

The Architectural Typology Analysis of Han Traditional Courtyard in Northeast China

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Abstract—In the past, the research on traditional dwellings in Northeast China mainly focused on Manchu and Korean ethnic group. There are few researches on the traditional dwellings of the Han nationality. In the vast Northeast China, the courtyard-style residence of the Han nationality has been deposited for thousands of years, and is still the most important living mode in the rural areas of Northeast China today and even in the future. According to typology presents as a stable structural relationship, and the generation and variation of type presents as a procedure and a pattern. In this paper, with the aid of architectural typology rational and scientific analysis method, to establish a system of cognitive concept, based on the commonality and characteristics of architectural form and planar formation, such as the number of rooms, axis relationship, middle wall, depth combination, relationship between the main house and attached house, trying to reveal the northeast Han traditional courtyard inherent law and logic of evolution. Through the architectural typology analysis of the traditional dwellings of the Han nationality in Northeast China, we can find out the stable structural relationship contained in many types and the evolution process of types according to different situation and needs. The study of the Han traditional courtyard in northeast China has great significance for the excavation and inheritance of the regional characteristics of the residential houses in northeast China, and the continuation and development the Chinese traditional culture and spiritual connotation carried by the courtyard house.

Index Terms—Han traditional residences, architectural typology, courtyard

I. INTRODUCTION

Courtyard is the typical living unit of Chinese traditional urban and rural. It contains the Chinese traditional residential culture and philosophy. China has a vast expanse of land, and the regional environment is different. Chinese often believe that human beings are shaped by environment. Different morphology of dwellings are also shaped by different “water and soil”[1]. The regional culture of Northeast China is influenced by many factors: cold climate, multinational society, local customs and culture, family concept, production methods, etc. These factors give the house unique local characteristics. Courtyard is the main pattern in Han traditional residences in Northeast China. Consequently,

studying Han traditional courtyards in the Northeast China can help to find regional characteristics of northeast residences and inherit traditional culture and spirit connotation of courtyard houses. This article mainly uses the method of architectural typology to analyze and summarize the courtyard types of the Han traditional houses in Northeast China.

II. METHODS

The study of architectural types is mainly due to the rising of structuralism. “Architectural type classification is that dividing architecture into several types in accordance with the architectural form and shape features, considering neither origin and pedigree relationship nor the geographical distribution of their past and present. Completely according to architectural form, structure, shape on the composition of commonality to classify them” [2]. The concept of type shows that how forms produced. The difference between the typology and taxonomy is that: taxonomy trends to discuss “nature”, while the typology is often used to study the variability and transitional issues. The building consists of types based on different tasks and problems. The appearance and form of the architecture may change constantly, but it will not deviate from the type.

The generation of building types has the following steps: First of all, people often face the same requirements and constraints, so a certain type of architecture is created to adapt and meet these conditions and requirements. What follows is that people tend to sum up experience again, so it is possible to sum up the general types that adapt and meet the conditions and requirements. Finally, people will use this type according to the specific circumstances, conditions and flexibility requirements, so as to produce various variants.

Courtyard architecture is the basic type of life in traditional China. This is the basic principle of living in China. This paper analyzes and summarizes the types and evolution of courtyards through the method of architectural typology to guide the future modern inheritance of traditional dwellings in the Northeast.

III. RESULTS AND ANALYSIS

“The typology consider that type appears as a kind of stable structure relationship, the production and the variation of type appears to be a kind of program, a kind

of model” [3]. Typology analysis of the Han traditional dwellings in Northeast China can find many stable structural types and the evolution of the types under different conditions and requirements. The prototype of han traditional courtyard in northeast China is: “the courtyard with a single house and the house with three rooms” [4]. The prototype derives four basic types. That is the courtyard with a single house, the courtyard with houses on two sides, the courtyard with houses on three sides and the courtyard with houses on four sides. And each of the “base type” produces a wide variety of variant under different conditions and requirements.

Constitution way of courtyard will affect the yard size, layout, thus affecting the courtyard type. If the courtyard is regarded as a sentence, then the structural relationship is grammar. By analyzing the traditional courtyards of the Han traditional dwellings in Northeast China, we can draw the following ways to influence the types of courtyards:

- Number of houses
- Axis relationship
- Whether have a middle wall
- Depth combination
- Relationship between the main house and wing house: A. main building and wing are staggered, B. The main building and the wing are not staggered, but keep a certain lighting distance, C. Corner wall connection between main building and wing.

A. Courtyard with A Single House

Courtyard with a single house is a combination of one house and three courtyard wall. Courtyard with a single house of three-room house is the prototype of Han traditional courtyard in northeast China. It is the most common courtyard type. It has three types.

1) House and the yard-entrance are located at the yard central axis

The paved path from the entrance to the house door divides the courtyard space into two equal parts. Such as Xia surname house of stone buddha temple village in Shenyang city . There is only a three-room thatched house in this yard. The house, paved road and courtyard entrance are all arranged in the middle. (Fig. 1)

2) House and the yard-entrance are located at one side of yard

Dividing the yard space into two unequal pieces, such as Liu surname house house in Kaiyuan of Shenyang city . (Fig. 2) House, paved path and yard-entrance are located at east side of yard. The yard entrance and the door in the house are not in a straight line. The layout of the courtyard is mainly affected by the way of land use in the old city, which reduced the space on the right side of the courtyard and changed the original entrance and paving of the courtyard.

3) House and yard-entrance are not in a line

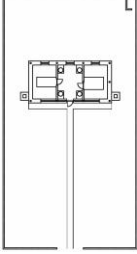
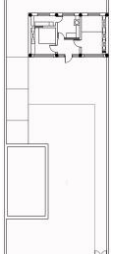
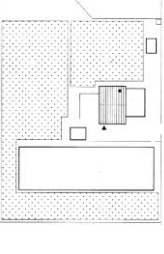
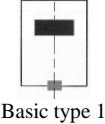
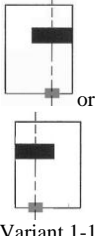
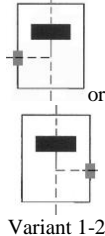
The yard entrance is on the side of the yard, not in line with the house. Such as Guo surname house in Tahe town

of Heilongjiang province. House is located in the middle of yard. Yard-entrance is located at east wall. (Fig. 3)

4) Summary

The first type is the most common in northeast China above all. The latter two are the variant based on the first type. This type is usually built by families with poor economic condition and a small resident population. It is also the most common form of courtyard in the Northeast during the traditional period. It is the prototype of the northeast traditional courtyard house. The house has only three rooms and is also symmetrical. In the middle is the kitchen and stove, which is used to heat up the fire in winter, and on both sides are bedrooms, which are equipped with heated beds, which can resist the severe cold weather in winter. (Table I)

TABLE I. PLANAR SUMMARY OF HAN TRADITIONAL COURTYARD WITH A SINGLE HOUSE IN NORTHEAST CHINA

layout	House and yard-entrance are located at the yard central axis	House and yard-entrance are located at one side of yard	House and yard-entrance are not in a line
planar			
Map title	Figure 1. Xia surname house of stone buddha temple village in Shenyang city	Figure 2. Liu surname house in Kaiyuan of Shenyang city	Figure 3. Guo surname house in Tahe town of Heilongjiang province
type	 Basic type 1	 Variant 1-1	 Variant 1-2

B. Courtyard with Houses on Two Sides

Courtyard with houses on two sides is a combination of two houses and two courtyard wall, it is a variant based on a courtyard with a single house . This courtyard is also a relatively large type of courtyard. It has three types:

1) Main house+gatehouse

This type composed of the same direction of yard-entrance and main house. Such as Li surname house in Kaiyuan of Shenyang city. (Fig. 4) It has a courtyard

entrance with three rooms and forms a similar structure to the main house.

2) Main house+west wing house

This type composed of main house and west wing house. Such as Zhu surname house of in Zhangzi island of Dalian city. (Fig. 5) The yard-entrance is facing the south window of main house. “There is a paved path leading to the main house tortuously” [5]. In order to avoid the west sun, people always build a wing house on the west side of the courtyard, and the west house opens the window to the east.

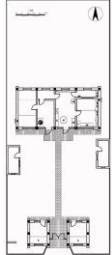
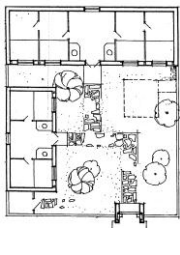
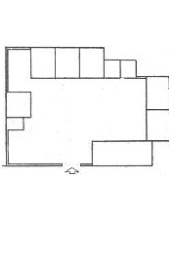
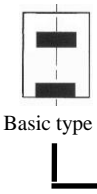
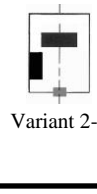
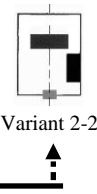
3) Main house+east wing house

Such as a house in Jian county of Tonghua city. (Fig. 6) The owner built a barn in the east. Because no one living in, there is no need to open windows. The barn needs lighting and ventilation to keep it dry.

4) Summary

This is a basic expansion in a courtyard with a single house. The layout of the latter two courtyards is mainly due to the expansion of living population and functions, and is the variation of the first type. In addition to the main house and the gatehouse, a wing house was built in the courtyard. (Table II)

TABLE II. PLANAR SUMMARY OF COURTYARD WITH HOUSES ON TWO SIDES

layout	Main house+gate house	Main house+west wing house	Main house+east wing house
planar			
Map title	Figure 4. Li surname house in Kaiyuan of Shenyang city	Figure 5. Zhu surname house in Zhangzi island of Dalian city	Figure 6. A house in Jian county of Tonghua city
type	 Basic type 2	 Variant 2-1	 Variant 2-2

C. Courtyard with Houses on Three Sides

Courtyard with houses on three sides is a combination of three houses and one courtyard wall. It is a variant on the basis of courtyard with two houses. This courtyard consists of the main house and two wings. It has two basic types: with middle wall and without middle wall. The yard without a middle wall occupies a large area, surrounded by the courtyard wall. The individual house is far away and do not connected with each other. The distance between the two wings depends on the length of the main house and forms the middle part of the courtyard. Such as a house in Zhaodong of Heilongjiang province. (Fig. 7) The main house is the place of masters living in. The wing houses are the place of servants living in. The main house and wing houses are independent with each other [6]. There are two variants according to the position of the middle wall:

1) The middle wall is located in the front of wing houses

The middle wall divided the courtyard into two parts. This type of courtyard is called “two-layer yard”. The external part is made up of four walls. The external part is used to park carriages, stack debris, raise livestock. It is the relatively noisy yard space. The inner part is used to living. It is the relatively quiet yard space. Such as a house of Donghe alley in Jilin province, (Fig. 8) which is divided into two parts by the middle wall [7]. The internal space is a layout with the main house of three rooms and the wing houses of three rooms.

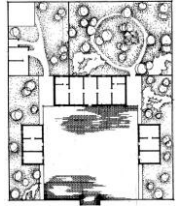
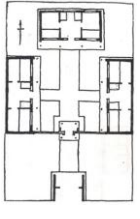
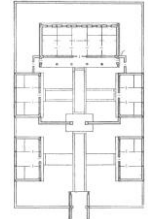
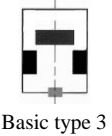
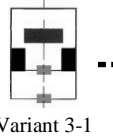
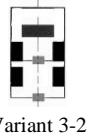
2) The middle wall is located in the middle of wing houses

This traditional courtyard is also departed into external part and inner part. The external part is made up of east and west wing houses, north and south side walls. It is the space of servants living in. The inner part is made up of north main house, east and west wing house, south middle wall. The inner part is the space of master living in. This type of traditional courtyard needs middle wall to divide the courtyard. Because the wing houses are too long. Such as a house in Niu surname alley of Jilin province. (Fig. 9) The east and west wing houses both have two groups of individual houses. Wing houses are too long and the depth of the yard space is too big. Therefore, the middle wall is used to divide the big courtyard into external and inner space. The inner yard became a yard with five rooms in main house and three rooms in wing houses.

3) Summary

The above courtyards are all symmetrically arranged on the axis, and the doors of the courtyard and the middle wall are made of bricks. These types are the results of the further expansion of courtyard land and population. The shape of the three-sided house enclosure makes the courtyard more integrated and private. The setting of the middle wall and inner courtyard can block the cold north wind in winter.(Table III)

TABLE III. PLANAR SUMMARY OF COURTYARD WITH HOUSES ON THREE SIDES

layout	without middle wall	with middle wall	
		The middle wall is located in the front of wing houses	The middle wall is located in the middle of wing houses
planar			
Map title	Figure 7. a house in Zhaodong of Heilongjiang province	Figure 8. a house of Donghe alley in Jilin province	Figure 9. a house in Niu surname alley of Jilin province
type	 Basic type 3	 Variant 3-1	 Variant 3-2

D. Courtyard with Houses on Four Sides

The courtyard is surrounded by four buildings. The planar arrangement is more integrated and thorough. The house of courtyard has many rooms and ornament. The main house has front porch. Similar to the courtyard with three houses, Han traditional courtyard with four houses in Northeast also has two basic forms: the courtyard without middle wall and the courtyard with middle wall. The courtyard without middle wall covers an area of broad. Individual building is independent respective. The main house and the wing house are staggered from each other. The wing house don't shelter the main house. The courtyard is spacious. The layout is loose. The courtyard adopts symmetric style, the entrance door and second door are all located in residential central axis. This is the convention form of Han traditional courtyard with four houses in Northeast. It is commonly known as "large courtyard of Northeast" [8]. Such as a house of Donghe alley in Jilin province. (Fig. 10) It has three variants:

1) The main house and the wing house are not mutually staggered

Keeping a certain lighting distance and ensuring the wing house shelter the main house. This type of courtyard has a compact layout and narrow courtyard. It is closer to the type of Huabei courtyard. But the layout of this kind of courtyard is simple, not as exquisite as Huabei courtyard. Because of this type is less than "large courtyard of Northeast", so it can be seen as the variant of "large courtyard of Northeast". This type of courtyard get more concentration in town. The reason of the form producing is mainly because the form is restricted by urban land. Such as Wang surname house in Jinzhou of Dalian city. (Fig. 11)

2) Middle wall is located in the front of the east and west wing house

The middle wall of this courtyard is located in front of the east and west wing houses, thus forming an inner courtyard and an outer courtyard. The outer courtyard is surrounded by gatehouse and north-middle wall. The inner yard is surrounded by main house, east wing house, west wing house and south-middle wall. Such as Zhou surname house in Xingcheng city. (Fig. 12)

3) Middle wall is located in the middle of the east and west wing house


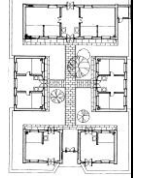
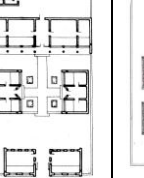

The courtyard has middle wall which is located in the middle of the east and west wing house. The outer layer yard is surrounded by gatehouse, east wing house, west wing house and north-middle wall. Inner yard is surrounded by main house, east wing house, west wing house and south middle wall.





The forming reason of the type is that mainly two wing house are so long that middle wall is needed to divide yard. Such as Zhang surname house in Toudao alley of Jilin province. (Fig. 13)

4) Summary

The courtyard with four houses is the most completed and more private. In the northeast of the traditional period, such yards were usually built by families with very good economic conditions, especially large yards, mostly built by landlords. (Table IV)

TABLE IV. PLANAR SUMMARY OF COURTYARD WITH HOUSES ON FOUR SIDES

layout	without middle wall		with middle wall	
	Main house and the wing house are staggered	Main house and the wing house are not mutually staggered	Middle wall is located in the front of the east and west wing house	Middle wall is located in the middle of the east and west wing house
planar				

Map title	Figure 10. A house of Donghe alley in Jilin province	Figure 11. Wang surname house in Jinzhou of Dalian city	Figure 12. Zhou surname house in Xingcheng city	Figure 13. Zhang surname house in Toudao alley of Jilin province
Type	 basic type 4	 Variant 4-1	 Variant 4-2	 Variant 4-3

E. Multilayer Compound Courtyard

Generally, a small courtyard consists of one or two yards in the vertical direction. The medium-sized courtyard consists of three or four yards. The previously mentioned courtyard with waist wall are divided into inner and outer courtyards, not to increase the size of the courtyard. So they are not classified as multilayer courtyards. Traditional multilayer courtyards in Northeast China are actually deformed by the combination of courtyard with two houses, courtyard with three houses and courtyard with four houses. It can be roughly divided into four types:

1) Add a main house behind the three-house courtyard without waist wall

The front yard is a courtyard with houses on three sides. This is the first courtyard. The main house and the back main house form a courtyard with two houses. This is the second courtyard. It's a courtyard consists of two yards in the vertical direction. Such as Na surname house in Zhaozhong alley of Jilin province. It shows the pattern of large family living. (Fig. 14)

2) Add a main house behind the four-house courtyard without waist wall

The front yard is a courtyard with houses on four sides. This is the first courtyard. The main house and the back main house form a courtyard of two houses. This is the second courtyard. It's also a courtyard consists of two yards in the vertical direction. Such as HaoYu's house in Tielin city. (Fig. 15)

3) Add a main house behind the three-house courtyard with waist wall

The waist wall of the front yard divides the three-house courtyard into two courtyards. As mentioned earlier, due to the difference in the location of the waist wall, the difference in the number and size of the rooms, there are two types of three-house courtyard. Therefore, the outer courtyard of this kind of courtyard is formed by four walls, or a two-house courtyard composed of east and west wing houses, a north waist wall and a south courtyard wall. This is the first courtyard. The inner courtyard is composed of a north main house, an east and west wing houses and a south waist wall. This is the second courtyard. A main house is added in the backyard,

forming a two-house courtyard together with the main house. This is the third courtyard. Such as Zhang surname house in Bajiazi of Fuyu city. (Fig. 16) The house is very long and large in area. The front yard rooms are basically used as storage rooms and warehouses, and horses can stay in the yard. Therefore, a waist wall is built to separate the inner yard as the main activity of the family.





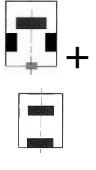
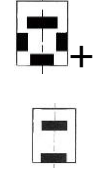
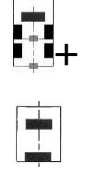
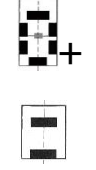
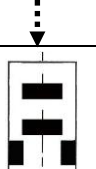
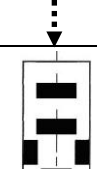
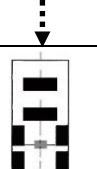
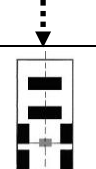
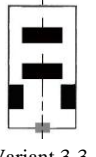
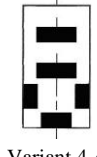
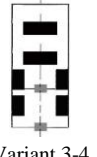
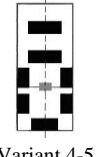
4) Add a main house behind the four-house courtyard with waist wall

The front courtyard waist wall divides the four-house courtyard into two courtyards. Due to the difference in the position of the waist wall, the difference in the number and size of the rooms, there will be two different types of four-house courtyard. Therefore, the outer courtyard is formed by three walls and a south gatehouse, or a three-house courtyard composed of east and west wing houses, a north waist wall and a south gatehouse. This is the first courtyard. The inner courtyard is formed by north main house, east and west wing houses and south waist wall. This is the second courtyard. A main house is added in the backyard, forming a two-house courtyard together with the main house. This is the third courtyard. Such as Niu surname house in Huguang hall of Jilin province. (Fig. 17) (Table.5)

5) Summary

As the population and living conditions continue to increase, the combination of courtyards can also be more complicated. In addition to adding a main house behind the main house of the three-house courtyard and four-house courtyard to form a two-house courtyard, it is also possible to add a main house, an east and west wing houses to form a three-house courtyard. Such as Niu surname house in Sandao wharf of Jilin province. (Fig. 18) Large-scale combined courtyards are also combined deformations in different sizes and scales in the two sides courtyard, three-house courtyard and four-house courtyard. The planar shape has gradually moved away from the scale of small and medium-sized courtyards, and tends to the scale of small palaces. There are turrets in the four corners. There are few types of such courtyards, and their owners are mostly bureaucratic landlords with extremely good economic conditions in the traditional period. (Fig. 19, Fig. 20)

TABLE V. PLANAR SUMMARY OF MULTILAYER COMPOUND COURTYARD

layout	courtyard consist of two yards		courtyard consist of three yards	
	Add a main house behind the three-house courtyard without waist wall	Add a main house behind the four-house courtyard without waist wall	Add a main house behind the three-house courtyard with waist wall	Add a main house behind the four-house courtyard with waist wall
planar				
Map title	Figure 14. Na surname house in Zhaozhong galley of Jilin province	Figure 15. HaoYu's house in Tielin city	Figure 16. Zhang surname house in Bajiazi of Fuyu city	Figure 17. Niu surname house in Huguang guildhall of Jilin province
Tandem form				
				
Type				
	Variant 3-3	Variant 4-4	Variant 3-4	Variant 4-5

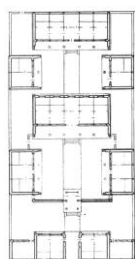


Figure 18. Niu surname house in Sandao wharf of Jilin province.



Figure 19. Wu surname house in Shuangliao city.

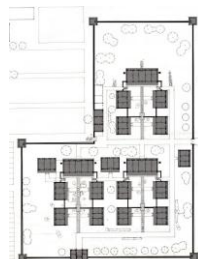


Figure 20. Guo surname house in Gongzhuling of Jilin province.

IV. CONCLUSIONS

In order to adapt to different economic conditions, land use, population, function, cold regional climate and other factors, Han traditional dwellings in Northeast China

have different types of flats. The traditional Chinese ritual system and the core concept also have an important influence on the planar through the form of the axis. Today, the urban population has basically lived in tall buildings, and urban courtyard houses have almost disappeared. However, in the northeastern rural areas with sparse population, courtyard housing will still be the main development direction of housing in the future.

According to the above generalization for courtyard types, we can summarize the evolution laws for planar types of Han traditional courtyard by next picture. This will help us to understand the law of development and evolution of courtyards in northeast China, which contains the concept of simple human settlements and is rooted in the regional environment. This law will help us to develop dwellings in the new period on the basis of inheriting the tradition of folk dwellings. (Fig. 21)

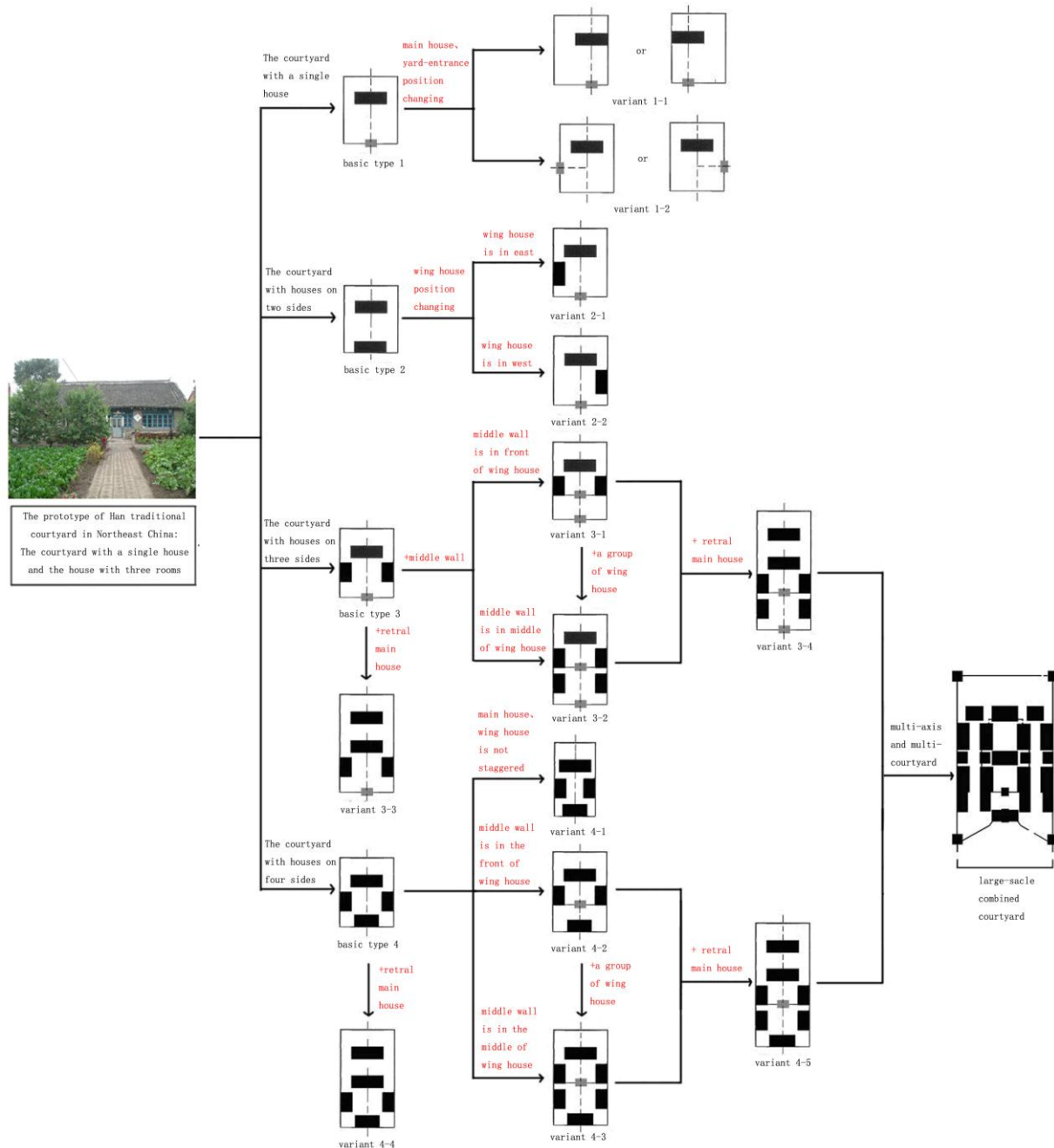


Figure 21. Type evolution map

CONFLICT OF INTEREST

The author declare no conflict of interest.

AUTHOR CONTRIBUTIONS

I write paper and draw tables. Fig. 1-2, Fig. 5, Fig. 12 and Fig. 21 in this paper are self drawn. Fig. 3-4 and Fig. 10 in this paper are provided by Building Research Institute of Shenyang Architecture University. Fig. 6-7, Fig. 8-9, Fig.11 and Fig. 13-20 in this paper are from reference [5].

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