A study on the spatial structure of house
— Four types of house space —

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Abstract

Introduction:
The purpose of this paper is to clarify different types of house space from the viewpoint of combination-unit-space.

In general, house space has conventionally been classified based on phenomenal similarities found in part-unit-space of each specimen. In other words, it was a phenomena-based classification.

This paper describes a new method of classification based on acknowledgment of the entity of void as a constituent element of unit-space in the whole plan which structures house space, using it as a common factor of each type.

Conclusion:

There are four types of spatial structure of house from the viewpoint of combination-unit-space.

Type 1: In this type of house space, a room and another, both of which are constituent elements of part-unit-space, are mutually exclusive to each other, and use void which is a constituent element of whole-unit-space as a medium. This type is called Room type.

Type 3: In this type of house space, a space and another, both of which are constituent elements of part-unit-space, are mutually dependent, and use void as a medium. This type is called Space type.

Type 2: In this type of house space, a space \times room of a combination-unit space (space \times room) consisting of a combination of space and room is formed. In this case, the space \times room uses a void which is a constituent element of whole-unit-space as a medium. This is called Space \times Room type.

Type 4: In this type of house space, void \times space and void \times room of a combination-unit-space is formed. In this case, the combination-unit-space is a combination of void which is a constituent element of whole-unit-space, and a space or a room which is a constituent element of part-unit-space. This is called Void type.
Preface

In the previous study, it has been clarified that combination-unit-space exists in the space structure of house.

This paper aims to clarify types of house space from the viewpoint of combination-unit-space of space and room that are constituent elements of part-unit-space, and void that is a constituent element of whole-unit-space.

Conventional and general classification of house space was a phenomenon-based classification in which house space was classified based on similarities in phenomena found in each of part-unit-space. However, this method does not sufficiently explain the mutually dependent or exclusive relations between part-unit-spaces.

Thus, this paper proposes a classification of house space from a new viewpoint in which the existence of void which is a constituent element of unit space within the whole plan which structures house space is used as a common feature of each type of house space.

Materials and Methods

1. Method of study—concept of operation (types of house space)

First, a diagram is made from the viewpoint of combination-unit-space of space and room that are constituent elements of part-unit-space, and void that is a constituent element of whole-unit-space. (Table 1.)

<table>
<thead>
<tr>
<th>Void</th>
<th>Space</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>Space × Room type (Space × Room)</td>
<td>Room-type (Room × Room)</td>
</tr>
<tr>
<td>Space</td>
<td>Space-type (Space × Space)</td>
<td>Void-type (Room × Space)</td>
</tr>
</tbody>
</table>

Note) Room × Space is called Void type of Non-space × Non-room

1 - 1 Analysis result and definition

Type 1: In this type of house space, a room is mutually exclusive to another room which are both constituent elements of part-unit-space. In this, a void which is a constituent element of whole-unit-space is used as a medium. This is called Room type.

Type 3: In this type of house space, a space is mutually dependent on another space, both of which are constituent elements of part-unit-space. In this, a void is used as a medium. This is called Space type.

Type 2: In this type of house space, a void which is a constituent element of whole-unit-space is used as a medium to combine a space and a room to form a
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space room of a combination unit space (space × room).
This is called Space × Room type.

Type 4: In this type of house space, a void which is a constituent element of whole unit space is used a medium to combine a space or a room which are constituent elements of part unit space to form a void space or a void room of combination unit space. This is called Void type, which is neither Space type nor Room type.

2. Method of study-concept of operation (three categories of house space)

The four types as shown above are further classified into three categories from the viewpoint of mutual exclusion and mutual dependence of Space type, Room type, and Space × Room type and peculiarity of the Void type.

Category 1 : Simple type: space type, room type, space × room type
Category 2 : Complex type: space type + space × room type + room type
Category 3 : Void type: void × space type + void × room type

3. Verification of specimen and types

(1) Forward

In this section, types are verified in 5 cases, i.e. Space type, Space × Room type, Room type, Void type and Complex type (space type + room type).

(2) Example 1 ; Room – type (Figure 1)

This is a three–story house attached to a shop owned by a salaried worker, located in a commercial district of Nagasaki City. It was built in 1997 and the type of house is room type. The ground floor is a shop space and is for rent. The first and second floors are the living space for a core family consisting of a couple and their children (distribution type of relative symmetry). The first floor is a Room type which has two rooms. One of the two rooms is a living room and the other is a guest room. The second floor is also Room type, consisting of two rooms. These are bed rooms in which family members are mutually exclusive.

The characteristics of this plan is use of a guest room as a space for social interaction with the community while it is a house for a modern family.
(3) Example 2; Space × Room type (Figure 2)

This is a traditional farm house which is designated as a cultural asset located in Nakazato Machi, Nagasaki City. It is one of the oldest architectural styles in Nagasaki prefecture and is estimated to have been built in the mid-18th century. Its space structure is dominated by a combination of unfloored space and floored space called NAKAE.

The floored space is further divided to parts named OUE", ZASIKI" and "NANDO". The characteristics of this plan is the wall between "OUE" and "NAKAE" in the center of the border line which separates the two spaces. "OUE" is a place for daily life equipped with "IRORI (a sunken hearth)". "ZASIKI" is a space where a household Buddhist altar is placed but which turns into a guest room. "NANDO", a bedroom for the head of the household, is a closed room with wall between "OUE" and "NANDO" except for the half-ken wide entrance into the room.

(4) Example 3; Space−type (Figure 3)

The Space type in the example is a condominium built in 1990 in Nagasaki City. The characteristics of this plan is the one space which can be converted into three separate spaces (8 tatami dining room / kitchen - 6 tatami room - 6 tatami room) (three parts = one whole). This space arrangement is the same as Example 5. This plan is thought to be derived from issues of lifestyle and dimensions allowed for living.

(5) Example 4; Void−type (Figure 4)

This is a detached house with a garden owned by a salaried worker located in an urban district of Nagasaki City. It was built in 1997. This house is of Void type with void × space. Type of family is two-couple type (a couple + children + grand-mother) (in other words, integrated type of relative non-distribution).

The ground floor consists of void × space type and Space type. The void × space is a living space for the grand-mother which also works as a guest room. The Space−type space is a place for family circle and eating (theory of separation of eating and sleeping). The first floor is Room type, consisting of three rooms and is used for bedrooms for the
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couple and children (theory of resolving of sleeping).

The characteristics of this house plan is that the guest room for community-based society (in this case, so-called guest from the community) also functions as a guest room for kinship-based society (in this case, the grand mother is the guest for the family).

(6) Example 5: Complex type (Space-type + Room-type) (Figure 5)

This is a detached house owned by a salaried worker built on sloped land in Mizu-no-Ura Machi, Nagasaki prefecture. The type of the house is Complex type. The

Fig. 4 Void-type

Fig. 5 Complex (Space-type + Room-type) type
house was built around 1980 and the type of the family is core family type.

The ground floor is a Complex type consisting of a Space type area which is a combination of three spaces and a Room type area consisting of a room. The bedroom for the couple is in the back area of the Space type area and a dining kitchen and a living room are located on either side of the central axis made up of the corridor and the bedroom (this space arrangement is the same as the Example 3, Space type). The room in the Room type area was initially a guest room but currently, it is used for piano lessons and activities related to hobbies. The first floor functions as a private bedroom for the children.

Comment

The house space is considered to have family-based society as its characteristic attribute (condition for containment) and to have community-based and kinship-based societies as its extensive element (Fig 6). It is also considered that there is a strong corresponding relation between the kinship-based society and void type house and between community-based society and complex type house.

\[ \text{Kinship-based society} \]

\[ \text{Grand parent} \]

\[ \text{Parent} \rightarrow \text{Guest} \rightarrow \text{Parent} \rightarrow \text{Guest : Community} \]

\[ \text{Family society} \]

\[ \text{Children} \]

Fig 6. Category of social types

Conclusion

This paper clarified that space structure of house can be classified into four types from the viewpoint of combination-unit-space. Further, three other types of space structure of house were extracted from the mutually dependent or exclusive relation between the four types.

A task for the future

As a task for the future, there is a study aimed to clarify the three categories of space structure of house, i.e., Simple type, Complex type and Void type in the corresponding
A study on the spatial structure of house relation with three categories of social awareness, i.e., family-based society, community-based society and kinship-based society.

Acknowledgment

In writing this paper, I fortunately received advice from Dr. Julienne Hanson of Bartlet School of Architecture and Planning, University College of London. I would like to take this opportunity to express my gratitude to Dr. Hanson.

Note

1) Family-based society: Mutually dependent space (living space) is created between a couple and children who are considered as kin in terms of social norms where blood connection and territorial connection are excluded. At the same time, mutually exclusive space is created where the child is separated from the couple as a guest (bedroom).

2) Community-based society: Relation based on territorial connection occurs when a social relation is created by living in the same community, even though the people do not have blood connections with one another. There, a space is created where each individual family uses the couple as a medium to be mutually dependent with guests on equal bases (guest entertaining space). At the same time, mutually exclusive space is created between the guest and family members other than the couple (guest room).

3) Kinship-based society: A space where family members known as kin who are in blood relations and/or matrimonial relation are mutually dependent in terms of "parent-child-grand-child" relation (living room or continuous room where two households gather at the same time). At the same time, a mutually exclusive space is created within the space inside the house (or, a retreat for the retired within the same vicinity of the house) where grandparents are considered as guests for the family based on the relation, "grandfather-grandmother family".

Reference