’s custom in this Huta, consists of 3 Jabu and 4 Sopo. Jabu or Bolon refers to a house or settlement, while Sopo refers to building to keep the crops.

The Bolon Toba House, which is selected as reference in this study, belongs to Marpaung’s family that was contributed to Batak’s museum of T.B. Silalahi Center [7]. The building as a result of translocation still uses timber and palm fiber to cover the roof, in accordance with the original condition of Bolon Toba house (See Figure 3).

Figure 3. Marpaung’s house in the museum of T.B. Silalahi Center.

4.3. Hajuruan Simanjuntak’s family house
Hajuruan Simanjuntak’s house lies at the south of Gurgur Aek Raja village. The house is occupied by a family that consists of four family’s members. This family makes a living as farmer. Based on results of identification and interview, the house has experienced few changes. The house had been removed at the bottom part of the building’s structure and painting the sides of the building. Some changes have been made in this house in comparison with the reference house. Referring to the adaptive building exoskeletons, this house has experienced two change categories, addition and substraction (See Figures 4 and 5).

Figure 4. Hajuruan Simanjuntak’s house location and documentation.

Figure 5. Detailed drawing of Hajuruan Simanjuntak’s house.
Addition refers to the new construction of the kitchen at the back of the building. There are two types of change strategies in such addition, continuity and integration. Continuity strategy refers to the addition of pillar construction at the back of the building, which has the same characteristic as the pillar construction in the main house. Meanwhile, the integration strategy refers to the constructional addition of the kitchen, which is integrated with the spatial function of the main house. Another addition refers to the addition of windows on the front side of the building as a stratification strategy due to its function as a surface element that changes the face of the building.

The change of subtraction category refers to replacement as well as the removal of several parts of the building. The subtraction that can be seen directly in the material replacement of the roof cover and wood pattern on Dorpi (front wall of the building). Such change is a replacement strategy because it replaces the old part with the new one with the same function, but it has a different characteristic. Other subtraction is the removal of ornament parts, Gorga and Sande-sande. Removing the gorga part refers to the cut strategy because it removes a part of the building as a whole. Removing the Sande-sande refers to the selection strategy because it only removes one of the elements in a part of the building.

4.4. Sugiono’s family house
Sugiono’s house locates in a block of family’s housing at the west of Gurgur Aek Raja. The house is occupied by a family that consists of three family members. They make a living in the agricultural sector. Based on the interview, some changes have been made since the house was built, such as the addition of a bathroom and new construction for the kitchen (See Figures 6 and 7).

Addition refers to the new construction of the kitchen and bathroom at the back of the building, which includes in integration strategy. Integration refers to the functional addition of the kitchen and bathroom, which are integrated with the function of the main house so that the functions will support each other.

The change of subtraction category on this building refers to the replacement or removal of some parts in this house. It is represented by the material change of the roof cover and replacement of Basiha (pillar of the building). Both changes refer to replacement strategy because the old part of the building is replaced with the new one with the same function, but it has different characteristics. Another change
is the removal of gorga ornament on the building’s face, as well as Buatpara. Buatpara is the wooden slats that transverses from the front balcony to the back part of the building, and its function is to keep offerings for the ancestral spirit. Removal of both parts refers to the cut strategy.

4.5. Roy Simanjuntak’s family house
Roy Simanjuntak’s house locates on the same block with Sugiono’s house. The house is occupied by a family that consists of three family members. They make a living as a farmer in the local farming field. Based on the information of the owner, the house has not changed since it was built, but some functional addition of the bathroom at the back of the building (See Figures 8 and 9).

![Figure 8. Roy Simanjuntak’s house location and documentation.](image)

![Figure 9. Detailed drawing of Roy Simanjuntak’s house.](image)

The change of addition category refers to the addition of kitchen and bathroom construction at the back of the building. Besides such construction, there are two approach strategies, continuity, and integration. Continuity refers to the addition of pillar construction at the back of the building, while integration strategy refers to the addition of kitchen and bathroom, which are integrated with the main building of the house as a whole.

The change of subtraction category on this building refers to the replacement or removal of some parts in this house. Such change is reflected by the building face as a material replacement for the roof cover, from palm fibers into corrugated iron sheets. Other changes are seen from the removal of the Gorga ornament and Buatpara construction. Such changes are considered as a cut strategy because a part of the building is completely removed.

4.6. Leo Simanjuntak’s family house
Leo Simanjuntak’s house locates in the social housing at the east of Gurgur Aek Raja village. The house is occupied by a family that consists of four family members. They make a living as a farmer at local estates (See Figures 10 and 11).
The addition to this house is represented by the addition of new construction, kitchen, and bathroom. Such changes consist of three approach strategies, such as continuity, integration, and contraposition. Continuity strategy refers to the addition of new pillars at the back of the building for the kitchen. The integration strategy refers to the addition of the kitchen at the back of the building as a whole. Contraposition strategy refers to the bathroom construction, which is separated from the main building so that it creates a new balance in the building.

The change of subtraction category refers to the replacement or removal of some parts in this building. Such change is reflected by the material replacement of the roof. Such change refers to replacement strategy because the new part replaces the old function with different characteristics. Another change is reflected in the substitution of Sande-sande. Some changes are found from the removal of Gorga ornament and Buatpara construction. Such removal is the so-called cut strategy.

4.7. Binsar Simanjuntak’s family house
Binsar Simanjuntak’s house locates in the same housing complex with Leo Simanjuntak’s family. This house is occupied by two families that consist of Binsar Simanjuntak and his child’s family. Mr. Binsar himself works as a farmer at a local estate and his son works as an employee in Balige. Based on the information of the owner, the house has changed a lot (See Figures 12 and 13).
The addition to this house is represented by the addition of new construction. Some additions have been made in the house by adding new house construction at the back of the main house, the window on the front side of the building, and partition between pillars on the bottom of the building. The addition of new house construction at the back of the main building refers to the absorption strategy because this new house is wider than the main house. The addition of the window refers to the stratification strategy. Meanwhile, the addition of partition between pillars on the bottom of the building refers to a filling strategy because the new partition fills the vacant space between pillars of the building.

The change of subtraction category is significant as reflected on the change in the front part of the building, removing and replacing some parts of the building. There are some change strategies in the front part of the building, such as modification, selection, adjustment, and revision. The modification strategy refers to the change in shape and position of the main door in the building. The selection strategy refers to the removal of Sande-sande on the front part of the building. Adjustment strategy refers to the change of wood pattern on the Dorpi part of the house. Revision strategy refers to the change of stairs form in front of the building. Another subtraction change refers to the removal of Garga ornament and Buatpara construction, as a cut strategy (See Tables 2 and 3).

Table 2. Summary of exoskeleton strategies on Bolon Houses in Gurgur Aek Raja village.

| Strategy of changes | Bolon 1 (Harujian S.) | Bolon 2 (Sugiono) | Bolon 3 (Roy S.) | Bolon 4 (Leo S.) | Bolon 5 (Binsar S.) |
|---------------------|----------------------|-------------------|-----------------|-----------------|-------------------|
| Addition | | | | | |
| Continuity | Adding stilt construction | n/a | Adding stilt construction | Adding stilt construction | n/a |
| Contrast | n/a | n/a | n/a | n/a | n/a |
| Completion | n/a | n/a | n/a | n/a | Adding new construction |
| Absorption | n/a | n/a | n/a | n/a | n/a |
| Integration | Adding new kitchen and bathroom | Adding new kitchen and bathroom | Adding new kitchen and bathroom | Adding new kitchen and bathroom | Adding new kitchen and bathroom |
| Contraposition | n/a | n/a | n/a | Adding new bathroom | n/a |
| Stratification | Adding new window | n/a | Adding new window | Adding new window | Adding new window |
| Filling | n/a | n/a | n/a | n/a | Adding new partition under the house |
| Substraction | | | | | |
| Substitution | n/a | n/a | n/a | n/a | Adding new roof material and Dorpa pattern |
| Modification | n/a | n/a | n/a | n/a | Replacing the sande-sande |
| Cut | Removing the Gorga and Buatpara part | Removing the Gorga and Buatpara part | Removing the Gorga and Buatpara part | Removing the Gorga and Buatpara part | Removing the Sande-sande |
| Selection | Removing the Sande-sande | n/a | n/a | n/a | n/a |
| Replacement | Substituting the roof material and the Dorpa pattern | Substituting the roof material and one of the Basiya posts | Substituting the roof material | Substituting the roof material | Substituting the roof material |
| Adjustment | n/a | n/a | n/a | n/a | n/a |
| Revision | n/a | n/a | n/a | n/a | n/a |
| Renewal | n/a | n/a | n/a | n/a | n/a |
Table 3. Figures of exoskeleton strategies on Bolon Houses in Gurgur Aek Raja village.

| Change Strategy | Hajunuan Simanjuntak’s family | Sugiono’s family | Roy Simanjuntak’s family | Leo Simanjuntak’s family | Binsar Simanjuntak’s family |
|-----------------|-------------------------------|-----------------|-------------------------|--------------------------|---------------------------|
| Continuity      | ![Continuity Image]           |                 | ![Continuity Image]     | ![Continuity Image]      | ![Continuity Image]       |
| (addition of construction poles) | ![Continuity Image] |                 | ![Continuity Image]     | ![Continuity Image]      | ![Continuity Image]       |
| Addition        | ![Integration Image]          |                 | ![Integration Image]    | ![Integration Image]     | ![Integration Image]      |
| (addition of kitchen and bathroom construction) | ![Integration Image] |                 | ![Integration Image]    | ![Integration Image]     | ![Integration Image]      |
| Absorption      | ![Absorption Image]           |                 | ![Absorption Image]     | ![Absorption Image]      | ![Absorption Image]       |
| (addition of new home construction) | ![Absorption Image] |                 | ![Absorption Image]     | ![Absorption Image]      | ![Absorption Image]       |
| Subtraction     | ![Subtraction Image]          |                 | ![Subtraction Image]    | ![Subtraction Image]     | ![Subtraction Image]      |
| (remove gorga and buatpara) | ![Subtraction Image] |                 | ![Subtraction Image]    | ![Subtraction Image]     | ![Subtraction Image]      |
| Replacement     | ![Replacement Image]          |                 | ![Replacement Image]    | ![Replacement Image]     | ![Replacement Image]      |
| (change in roof material) | ![Replacement Image] |                 | ![Replacement Image]    | ![Replacement Image]     | ![Replacement Image]      |

5. Conclusions
Based on the analysis results of this study, some changes in five Bolon Toba houses in Gurgur Aek Raja are due to the adaptation of its people’s lives. Visual and spatial changes, as identified on the whole objects, are the addition of kitchen and bathroom at the back of the building, removing Buatpara construction and Gorga ornament, and substituting material of the roof cover. The addition kitchen and bathroom are related to the fulfilment of the needs for cooking and sanitation. Based on the results of the interview, the inhabitants added the kitchen as the cultural change in cooking, which was communal, but today it is done individually to fulfil the needs of each family. As well as the addition of a bathroom, in which they were used to take a bath in the bathing place, but it has changed due to privacy. Another change is the removal of Buatpara construction where offerings to the ancestral spirits were kept because the majority of Batak Toba’s people today are Christian. Besides that, the Gorga ornament on the building face is removed as well because it requires special skills and costly, therefore the inhabitant thinks that the ornament is less important. The last change is the substitution of the roof material, from palm fibers to corrugated iron sheets. Such changes are based on some considerations, such as durability, easy installation, and maintenance.

References
[1] Wahid J and Alamsyah B 2013 *Arsitektur & Sosial Budaya Sumatera Utara* (Yogyakarta: Graha Ilmu)
[2] Hanan H 2011 A House is A Figure Between The Earth and The Sky Case Study Batak Toba House in Samosir Island Review of Urbanism and Architectural Studies 9 51-60
[3] Eni S P 2017 Pelestarian Permukiman Rumah Tradisional Batak Toba di Desa Jangga Dolok J. Arsitektur Scale 5(1) 1-8
[4] Sitindjak R H I, Wardani L K and Thamrin D 2016 Form and Meaning of Batak Toba House Ornaments Advanced Science Letters 22(12) 4050–4053
[5] Napitupulu S 1997 Arsitektur Tradisional Daerah Sumatera Utara (Jakarta: Departemen Pendidikan dan Kebudayaan RI)
[6] Scuderi G 2015 Adaptive Building Exoskeletons A Biomimetic Model for the Rehabilitation of Social Housing Archnet-IJAR 9(1) 134-143
[7] Yusran Y A 2018 Envisioning Open-Air Museum for Indonesian DIMENSI – Journal of Architecture and Built Environment 45(1) 63-72