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Architectural Spatial Characteristics of Fujian Tubao from the Perspective of Chinese Traditional Ethical Culture

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Abstract: Ethics was used as a building code in ancient China, not only to guide the construction of cities and buildings but also to define a strict hierarchy of architectural characteristics. The Fujian Tubao is a unique vernacular architecture and defensive rammed earth dwelling in China. The existing research on architectural spatial characteristics from the perspective of traditional ethical culture focuses on official architecture and residential-oriented vernacular architecture, and research on defensive dwellings has not yet been carried out. Based on data from our field research over the last ten years and 11 case studies, this paper constructs a research framework through five aspects, the spatial axis, functional arrangement, building volume, settlement pattern, and defense system, and analyzes the architectural spatial characteristics of Tubao under the ethical perspective. We find that although the Fujian Tubao is a rammed earth dwelling with mainly defensive functions, it also follows the traditional Chinese ethical concept of "clear-cut hierarchy and order of superiority and inferiority"; however, because of its special defense performance, it has added practical and defensive space to the traditional dwelling arrangement pattern. This study helps to provide a manual for the restoration and sustainable development of the vernacular architecture heritage of the southeastern coastal regions of China.

Keywords: Chinese traditional ethical culture; vernacular architecture; defensive rammed earth dwelling; architectural spatial characteristics; Fujian Tubao; cultural heritage; Hakka

Citation: Lin, X.; Wu, Y. Architectural Spatial Characteristics of Fujian Tubao from the Perspective of Chinese Traditional Ethical Culture. *Buildings* **2023**, *13*, 2360. https://doi.org/10.3390/buildings13092360

Academic Editor: José María Fuentes-Pardo

Received: 12 August 2023
Revised: 11 September 2023
Accepted: 14 September 2023
Published: 16 September 2023

1. Introduction

The culture of architectural ethics pervades all aspects of architectural activity, not only meeting human spiritual needs and adjusting social etiquette but also expressing human thought and culture and guiding architectural design [1,2]. Over thousands of years of development, Chinese traditional architecture has gradually developed a rich connotation of architectural ethics, which includes family ethics, social ethics, ecological ethics, and more [3–5]. Since ancient times, China has had a strong clan culture of "respecting ancestors and clansmen". Sacrificial buildings such as the "Mingtang" appeared in the Shang Dynasty [6,7], and the ancestral halls often became the ceremonial centers of architectural groups [8–10].

Traditional Chinese architecture, which has evolved gradually over thousands of years of Chinese history, on one hand, has become a cultural and built heritage as an architectural tradition of identity; on the other hand, their historical forms, as traditional imagery, have become archetypes or forms that are reproduced in contemporary architectural design and urban renewal. Traditional Chinese architecture can be divided into official architecture or vernacular architecture, in which the official architecture includes imperial palaces, government office buildings, and other structures that symbolize the ruler's supreme authority and the strength of long-lasting peace and security, and the vernacular architecture is the spontaneous formation of regional architecture by the people, which is adapted to the environment according to the local conditions [11,12]. Chinese traditional architectural culture

is based on the philosophical concept of "the unity of heaven and man" and the ethical concept of "coexistence of *Li* and *Yue*", which favors idealism. Because of the ancient Chinese economic system of small farmers and the reverence of the ancestors for heaven and earth, people hope to establish a kind of affinity with nature, thus forming the unique Chinese feng shui connotation. And traditional Chinese architecture, whether it is official architecture or vernacular architecture, from the large courtyard groups and plan layouts to the small building components, sizes, and materials, all follows a set of strict architectural hierarchies: both the axis of symmetry, before and after the space arrangement of the limit, and also the modulus size standards [13–16]. From the prehistoric Yangshao and Longshan settlements to the prevalent Li-Fang Unit System in the Sui and Tang dynasties, to the splendor of the royal buildings in the Ming and Qing dynasties, the cultural connotations of traditional Chinese architecture have not changed drastically, showing stability and unity, although it has gone through various dynastic changes; however, the characteristics of architectural culture in different regions of China also demonstrate variety under the general setting of Chinese architecture [17].

Since ancient times, the Fujian region of China has been wealthy in natural resources, but later, there was political unrest and widespread banditry. In order to protect their homeland, the forefathers of the Fujian people built many vernacular architecture and defensive rammed earth dwellings, including Fujian Tulou [18–20], Fujian Tubao [21–23], and Fujian Zhailu [24]. Fujian Tulou are mainly distributed in the western and southwestern regions of Fujian, and the related research first originated in the 1950s [25], in which 46 Hakka Tulou buildings in Nanjing, Yongding, and Hua'an were added to the UNESCO World Heritage List in 2008 [26], and the research has been conducted in the areas of architectural type [18,20], wall materials [27], seismic performance [28], regional culture [19,29–31], and the comparison of the other dwellings [18,21,22], which have made the research on Fujian Tulou more in depth and comprehensive. Fujian Zhailu are mainly distributed in the area of eastern Fujian and were first proposed in the first edition of the Typological Collection of Chinese Dwellings [32]. The majority of Fujian Tubao are located in the Sanming region of central Fujian. Tubao research began in the 1980s, but the first national conference to discuss the conservation and utilization of Fujian Tubao was not held until 2010. The studies on them have primarily focused on individual cases [33,34], and the maintenance system for Fujian Tubao has only recently begun to take shape [23,35,36]. The representative Tubao include Anzhen Bao in Yongan City and Ruiqing Bao and Maojing Bao in Youxi County (Figure 1).

The inhabitants of Fujian Tubao mostly live together with a single blood relationship, and there is no place for religious rituals in the Tubao, but an ancestral hall for clan rituals, which reflects the idea of "downplaying religion and emphasizing ethics" [21]. On one hand, it has many different spatial characteristics from other Chinese vernacular architecture because of the unique defensive nature of Fujian Tubao. On the other hand, although both Fujian Tulou and Fujian Tubao belong to the same architectural heritage pedigree of defensive rammed earth dwellings, there are significant differences in their functional tendencies and spatial arrangements. Although a Fujian Tulou contains defensive qualities, it is still a dwelling with living being the primary purpose and defense being an auxiliary. However, a Fujian Tubao is a dwelling with the primary purpose of defense and the secondary purpose of living. Since ancient times, the central region of Fujian has had a combination of mountains, water and fields, dense forests, and complex terrain and has been the site of Tubao to maximize the combination of geographic features, resulting in the formation of natural defense advantages. In the era when there was no use of electricity for artificial lighting and heating, Fujian Tubao maximized the use of natural conditions and buildings to create a reduction in energy consumption to meet the needs of residents for ventilation and lighting, heat preservation, and insulation, so it can be said that the Fujian Tubao is a passive sustainable development of housing. Fujian Tubao are still inhabited today, and they not only preserve the slang dialect and living customs of the past, but they also preserve the spatial entity and cultural memory. As a result, the most cen-

tral research questions of this paper are how Fujian Tubao, a particular kind of defensive rammed earth dwelling, follow the Chinese traditional ethical culture and what similarities and differences exist between the ethical representations of Tubao and other Chinese vernacular architecture.

Figure 1. The location distributions of Fujian Tulou, Fujian Tubao, and Fujian Zhailu.

The remainder of the paper is organized as follows. The Section 2 reviews the relevant literature and presents the article's research framework. Through five features and 11 cases, the Section 3 offers a thorough analysis of the spatial characteristics of Fujian's earth fortifications from the perspective of traditional ethics. The Section 4 discusses the background and underlying reasons for the formation of ethical thinking in Fujian Tubao. The Section 5 is the paper's conclusion and future sustainable research directions. This study helps to fill the gap in the study of spatial representations of defensive rammed earth dwellings from the perspective of Chinese traditional ethical culture and as a manual for the restoration and sustainable development of vernacular architecture heritage of the southeastern coastal regions of China.

2. Literature Review

2.1. Fujian Tubao

In 1985, Yang and Chen investigated the relationship between Fujian Tubao and native inhabitants from the perspective of socio-economics and conducted a preliminary analysis of the forms and causes of Fujian Tubao, they believed that Tubao not only preserve the physical form but also portray the local rural life and folk culture of the Ming and Qing eras, which initiated academic research on them [34]. Dai's exploration of the plan features, defense system, and decoration of Anzhen Bao is an early analysis of the case of Tubao from the perspective of architectural space, and he summarizes the plan type of Anzhen Bao, which is a square front and a circular back shape, as well as the defensive features of the

running corridor linking the various spaces and the thick rammed earth wall [33]. By analyzing the case of Jukui Bao, Chen not only shows the spatial characteristics of Fujian Tubao but also concludes that a Tubao is a green body building with special characteristics [37]. In addition to case studies, many scholars have gradually carried out field surveys and provided field mapping data to conduct research on the spatial preservation, utilization, and revitalization of Fujian Tubao. Li discussed various aspects of Tubao in terms of their basic profiles, defense functions, architectural structures, decorations, feng shui concepts, and folk customs and concluded that there is some degree of correlation and origin between Tulou culture and Tubao culture, Weiwu culture, and Hakka culture [36]. Dai and Chen have thoroughly explained the case of Fujian Tubao with a combination of text, pictures, and map diagrams and concluded that Fujian earth fortresses have outstanding defense functions, adapt to local conditions, and have peculiar and practical structures [23]. A number of scholars have investigated the historical development of Fujian Tubao. Liu elaborates using numerous examples while analyzing Tubao's historical context, geographic distribution, construction methods, and other humanistic trajectories, and he believes that Wu Bao of the Han Dynasty were the predecessors of Fujian Tubao, so the Tubao carries a long history of culture [35]. According to Dai, Fujian Tubao date back to the late Sui and early Tang dynasties, were in their development during the Song and Yuan dynasties, and began to exhibit a rich variety of plan types and space forms in the late Ming and early Qing dynasties [22]. Other academics compare Fujian Tubao with other varieties of defensive rammed earth dwellings on the basis of summarizing the spatial characteristics of Tubao. Lin contrasts and evaluates Fujian Tubao and Fujian Tulou from the perspectives of historical distribution, layout, defense and living, and structural construction, and he proved that although Fujian Tubao and Fujian Tulou have similar types of fortresses, they are two different types of buildings [21].

In terms of their spatial characteristics, Fujian Tubao typically take the form of a combination of "outer corridor type fortress" and "inner courtyard type dwelling" or "inner row type dwelling" [21] (Figure 2). The plan shape of a Tubao is primarily rectangular, square front and circular back, circle, etc. [23,36]. The primary purpose of Tubao is to provide defense against external adversaries; residential life and clan rituals and sacrifices are secondary. The "inner courtyard type dwelling" is primarily used for habitation, and the "outer corridor type fortress" is primarily used for defense [21,35]. The structures of Tubao contain corner towers, trenches, fort walls, dog holes, pigeonholes, *Pao Madao*, doorways, windows, gun holes, etc. The fort walls are constructed from rammed raw earth [22,23,35].

Fujian Tubao, as a distinctive defensive type of traditional Chinese dwelling, have similar living spaces to those of other traditional dwellings, but their spatial arrangement differs from other dwellings due to their special defensive nature. The existing research on Fujian Tubao focuses on aspects of physical space like spatial patterns, functional arrangements, and structural configurations but has not yet looked into the relationship between this specific type of defensive rammed earth dwelling and the traditional Chinese architectural ethical culture.

2.2. Traditional Chinese Architectural Ethical Culture

The word "ethics" first appeared in Homer's epic poem "The Iliad", a work of ancient Greek literature, which originally meant a place of residence, shelter, or public place, so it can be seen that "ethics" and "architecture" have come to some sort of unity [38]. Professor Kirsten Harries of Yale University makes the observation that the word "ethical" is more closely related to the Greek word "ethos" than to the common term "ethics" in his book "The Ethical Function of Architecture" [39]. In China, "ethics" refers to the morals and rules that should be followed in how people interact with one another [40].

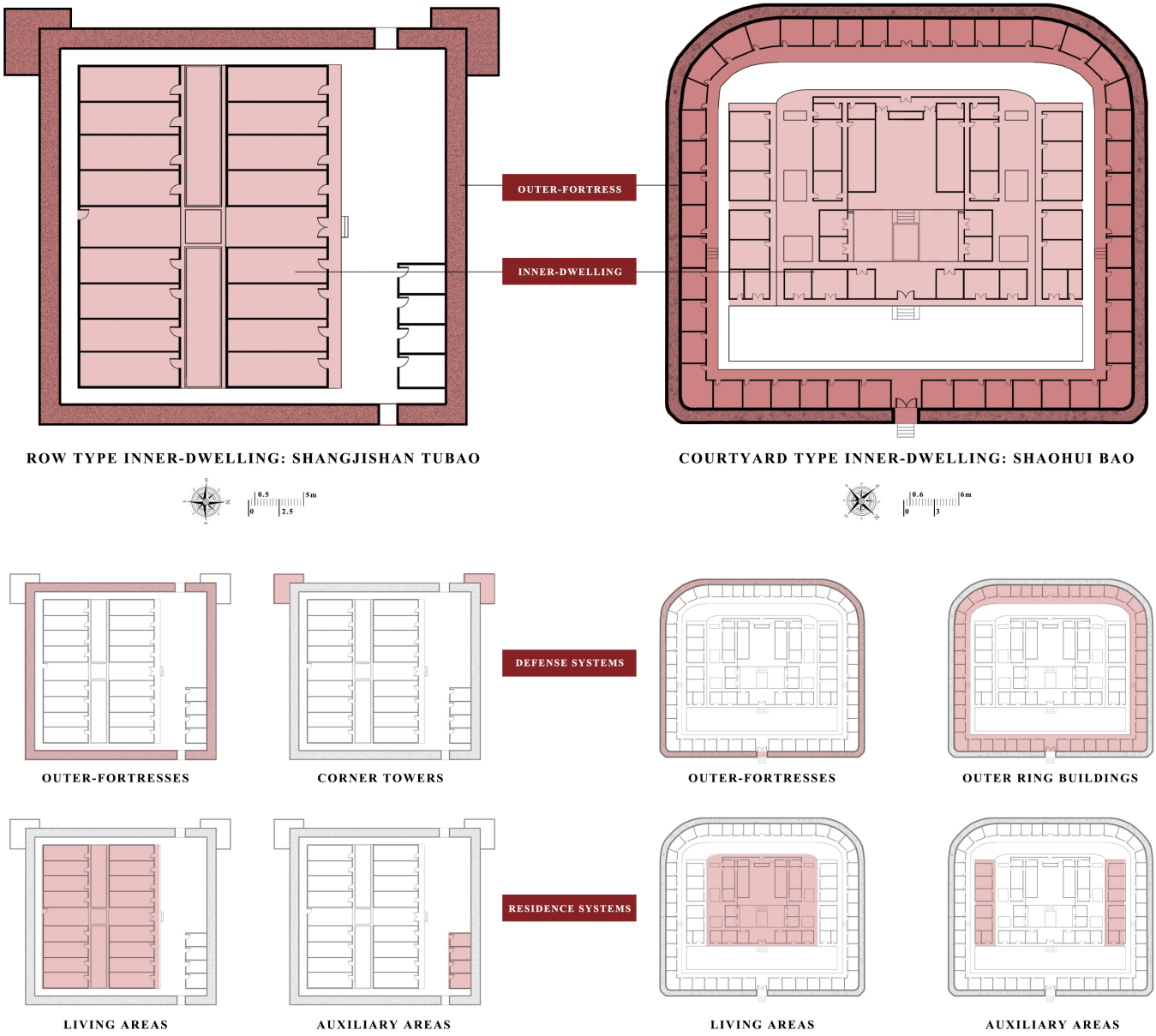

Figure 2. Plan types and architectural systems of Fujian Tubao.

Traditional Chinese ethics is the rule of communication and moral standards that have gradually developed on the basis of Confucian doctrine [41,42]. "*Li*" (rites 礼) is the connotation of traditional Chinese ethical thinking, and "*Yue*" (musical/theatrical performances 乐) is the artistic form and spatial extension of inner emotions [43]. The "*Rites System*" evolved into the laws and policies put in place by the rulers to strengthen the state's social politics [44]. And this ethical culture is expressed in the corresponding architectural space as the guiding principle of traditional Chinese architecture. At the social level, it created a strict hierarchical system of the capital city and the ritual architecture of ancestor veneration; at the family level, it developed a living space that clearly separates the young and the old, inside and out; at the ecological level, it formed an environmental order of balancing Yin and Yang, and choosing suitable and comfortable living conditions [43,45,46].

Numerous academics have analyzed the spatial characteristics and related factors of various types of traditional Chinese architecture and settlements from the perspective of ethics. Using Miaoyinsi as a case study, Aurelia Campbell demonstrates how the Buddhist temple, despite being a traditional Chinese architecture, also responds to a fusion of local architectural ethical connotations and is an expression of the regional character of Tibetan

Buddhist rituals [47]. Almodovar-Melendo et al. investigated the relationship between the traditional Chinese philosophy of "Tao" and the natural and built environments by analyzing data from traditional streets and alleys in Beijing [48]. Through a comparative analysis of traditional dwellings in Xidi and Hongcun and the Tianluokeng settlement, Jiang et al. explored tourists' perceptions of the spirit of place in traditional villages and urged managers to take the spirit of place in traditional architectures into consideration as a key indicator of sustainable development [49]. Jie comes to the conclusion that the imperial tomb is a monument, a symbol of the empire and its founders' ethical view of their political rule and power through a comparative analysis of the spatial typology of the imperial tombs of Qin, Wei, Zhao, Qi, Chu, Han, and Yan [50]. Leonidas et al. studied traditional Chinese gardens to show how they embody traditional Chinese ethical views and wisdom [51]. Several scholars have explored the social and cultural influences on traditional Chinese architecture and settlements. Zhao et al. introduced the concepts of neo-vernacular and semi-vernacular, demonstrating that changes in government policy can improve the preservation of vernacular heritage in China and that vernacular settlements require both tangible and intangible heritage to achieve sustainability [52]. According to Liu et al., population hollowing out is the root cause of traditional village hollowing out; additionally, most traditional villages have a very high rate of cultural hollowing out [53]. After conducting extensive research on Chinese temple theater, Zhao came to the conclusion that feng shui, folk beliefs, traditional Chinese practices, and ethical principles are all combined in this type of architecture [43]. Some other scholars have discussed traditional Chinese architecture in terms of its cultural heritage preservation and sustainable development. Using Wudaoying Hutong as a research object, Xu et al. built a micro-scale built environment (MiBE) to demonstrate the influence of cultural factors such as the contrast between Chinese and Western styles and traditional Chinese characteristics on people's walking behavior, providing a new foundation for the protection of cultural heritage in the neighborhood [54]. Huang et al. proved, using the example of ancient Chinese courtyard buildings, that the traditional "people-oriented" cultural concept may be used to realize the contemporary sustainable development of courtyard houses [55]. Liu et al. constructed a pedigree of cultural conservation and sustainable development of traditional villages and vernacular architecture in Jiangnan through dynamic spatial analysis and static spatial analysis using big data methods [56]. Although research on traditional Chinese architectural ethical culture has been carried out gradually, it has primarily concentrated on official architecture and residential-oriented vernacular architecture, and there is a gap in the research on defensive dwellings.

Through the above literature review, we make a conclusion: The Fujian Tubao is a one-of-a-kind defensive rammed earth dwelling in China that has the allure of "a single building forming a fortress". However, academics have been concentrating their attention on the study of Fujian Tulou for a long time, regardless of the perspective, from architecture, urban and rural planning, design, culturology, or sociology, and the study of Fujian Tubao is relatively insufficient. Moreover, the existing research on architectural features from the perspective of traditional ethics focuses on official architecture buildings and residential-oriented vernacular architecture, and research on defensive dwellings has not yet been carried out.

3. Research Questions and Research Framework

We present the central research question of the article through the discussion of the literature review and the summary of research deficiencies in the previous section: how Fujian Tubao, which are special defensive rammed earth dwellings, follow traditional Chinese architectural ethics culture and what similarities and differences exist between Tubao ethical representations and those of other vernacular architecture.

Existing studies have built a framework for analyzing the characteristics of traditional Chinese architecture from ethical perspectives for four aspects: the spatial axis, functional arrangement, building volume, and settlement model. Zhao et al. utilized functional lay-

out to analyze the cultural connotations of harmony, holistic beauty, and the nature of traditional dwellings in Huizhou ancient villages [57]. Guo et al. investigated the royal palaces of the Tang and Song dynasties in terms of the spatial axes, functional arrangement, and building volumes, elaborating on the dialectical relationship between ritual space and traditional ethics [45]. Yu investigates the spatial characteristics of traditional Chinese funeral architecture and its close connection to Buddhist rituals and ethics using spatial axes, functional arrangements, and extensive field research [7]. Through functional arrangement, building volume, and comprehensive historical data, Zhou investigates the transformation of traditional ethical conceptions across the three ritual sites of Mount Baohua's Longchang Monastery [58]. Rao et al. investigated the clan culture of traditional Shaoxing architecture using spatial axes and functional arrangements, demonstrating that family ritual activities accentuated class differences in architectural space [59].

Because Fujian Tubao place a high value on defense, this paper adds the analytical framework of the defense system on the basis of the predecessors and analyzes the architectural spatial characteristics of Fujian Tubao from the perspective of ethics, focusing on the five aspects of the spatial axes, functional arrangement, building volume, settlement model, and defense system with eleven case studies. The purpose of this paper is to provide guidance for the restoration and revitalization of neglected defensive rammed earth dwellings such as Fujian Tubao, as well as to fill a gap in the study of defensive dwelling spatial characteristics from a traditional Chinese ethical perspective.

4. Architectural Spatial Features of Fujian Tubao from the Perspective of Traditional Ethics

4.1. Space Axis: Symmetrical and Rigorous

Confucianism has influenced Chinese feudal thinking for more than 2000 years, and the "center is the most honorable" layout is the primary representation of feudal etiquette in architecture. Similar to ancient cities and traditional dwellings, Fujian Tubao are infused with the notion of "the center is the most honorable", which is reflected in two different ways: first, in the architectural space arrangement of "central axis symmetry" and second, in the prominence of the central axis's main building. The majority of the spatial axes in Fujian Tubao can be divided into a central axis and several transverse and longitudinal sub-axes. The central axis is a symmetry axis located in the middle of the Fujian Tubao that may divide most of the Tubao's planar space, the longitudinal sub-axes are axes parallel to the central axis, and the transverse sub-axes are axes perpendicular to the central axis. The central axis connects the core space of the Tubao; there is no obvious architectural level on the sub-axes, and the main building is emphasized through the arrangement of subordinate buildings, reflecting the ethical view of "the center is the most honorable". For courtyard type Tubao and row type Tubao, the spatial axes are quite different, and the axes of the Tubao of various shapes are also different.

Fanglian Bao in Datian County is an example of a courtyard type Tubao. Fanglian Bao is one of the better-preserved courtyard type Tubao, with a central axis running from south to north through its center space, lining up the architectural sequences of the front building, the foreyard patio, the front hall, the central patio, the hall, the backyard patio, and the dragon hall. The main building in the entire Tubao is the hall on the central axis, which is the largest and highest level of any single building and is furnished with a shrine for the ancestral tablets. In front of the hall is the central patio, which is also the largest of several patios in the Tubao. A row of the Tubao's core living spaces is arranged symmetrically around the central axis. Additionally, Fanglian Bao can be divided into several longitudinal sub-axes along the longitudinal space. The secondary axis near the center runs through the patio between the main building and the kitchen, and the secondary axis near the outside runs through the patio between the kitchen and the outer ring building. It can be seen that the closer you are to the central axis, the higher the grade of the building. The arrangement of the main building with the largest volume and the patio with the largest space to the central axis not only emphasizes the highest level of the building

in terms of space but also embodies the architectural function and ethical thinking of "the center is the most honorable" (Figure 3).

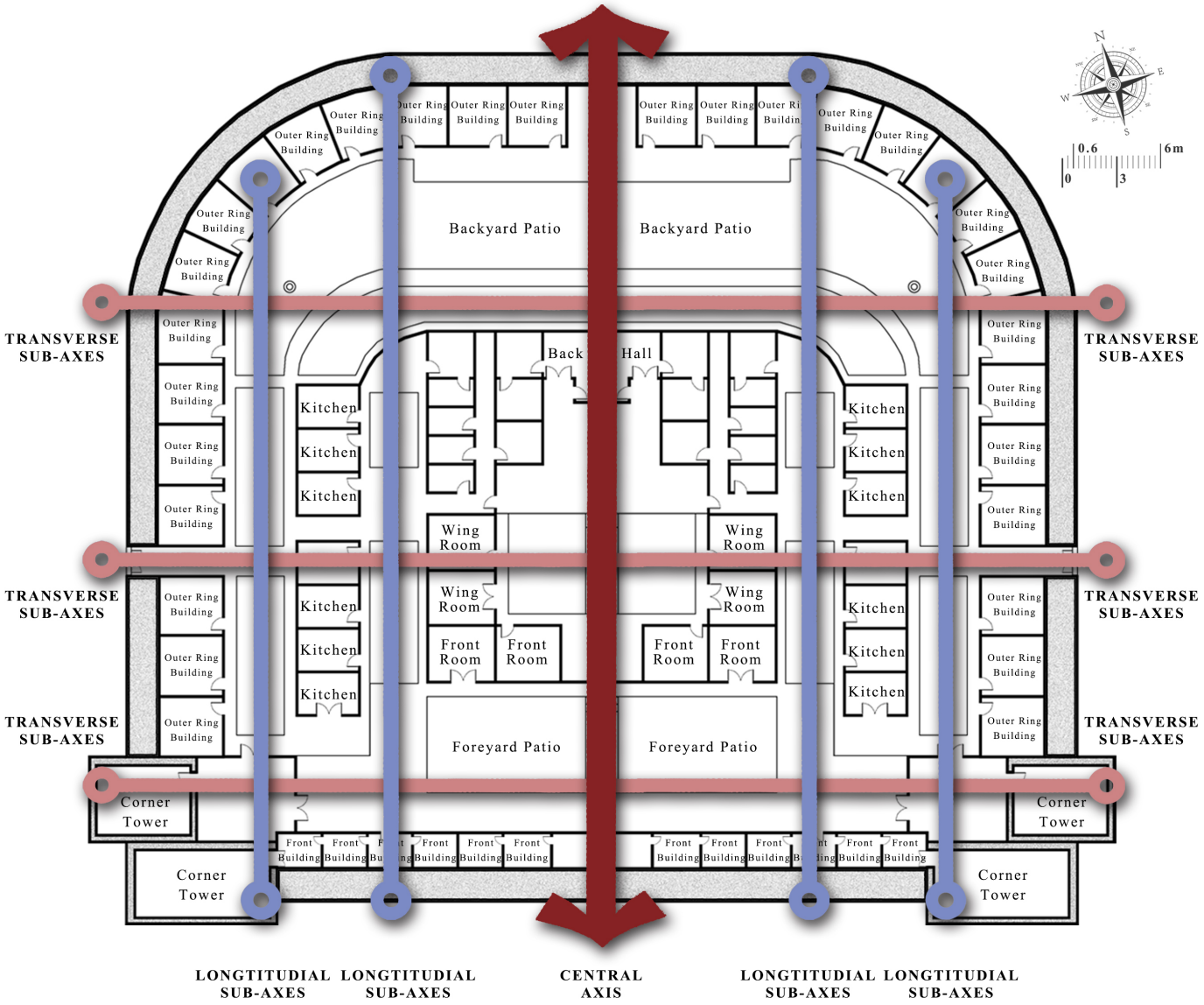

Figure 3. Space axis plan of courtyard type Fujian Tubao (Fanglian Bao).

Shangjishan Tubao in Yongan City is an example of a row type Tubao. Shangjishan Tubao is the best-preserved row type Tubao, which can be divided into a central axis and four sub-axes according to its plan layout. The Tubao's rooms are symmetrically arranged along the central axis, and the core buildings of the Tubao are lined up on the central axis, from east to west, for the front yard patio, the front hall, the center patio, and the hall. The front hall, which serves as a significant location for public gatherings and deliberations, is Tubao's largest hall. The hall is a place for open, public gatherings, and on its second floor is a shrine where ancestor tablets are kept. Two secondary axes on the left and right divide the bedrooms and the kitchen. The two transverse axes then divide the space between the front and back. Shangjishan Tubao is only symmetrical on the central axis of the inner dwellings, and the outer fortress is not completely symmetrical due to the placement of the corner towers, but the central axis still places the main public activities and ritual spaces (Figure 4).

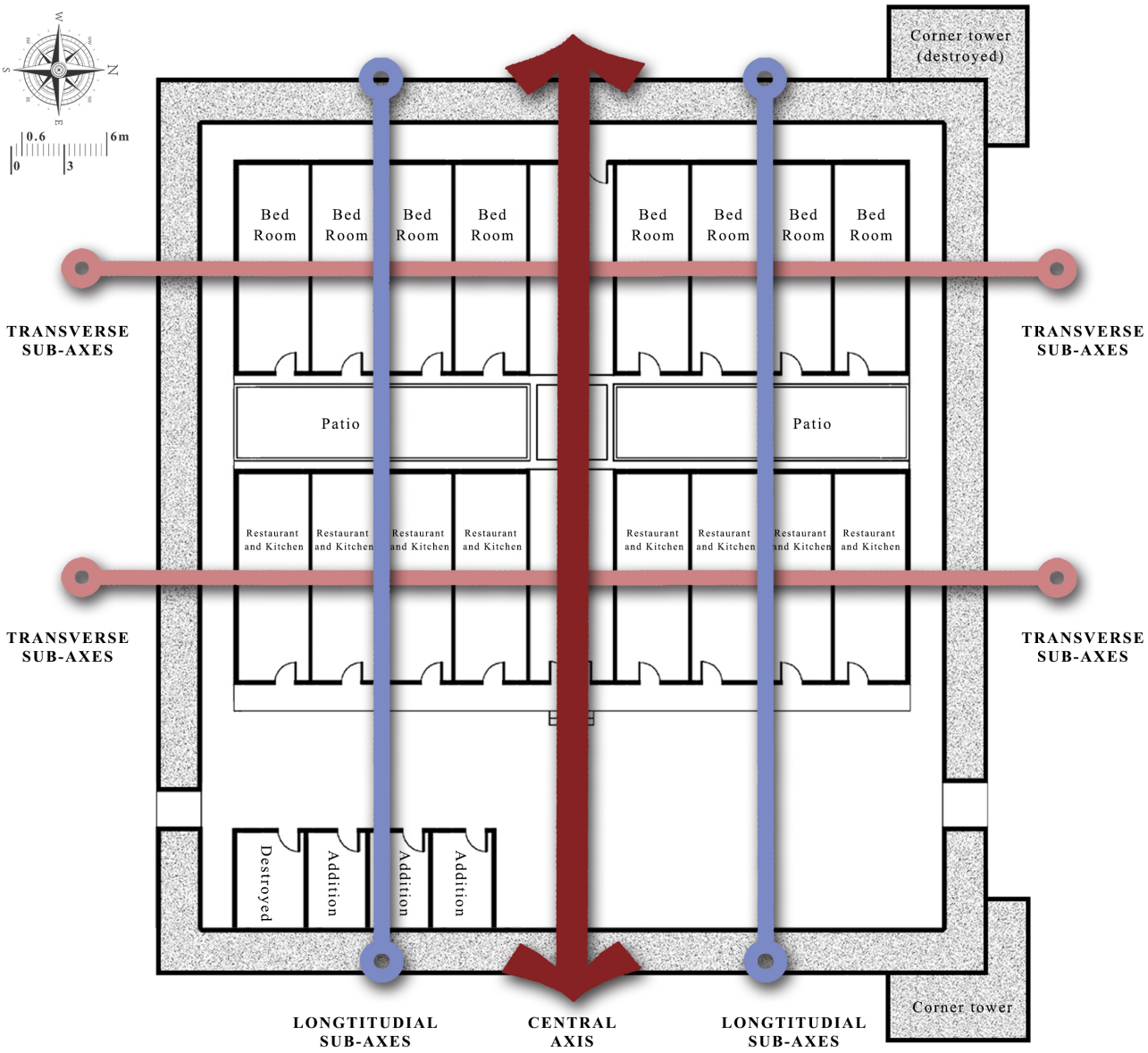

Figure 4. Space axis plan of row type Fujian Tubao (Shangjishan Tubao).

Furthermore, the spatial axes and proportional relationships of various types and forms of Fujian Tubao differ. The courtyard type Tubao is a combination of residential and defense functions with a larger building scale, with roughly the same proportional relationship between the dimensions along the transverse axes and the longitudinal axes. The row type Tubao is primarily for defense purposes, emphasizing the defense capability of each spatial level along the longitudinal axes, so the proportion of buildings in this direction will be bigger. Most square Tubao are symmetrical, but only the ancestral hall and the halls lined up on the central axis, such as Fulin Bao in Yongan City, emphasize the buildings on the central axis, and its building dimensions along the transverse axes are larger. The circle Tubao and the square front and circular back Tubao are essentially symmetrical on the center axis and emphasize the central building, and their longitudinal and transverse proportional relationships are roughly the same. For other shaped Tubao, the state of the base and the building's form determine the proportional relationships of their planes, such as Huiqing Bao and Tancheng Bao. Despite the fact that the entire Tubao is irregularly shaped, its core living space still follows the principle of center-axis symmetry (Figure 5).

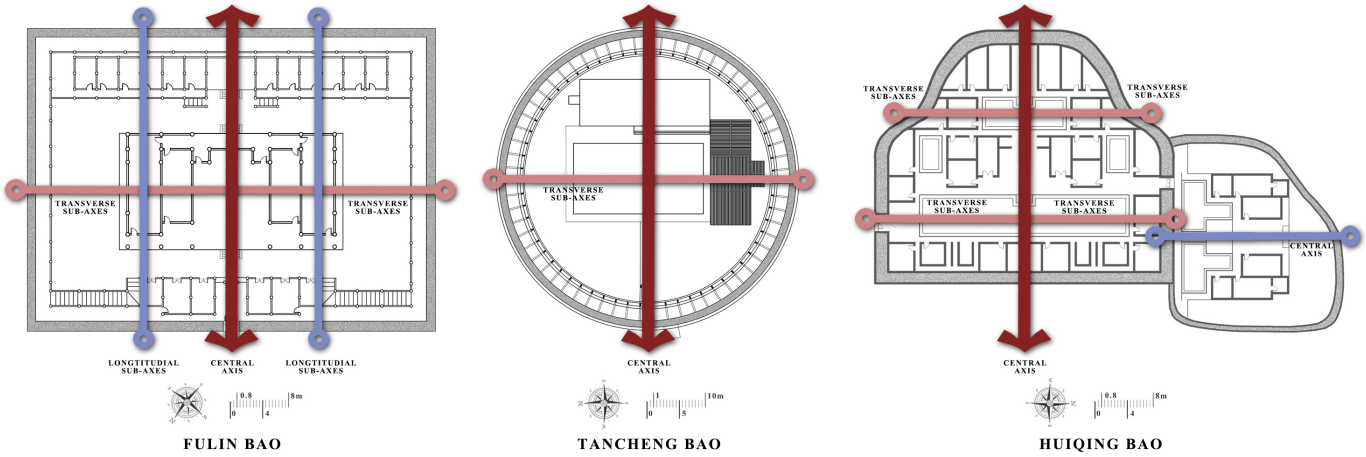

Figure 5. Space axis plan of multi-formed Fujian Tubao.

It is said in *Xun Zi* that "there is nothing better than the center to be close to the four sides, so the king must live in the center, which is a kind of *Li*". *Lu Shi Chun Qiu* said, "ancient kings chose the center of the world to establish a state, the center of the state to establish a palace, and the center of the palace to establish a temple". The central axis of symmetry is the earliest and most regular spatial arrangement in ancient Chinese architecture, and its translation into human cognition has become a sign of order and importance; this pattern is also reflected in Tubao. Tubao's symmetrical and rigid space axis emphasizes the core ethical space, expressing its authority; on the other hand, it controls the four directions, reflecting its power and defense. Although there are many types and forms of Fujian Tubao, it can still be seen that Tubao inherit the ethical thinking of traditional Chinese architecture, "the center is the most honorable".

4.2. Function Layout: Clear Hierarchy

In traditional dwellings, the primary and secondary spaces are separated not only by the orientation of the building but also by the functional arrangement that distinguishes the residences of the superior and inferior based on rank and gender. Tubao is a vernacular architecture formed by Fujian's ancestors through the fusion of Han Chinese culture, which was moved from the north to the south, and Fujian's local culture, and its layout follows the ethical principle of "clear hierarchy". Because of its special defense performance, it has added practicality and defensive space to the traditional residential arrangement pattern. Consider Shaohui Bao, which has been completely preserved in its architectural arrangement. Shaohui Bao, like traditional courtyard dwellings, can be divided into three courtyards from south to north, but on the basis of the traditional three courtyards to the east and west to extend other horizontal courtyards, the building wall is not an external wall, but with a strong and thick fortress wall enclosure (Figure 6).

The main gate of Shaohui Bao is located on its central, south-facing axis, and it leads to the foreyard, the first courtyard, which serves as a reception area for guests. The front building is the south-facing room in the foreyard. Its purpose is for daily storage or for defense during times of war, but it also engages in grain trading, unlike the traditional courtyard-style residential dwellings. Additionally, the foreyard patio of the Tubao is the largest of all patios, not the center patio, which is the biggest distinction between the Tubao and the front yards of other residential dwellings. However, in terms of its subordinate status, the foreyard, like the traditional residential dwellings, still belongs to the subordinate space.

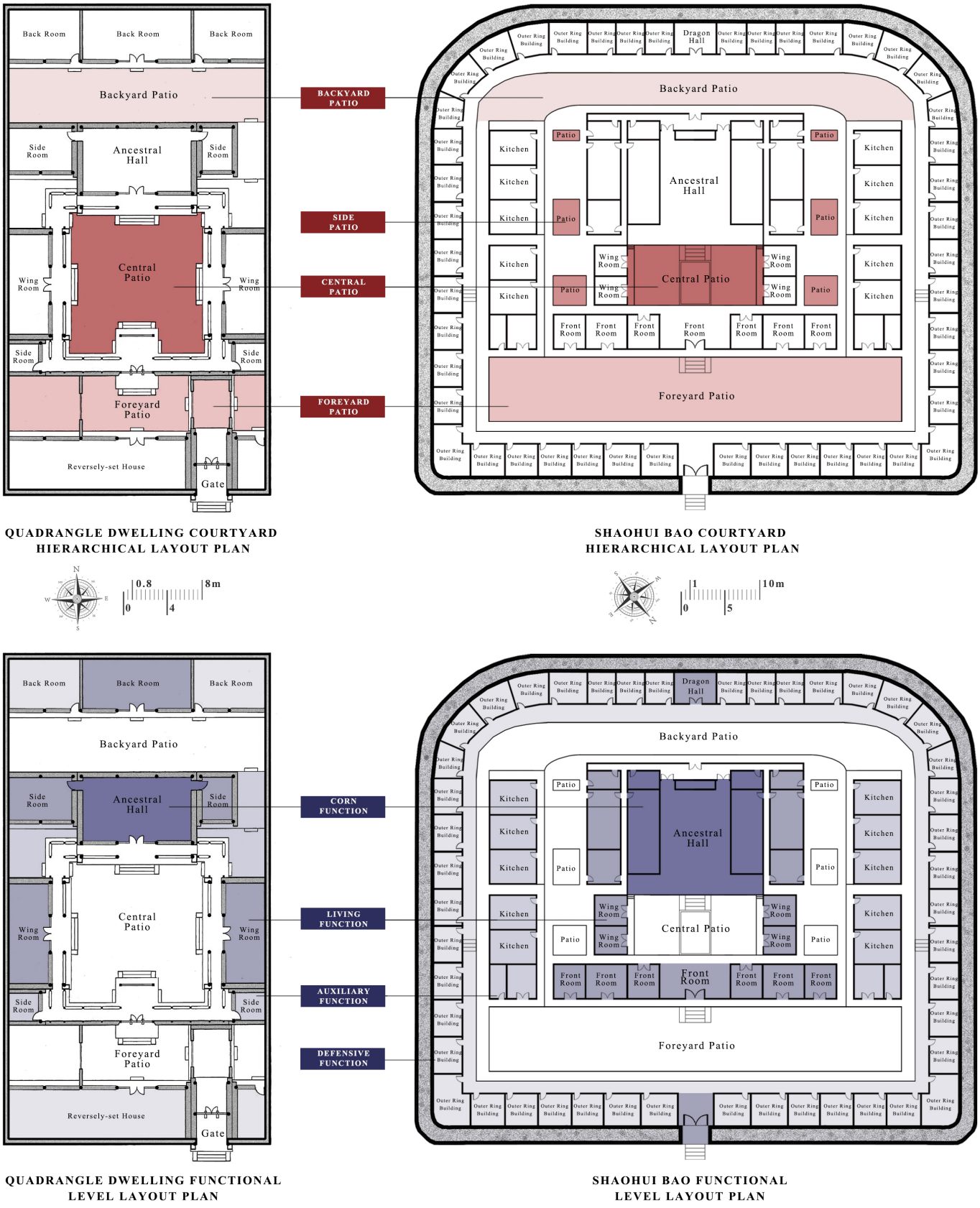

Figure 6. Comparative analysis of the courtyard hierarchical layout and functional level layout between traditional quadrangle dwelling and Fujian Tubao (Shaohui Bao).

The second courtyard is the central courtyard, which is smaller than the foreyard but contains the Tubao's most important spaces, including the front hall, the central patio, the hall, and the wing rooms. The hall, like the main room of a traditional residential dwelling, is located to the north of the center axis and has the highest rank and the largest area, while also serving as a ritual space. The front hall has a door that separates the foreyard from the central patio, similar to a floral pendant gate of the quadrangle dwellings, and only the male host and his guests are allowed to enter. Therefore, the front hall not only serves as a transition space between the inner and outer courtyard spaces, but it also serves as a space for family patriarchal ritual division. The room layout in the Tubao differs from that of traditional dwellings, but the concept is also based on the hierarchical division of "seniority and inferiority". The hall divides three rooms to the left and right, all of which are of the highest rank in the entire Tubao, with the owner's mother and child living on the first floor and the owner living on the second. The front room can be a meeting room or a traditional academy, and the wing room can be either a living room or a traditional academy. The kitchen of Shaohui Bao is positioned behind the wing rooms, close to the side patio with a well, solving the problems of lighting and ventilation as well as the supply of water during times of war, which is different from the layout of traditional dwellings.

The third courtyard is the backyard, which serves the same purpose as a private space for women's activities in traditional dwellings with the exception that its spatial form is a combination of two folded linear patios. The central axis of the backyard is known as the "dragon hall", and it follows the terrain as the high point of Tubao. The first floor is a hall for the reception of ladies, the second floor is used as a place to store coffins for funerals, and some dragon halls are also dedicated to land deities (Figure 7).

Figure 7. Functional space inside Fujian Tubao.

As a result, the functional layout of the Fujian Tubao is based on the traditional courtyard dwelling's functions of worship, living, dining, and cooking, with the addition of storage and defense space at the exterior. While the functional layout of Fujian Tubao differs slightly from that of traditional dwellings, it also maintains the regional division of "seniority and inferiority" and "differentiation between inside and outside", which is the spatial representation of traditional Chinese architecture's ethical concepts.

4.3. Building Volume: Order of Rank and Inferiority

In ancient China, the concept of "number" encompassed more than just counting and algorithms; it also formed a unique set of philosophical systems containing symbolic meaning and ritual order. For example, in traditional courtyard dwellings, the height and volume of the building decrease according to the hierarchy of respect and inferiority, and the basic order is the main rooms, the wing rooms, the back rooms, the dining rooms, the kitchen auxiliary room, the corridor, and other transportation spaces. Although the Fujian Tubao does not have the strict mathematical limitations of the royal buildings, it does have the hierarchical distinction of "seniority and inferiority" through the building height, breadths, and depths. Consider Anliang Bao and Anzhen Bao, both of which have been well preserved in terms of building size and volume.

The hall is the highest-ranking room in Anliang Bao, followed by the dragon hall, the wing rooms, and other auxiliary rooms. In terms of architectural scale, the hall is the deepest room in Anliang Bao with a depth of 6.96 m. The depth of the dragon hall is 4.40 m, the next level is the side rooms used as a storehouse 2.70 m, and then the east and west wing rooms are both 2.40 m (Figure 8). As can be seen, Anliang Bao's building level and depth have a similar relationship; the only difference is that Anliang Bao places a greater emphasis on storage and defense due to its practicality. In terms of building height, Anliang Bao's highest point is also the hall, with a ridge purlin height of 4.3 m, followed by the dragon hall height of 3.8 m, and then wing rooms with a height of 3.0 m, and the rest of the auxiliary rooms and the outer ring building are between 2.4 m and 3.5 m. As can be seen, the building heights of Anliang Bao also basically follow the traditional architectural ethical hierarchy.

Moreover, use Anzhen Bao as an illustration. The hall in Anzhen Bao is the largest room, measuring almost 200 square meters; the bedrooms, wing rooms, and front hall follow, measuring roughly 20 to 30 square meters each; finally, the kitchens, dining rooms, and outer ring buildings measure roughly 10 to 20 square meters each (Figure 9). In terms of building height, the hall is the tallest at around 6 m, followed by the bedrooms and wing rooms, and the shortest at around 4 m is the outer ring building. As a result, although Fujian Tubao are defensive rammed earth dwellings with regional characteristics, they also distinguish traditional architectural grades through building volume and height. However, there are still challenges in cultural preservation, inheritance conservation, and sustainable development of Tubao. On one hand, the function layout and building volume of Tubao follow the traditional ethical concepts, but they may not be able to fully meet the needs of contemporary daily life; for example, some of the kitchens in Anliang Bao have been destroyed (Figure 8). On the other hand, the defense needs of Tubao are no longer required, but the defense space, ceremonial space, customs, and settlement mode are still preserved today, such as Anzhen Bao (Figure 9) and Shaohui Bao (Figure 6). How the remaining space of Tubao carries on the unique Chinese traditional culture is another direction that needs to be explored in the future.

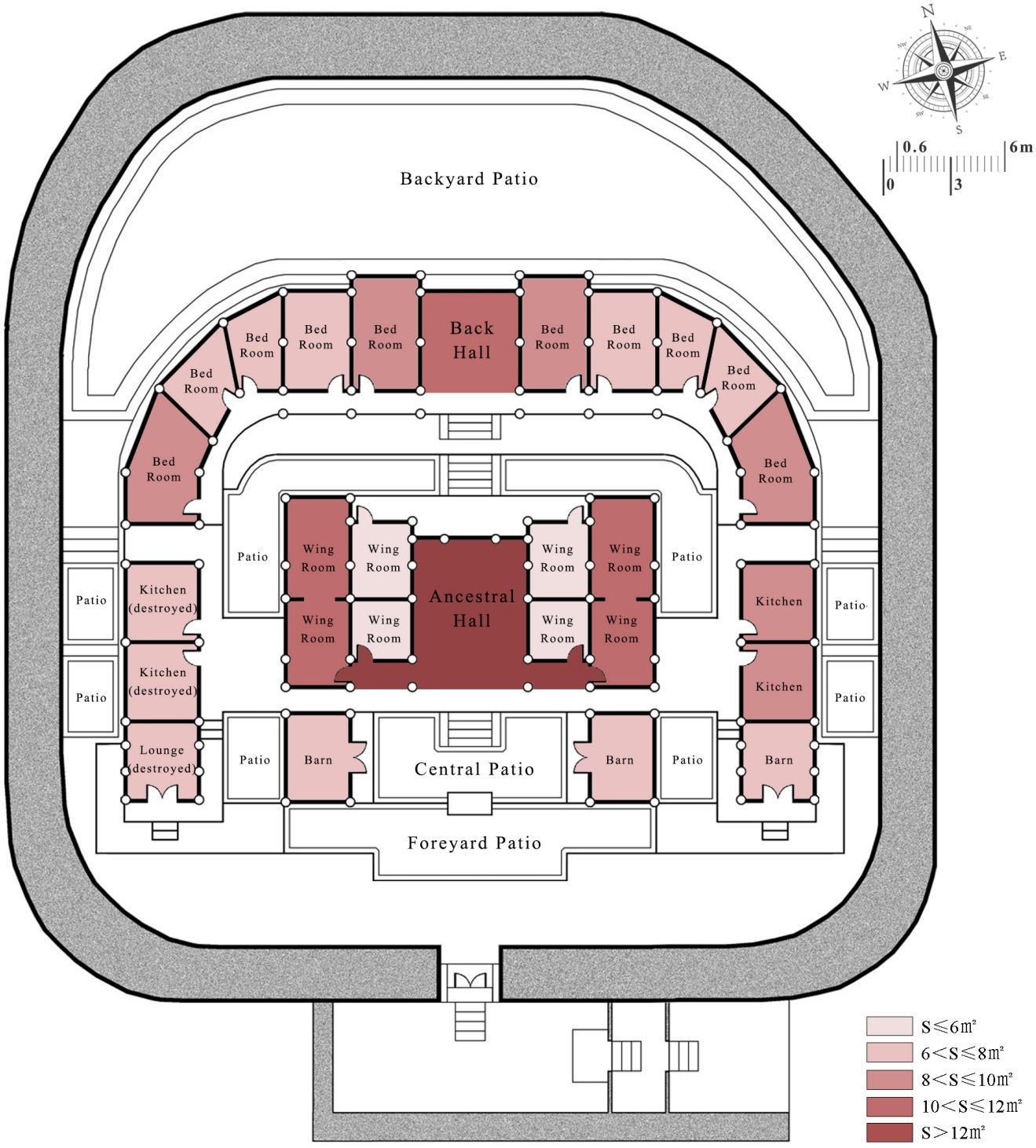

Figure 8. Distribution of indoor floor area of Fujian Tubao (Anliang Bao).

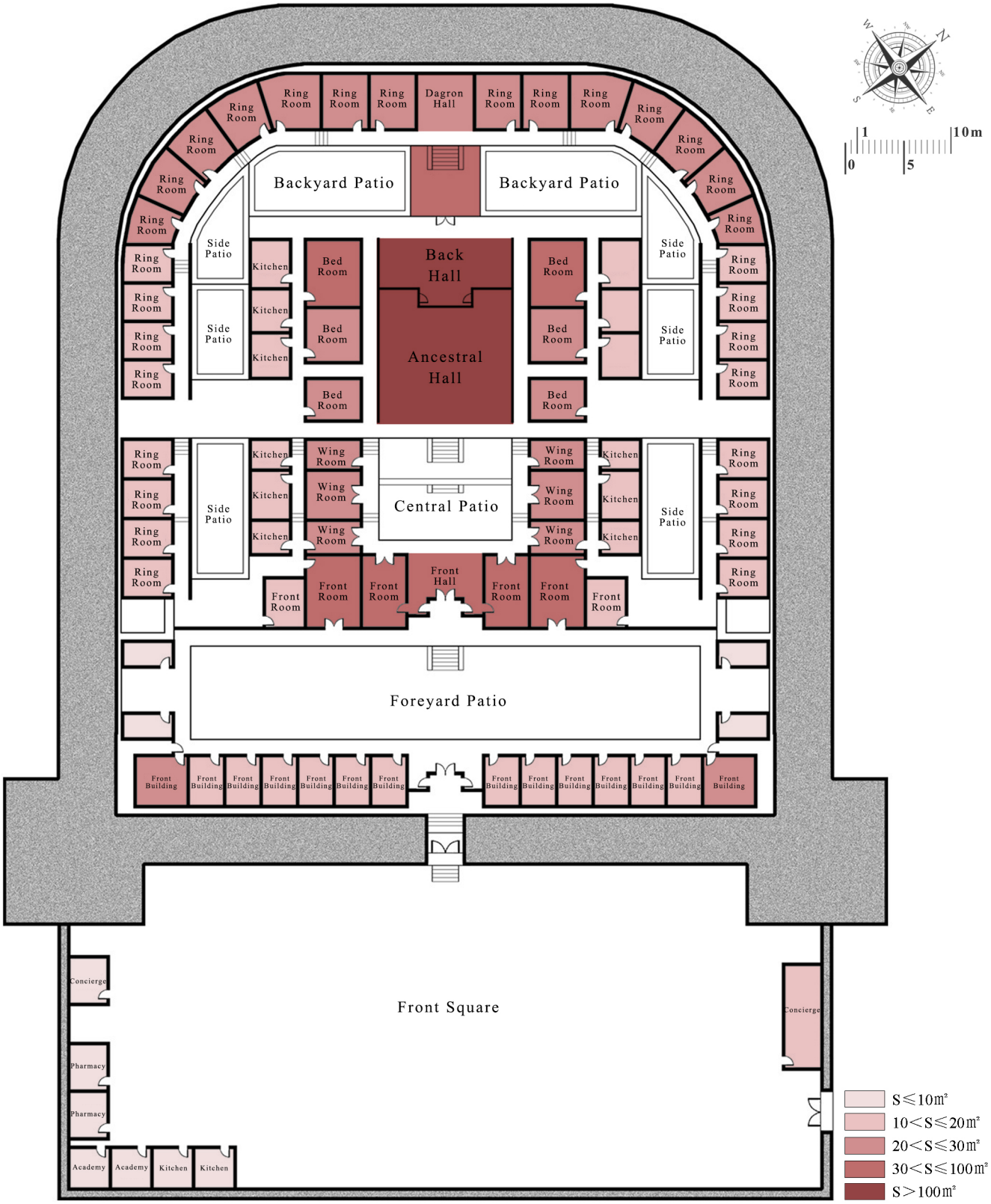

Figure 9. Distribution of indoor floor area of Fujian Tubao (Anzhen Bao).

4.4. Settlement Mode: Respecting the Ancestors

The traditional Chinese family is the basic unit of human relations bound by blood and marriage. The idea of a clan is to have a thriving population. To avoid clan alienation due to geographical migration and dispersal of descendants, the goal of "keeping the clan"

was achieved through "ancestor worship", and ritual architectures were created [46]. The Fujian Tubao is modeled after ancient castles, which have inherited not only the architectural style but also the social and ethical concepts of the Central Plains.

In ancient times, human beings gathered collectively in order to defend themselves against natural disasters, and primitive tribes generated the intention of spatial closure. Due to its distinct self-sufficient farming culture and semi-enclosed continental landscape, China has also developed an inward-looking social psychology and spatial pattern. The Central Plains developed a pattern of settlements during the Shang and Zhou Dynasties, where cities and towns were grouped together around a single bloodline, with the clan temple at its center and radiating outward in accordance with blood affinity (Figure 10A). Later, the feudal society gradually evolved into Li-Fang Unit System, the city was formed with the imperial buildings as the core, and the clans were divided into a number of units, with internal and external hierarchical relationships organized by social classes. The urban layout remained centripetal and closed, but clan relations gradually weakened, and the imperial hierarchy gradually strengthened (Figure 10B).

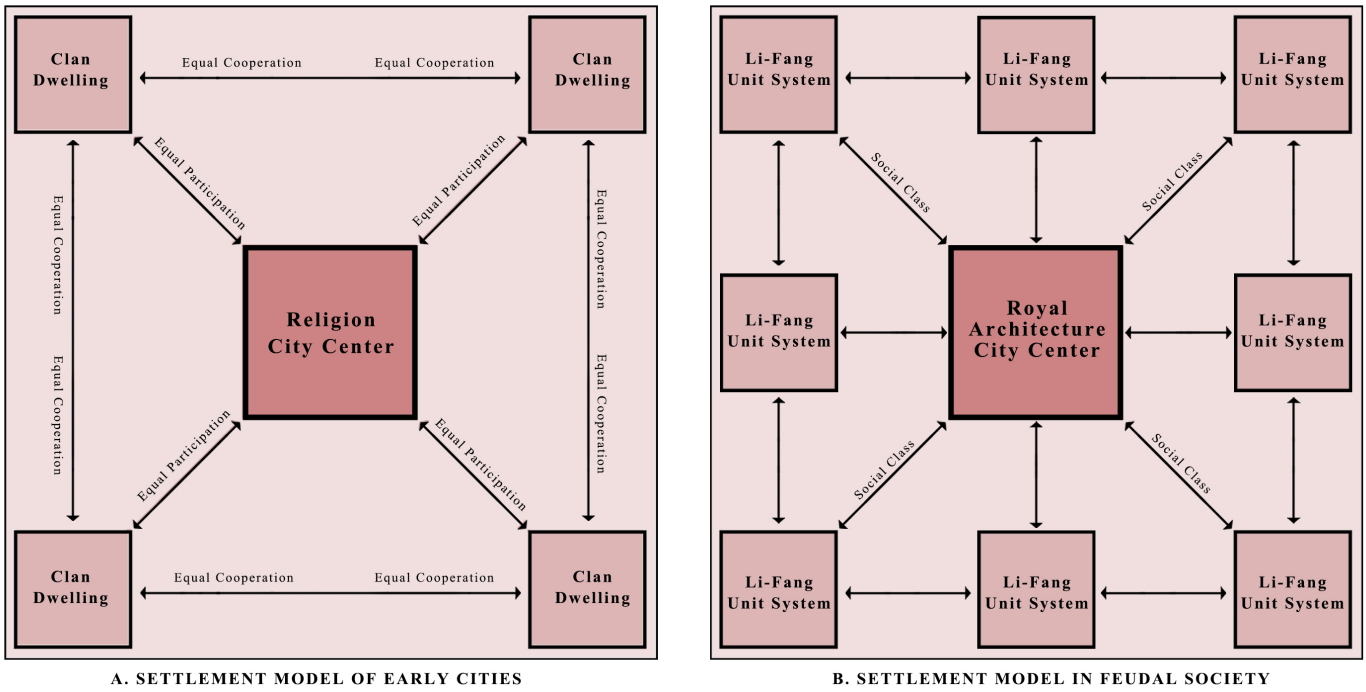

Figure 10. Settlement model diagrams of early cities and feudal society.

In the Fujian region, the clan settlement mode is once more different. Fujian is far away from the political center, the social organization relationship is weakened, and the clan management system is strengthened. The grade of the Tubao compound can be divided into three levels, using the well-preserved Guangyu Bao as an example: the inner ritual and public space, the middle life-affiliated space, and the outer defensive space. The inner ritual and public space of Guangyu Bao is the courtyard enclosed by the ancestral hall, the wing rooms, and the central patio, which is the overarching space of Tubao. The middle life-affiliated space of Guangyu Bao is dominated by living or assisted functions such as the kitchen, bedroom, living room, and barn. Some Tubao, like Fanglian Bao and Maojing Bao, have wells in the middle life-affiliated space, and some are still being used sustainably today because of the amenities. The outer defensive space of Guangyu Bao was enclosed into a closed defense system through the front buildings, the outer ring buildings, and the *Paoma Lang*. Unlike the traditional courtyard dwellings, Tubao courtyards are not only arranged back and forth along the central axis but also feature a pattern of layers of enclosure from the outside to the inside. The traditional courtyard dwellings are divided into spaces before and after the courtyard, whereas the Fujian Tubao is similar to the an-

cient city's "inner city—imperial city—palace city" centripetal arrangement system. The Tubao's courtyard level established a pattern of "gradually increasing defense function from inside to outside, and gradually increasing living function from outside to inside". It can be seen that in the Fujian Tubao, the clan ritual space is the center, strictly in accordance with the seniority and inferiority of the arrangement of internal and external hierarchical relationships, and the architectural hierarchy is clearly delineated (Figure 11). In conclusion, although the architectural style differs from that of traditional residential dwellings and cities in the Central Plains, the Fujian Tubao is arranged in the core space according to blood relations, and the traditional patriarchal concept of honoring the ancestors is inherited from the same lineage.

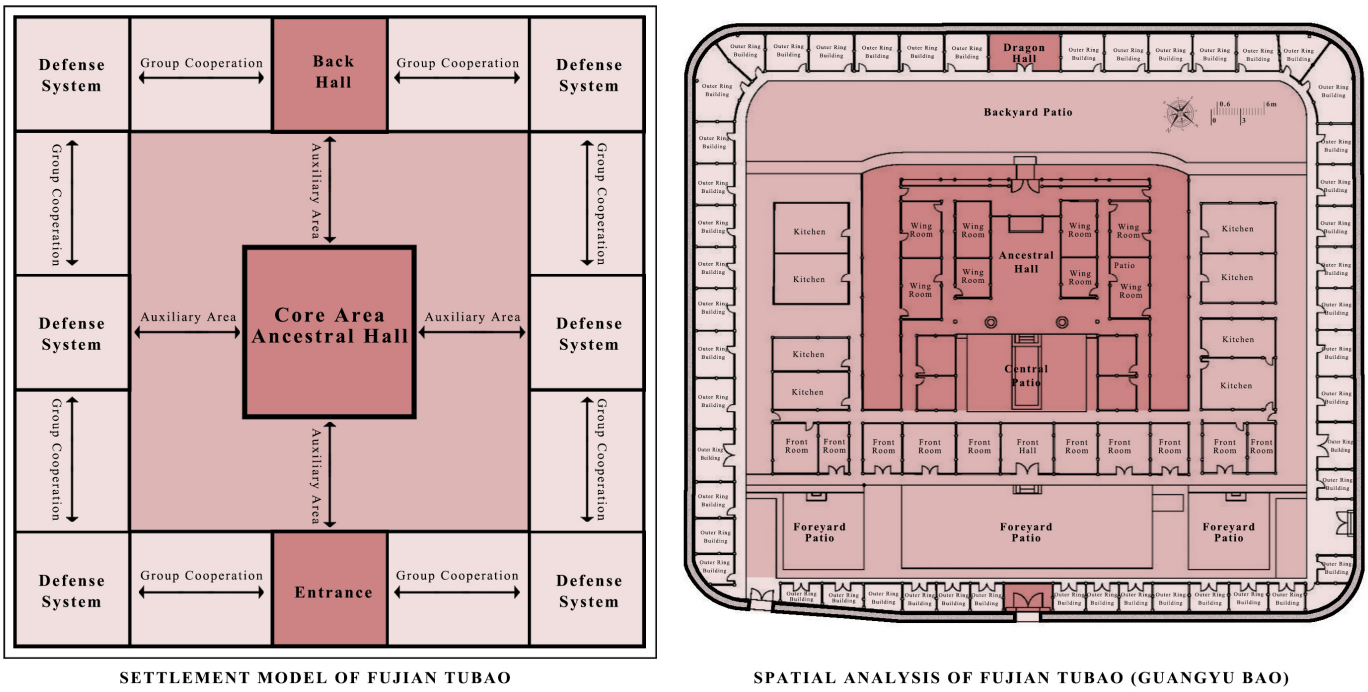

Figure 11. Settlement model diagrams of Fujian Tubao.

Furthermore, the symbolism of feng shui and the use of decorative elements are also reflected in the settlement pattern of Tubao. Some Tubao buildings named using feng shui imagery to achieve psychological compensation, such as "Dengyun Tower" (which means climbing the cloud) and "Qingtian Tower" (which means holding up the sky), are the ancestors of the Tubao's towering great building with the intention of support. The internal dimensions of Tubao are mostly determined by the number of the Lu Ban ruler, in the hope of approaching auspiciousness and avoiding misfortune. The walls and foundations, for example, take the "auspicious number" of the Lu Ban ruler, which is aimed at attracting wealth and prosperity; the bucket windows and shooting holes take the "evil number", which is aimed at instilling fear in the invaders. The architectural decoration of Fujian Tubao, in addition to the trend of complexity to simplicity due to its architectural hierarchy from the inside out, is more to accentuate the solemn and inward-looking family atmosphere through the gracious scale and edifying content. The earth fortress's architectural decoration is generally less elaborate than that of other traditional homes because of its unique defense requirements. There are three main types of Tubao decorations, carvings, clay sculptures, and paintings, in addition to couplets and plaques. The decorations' content is divided into five categories: historical allusions, dramatic legends, flowers, birds and animals, symbols, and famous poems, all of which reflect a yearning for a better life and the pursuit of good morals.

In addition to Fujian Tubao, the defensive rammed earth dwellings of China's southeastern coastal regions include Tulou and Zhailu in Fujian, Weilong Wu in Guangdong,

and Gannan Weiwu in Jiangxi, which can be classified as Hakka or non-Hakka. They were all constructed by local ancestors to protect their homes from bandits, and they were all situated in locations with significant forested and mountainous terrain, as well as a meager peasant economy. Academics frequently confuse them due to their similar defensive functions and fortress architectural systems. On one hand, they share a common defensive pattern, with defensive dwelling units in settlements and villages, and their defensive patterns include both temporary and permanent defenses. Temporary defense means that the inhabitants only enter the defensive dwellings to seek refuge in the event of an invasion by foreign enemies, and they usually live in the village; permanent defense means that the inhabitants live in the defensive dwellings on a daily basis, forming a pattern of "defense and residence in one". However, because of differences in the age of formation, the type of plan, and the proclivity for defense, it can be argued that they are different types of buildings, despite belonging to the same architectural pedigree of defensive rammed earth dwellings. Nonetheless, they share an emphasis on clan propriety and law, which adheres to traditional Chinese ethical culture.

4.5. Defense System: A Combination of Entity and Void Body

Ninghua County Annals (1869) recorded, "During the Daxing period of the Sui Dynasty (605-616) bandits were rampant, Wu Luojun from Huanglian was young and brave, built Tubao to defend the people, after that bandits did not dare to invade again". This is the earliest existing written record about Fujian Tubao. It can be seen that Fujian Tubao can be traced back to the Sui Dynasty and were established in an era of rampant banditry. Central Fujian has been rich in resources and plagued by invaders from ancient times. To safeguard their homeland, the ancestors banded together via blood and clan ties, creating Fujian Tubao. Additionally, since squire landlords everywhere rely on violent, armed hoarding of wealth, the construction of Tubao is more favorable to the consolidation of the landlord class's property because of its unique building type and strong defense system. The defense space of the Fujian Tubao is divided into two parts: the defensive entity and the defensive void body. The defense entity refers to the Tubao's defense components and defense space, which includes the fortress walls, *Paoma Lang*, corner towers, bucket windows, shooting holes, and so on. The defensive void body is the psychological oppression inflicted on the aggressor via the defensive entity (Figure 12).

4.5.1. Defensive Entity

The outer walls of Fujian Tubao are thicker than two meters, with some individual walls reaching a thickness of four to six meters. Regarding the construction method, the fortress wall is made up of two layers: a lower stone wall and an upper rammed earth wall that serves as a maintenance enclosure for the Tubao. The lower stone wall is made of local granite and pebbles. Regarding the structural type, the outer fortress of the Tubao has two ways of independent load-bearing of wooden frames or joint load-bearing of the outer wall and wooden frames, while the lower part of the outer walls and the upper part of the ring buildings form five different load-bearing combinations. Some Tubao have independent wooden structures on the upper ring buildings and rammed earth walls on the bottom layer that are load-bearing, with the rammed earth walls on the higher layer just acting as an enclosure (Figure 13A–C). Some Tubao have rammed earth walls on the bottom layer with wooden frameworks for joint load-bearing and independent wooden structures on the upper ring buildings (Figure 13D). Additionally, there are Tubao like Fanglian Bao and Shaohui Bao that have independent wooden structures on the upper and lower ring buildings and rammed earth walls that serve only as an enclosure (Figure 13E). *Paoma Lang* is a circular passageway that has been built inside the Tubao rammed earth wall. Unlike *Paoma Lang* in Tulou, which only serves to connect the outer ring buildings for transportation, *Paoma Lang* in Tubao is the most important defense facility, connecting the Tubao's inner dwellings with the outer fortress, forming a unique and complete defense system. In the event of an invasion, the corner towers and gates linked by *Paoma Lang* form

the first line of defense, bucket windows and shooting holes installed in *Paoma Lang* form the second line, and residents can retreat to the inner dwellings through *Paoma Lang* to form the third line. Furthermore, the Paoma Lang was used by the residents for quick movement of commodities and enemy information, as well as storage and temporary homes.

Figure 12. The defense system of Fujian Tubao.

The corner tower, also known as a watchtower, gun tower, or gun building, was built at the intersection of the Tubao's two walls, and it served as both a daily sentry observation post and a battlefield shooting position. The corner towers were taller than the other structures of the Tubao and were designed to occupy the high ground to increase the attack's range. The corner towers are primarily square or some variant squares, each of which can guard a range of 270 degrees (Figure 14A). The number of corner towers in different Tubao varies as well. If there is only one corner tower in a Tubao, it is more likely to be placed in the front and side of the fortress wall, in order to protect the fortress door. If there are two corner towers, placed at opposite corners, each one protects both sides of its corner, thus maximizing the defense of the Tubao. If there were three corner towers, they were placed on both sides of the front and one side of the back. Since enemies could only choose to attack from the front due to the locations of Tubao being mostly in hazardous terrain, this strengthened the frontal defense. The corner towers were on high ground, and in addition to shooting, the Tubao residents drove away enemy robbers by throwing stones, lime, chili

powder, and boiling water. Some Tubao positioned the only exit on the bottom floor of the corner tower and thus set up cannons to strengthen their fortifications.

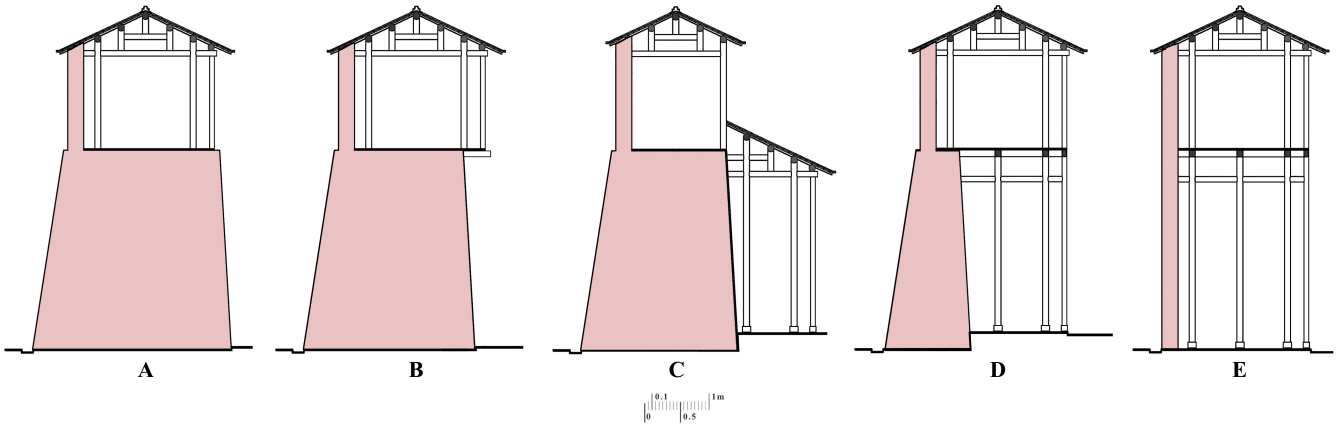

Figure 13. Building structural types of the outer fortress of Fujian Tubao. (**A**–**C**): independent wooden structures on the upper ring buildings and rammed earth walls on the bottom layer. (**D**): rammed earth walls on the bottom layer with wooden frameworks and independent wooden structures on the upper ring buildings. (**E**): independent wooden structures on the upper and lower ring buildings. This figure was drawn by the authors based on our field research and the content of the paper *Study on The Earth Fortress in Fujian. Master's thesis* [60].

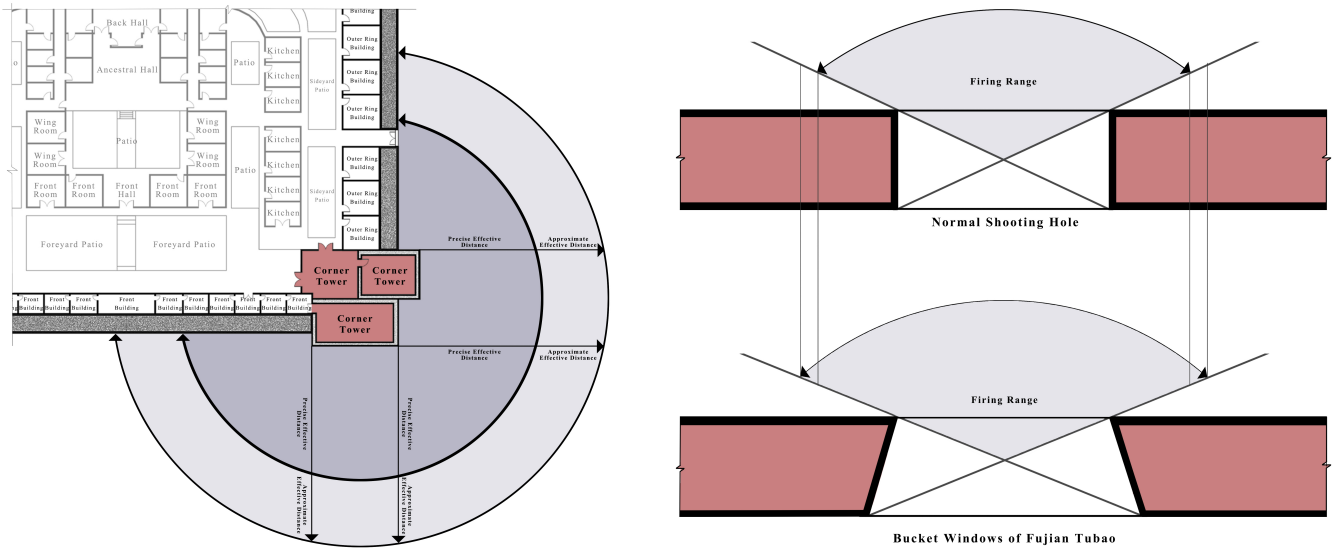

Figure 14. Corner tower defense range and bucket windows firing range of Fujian Tubao.

The windows of traditional dwellings are used for ventilation and light; however, the bucket windows of Tubao are used for shooting and defense. Bucket windows were installed in the outer fortress walls, typically between 0.8 and 1.6 m high and in line with the shooter's standing or kneeling shooting position. The windows were trapezoidal in cross-section, wide on the outside and narrow on the inside, to increase Tubao's firing range while decreasing the angle of attack of the invaders (Figure 14B). The shooting holes ranged in diameter from 8 to 12 cm and were installed in the fortress walls as well as the corner towers. The shooting hole's shooting range is narrower than the bucket windows, and it employs the "distance measurement from the pole" principle to shoot at a fixed point, which has the advantage of greater accuracy. Because of this, the Tubao is covered in shooting holes; large Tubao shooting holes can number over 150. The firing holes were

made of bamboo, which was hollowed out and dried, cut to the thickness of the fortress walls, and fixed in position according to the firing angle. The firing holes on the lower floors are "slanted", and those on the upper floors are "flat" due to the different heights and firing angles of the Tubao.

The gate is the weakest link in the Tubao's defense; the gate is located in the front or side of the Tubao, and some Tubao have a side door in addition to the gate. Some Tubao have double or even triple doors, each twenty centimeters thick, with an iron gate on the outside and a wooden door on the inside. Tubao in Youxi County and Daitian County mostly raised their bases and built 4–5 m high steps in front of the fortress walls, such as Maojing Bao. One reason is to make the attack more difficult and targeted; the other is to portray the Tubao building in a dignified and upright manner to oppress the enemy psychologically. There is a "water filling hole" above the Tubao gate, which is used for spying on the enemy, filling the lower level with hot water, firing cannonballs at the bandits, and putting out the enemy's fire from the upper level. Some of the water filling holes were also designed with a small top and a large bottom to repel the enemy bandits by pouring hot water over a larger area.

Some Tubao have trenches in front of them, with a width of 3–5 m, functioning like ancient castle moats, such as Wentang Tubao in Youxi County. Some of the Tubao fortress walls' back sides have additional walls with heights ranging from 1.5 to 2.4 m and a thickness of 0.4 to 0.6 m that also contribute to maintenance, like Wenyang Tubao in Ningde City. In order to connect trapped Tubao to foreign aid through carrier pigeons, some Tubao, like Fanglian Bao in Datian County, have pigeon lofts installed on the back walls.

Tubao, Tulou, and Zhailu all belong to the same architectural pedigree of Fujian defensive rammed earth dwellings, but they serve different purposes. Tulou's living and defense functions are mostly concentrated in the outer ring buildings, whereas Zhailu and Tubao's living and defense functions are mostly concentrated in the internal dwellings. Some Tubao residents do not have a well and must obtain water through a stone wall and a mountain stream gap. Tulou's and Zhailu's kitchens and wells, on the other hand, are quite complete. Tulou are defended solely by the shooting holes, whereas Tubao and Zhailu are protected by the shooting holes, the gate, and the corner tower, forming a comprehensive defense system. Furthermore, Tubao and Zhailu designs are more concerned with functionality, whereas Tulou craftspeople are more concerned with the decorative and artistic. As a result, Tubao are primarily used for defense, with living serving as a secondary function; Tulou are primarily used for living, with defense serving as a secondary function; and Zhailu serve both defense and living.

4.5.2. Defensive Void Body

In addition to the physical defense entity that provides residents with material security, Tubao provide psychological comfort from a spiritual standpoint through the defensive void body. The defensive void body has two components: the first is the ancestral shrine and temple, door plaque, couplets, and talisman to provide spiritual solace for the inhabitants; the second is the perilous terrain, high fortress walls, corner towers, and many tricky mechanisms to provide spiritual deterrence for the invaders. The defensive void body of Tubao suggests the symbolic image of "firmness and security", which has both physical and psychological "force", giving the invaders a majestic and cold psychological feeling. In addition, the bucket windows and shooting holes of Tubao have "one-way visible" properties, which prevent invaders from easily launching an attack due to their own insecurity and uncontrollability and the behavior of its restrictions.

The ethical culture of traditional architecture is reflected in man's relationship with his ancestors on one hand and man's relationship with God on the other. However, due to their unique defensive requirements, the ethical culture of Fujian Tubao is also reflected in the external defense connection. Tubao are made up of a single bloodline gathering, with the ancestral hall serving as the center of the entire Tubao, and all defensive systems are built around the protection of the core space to develop internal and external

hierarchical relationships. While private family worship is less common in Tubao, it is largely public clan worship, with no separate family temple. Tubao not only emphasize the psychological feeling of majesty and solemnity given to people by the ancestral hall through the comparison approach but also give them authority through the comprehensive defense system created around the ancestral hall. Under the ethical concepts inherited from the southward-migrating Central Plains, the Tubao forefathers satisfied their inner solace through the worship of nature and ancestors and also searched for survival space and self-identity in the turbulent region and era. Fujian Tubao eventually developed a unique architectural system and ethical culture of "people, gods, and defense system coexisting".

5. Discussion

Through the analysis in the previous chapter, we found that although Fujian Tubao are rammed earth dwellings with mainly defensive functions, their spatial axis, function layout, building volume, and settlement mode all reflect the traditional Chinese ethical concepts of "clear-cut hierarchy and order of superiority and inferiority". But then, their special defense performance added practical and defensive space to the traditional residential arrangement pattern. Behind the analysis of the spatial characteristics of Fujian Tubao under the traditional ethical perspective, we also discuss the background and underlying causes for the formation of this special spatial feature.

5.1. Unique Geographic and Natural Environment

The central region of Fujian is located between the Wuyi and Daiyun Mountains and is characterized by high mountains and narrow valleys, making land transportation difficult in ancient times. The main rivers flowing inland to the Minjiang River are the Youxi River, Meixi River, and Dazhangxi River, which has a well-developed water system but is difficult to transport by waterway due to the complicated terrain [61]. Therefore, the ancestors of central Fujian lived in the mountains and forests, relying on traditional agriculture for survival and developing a mountain and forest culture of self-sufficiency and contentment.

Fujian has the second highest forest coverage in China, and the forest reserve in central Fujian is even richer, with cedar, bamboo, pine, camphor, and other woods becoming not only the main structural material of dwellings but also the reinforcement material of the walls [35,36]. The soil of Fujian is mainly red soil and yellow soil, which is an excellent material for strong and durable rammed earth walls. Many of the existing Tubao have collapsed internally, but the outer rammed earth walls are still intact, showing their excellent durability [21,23]. The simple and straightforward use of natural materials in Tubao and other traditional dwellings is the architectural manifestation of the "land culture" and "love of earth and wood" of central Fujian's ancestors.

5.2. Cultural Inheritance of the Northern People's Migration to the South

The native Baiyue tribe was the majority of Fujian's ancestors before the Qin and Han Dynasties. With the four northern migrations to the south following the Qin and Han Dynasties, Fujian's native cultures and construction techniques were incorporated [19]. Along with bringing the Central Plains culture to the south, northerners' migration also brought rammed earth technology, which had a significant impact on the later construction of Fujian Tubao. The prototype of a Tubao is derived from small castles, one of which is Wu Bao. Wu Bao originated from the border area of the Western Han Dynasty, and this form of construction was introduced to Ninghua County of Fujian during the migration of the northern people to the south [20]. According to archaeological discoveries, the tamping technology of the Tubao was also inherited from the mature plate construction technology in the Yellow River Valley during the Han Dynasty [62]. The feng shui concepts such as "getting water is superior", "rich water should not be let out", and "water returns to the hall in all four directions" followed by the Tubao, as well as the spatial arrangement that places the ancestral hall in the center, are all in the same lineage with the Central Plains clan ritual concepts.

5.3. Bloodline Cohabitation and Ethnic Identity

The Hakka people became an important branch of nationality during the process of the northern people's southward migration to Fujian, and it was the Hakka culture that had a large influence on the later construction of Fujian Tubao [63]. While some northern Han Chinese moved south, others chose to stay in Fujian, Jiangxi, and Guangdong, gradually integrating with the original inhabitants to form the Hakka people [64], and central Fujian is where the majority of Hakka people live. The Hakka people live together in clans with their bloodline and have developed agriculture through hard work and farming, and Fujian Tubao is the best architectural example of the bloodline-based settlement.

Most of the residents of Tubao are the Hakka people. The Hakka people have developed a unique clan culture called the "patriarchal system" based on their common Hakka dialect, blood relationship, customs, and geography. The chief of the clan is a high-ranking and well-respected elder of the same family name and maintains the authority of the clan's legal system through specific clan rules. The clan system has enabled the Hakka people to develop a Hakka culture of unity and respect for their ancestors [65]. The Hakka culture is characterized by "strong ancestor worship and a high sense of clan cohesion" and places a strong emphasis on the moral principles of respecting older adults, filial piety, and lending a helping hand to one another when they are in need [66]. In such a cultural context, unlike the Central Plains, where multiple bloodlines gathered and lived together, Fujian Tubao formed mostly single-bloodline settlements [30]. There is no place for religious worship in Tubao, regardless of how many people live there, and only ancestral halls for clan worship are built. The ancestral hall has the highest status in the Tubao and is the centerpiece of the vertical and horizontal axes and spaces on all levels. From the space axis, and courtyard level to the building volume and settlement mode, Fujian Tubao follow the strict hierarchy of respect and inferiority, forming the idea of "downplaying religion and emphasizing ethics".

6. Conclusions

From the perspective of historical changes, Fujian branches of nationality mostly evolved from the migration of the Central Plains ancestors to the south. The inhabitants of Tubao live together as a single lineage, and the architecture takes the form of "rituals and dwellings in one". Fujian Tubao have developed a distinct architectural ethical connotation as a result of cultural inheritance, historical changes, and regional integration from the north to the south. From this point of view, Fujian Tubao have profound implications for the study of the bloodline settlement type of architecture, as well as the regional integration of the southward-moving Central Plains culture.

From the point of view of spatial form, Fujian Tubao follow the development route of fortress architecture "from castle to fortress". When foreign bandits invaded the country at the end of the Qing Dynasty, the ancestors of Fujian responded to the geography and climate by gradually improving on the original castles, which evolved into the later Fujian Tubao. The prototype of the Fujian Tubao can be described as a "miniature" ancient castle. Furthermore, Fujian Tubao not only maintain the Quadrangle Dwellings characteristics in the functional layout but also meet the needs of the defense building, which can be considered the homologous isomerism of the traditional Central Plains vernacular architecture in the mountainous areas of central Fujian. In this sense, Fujian Tubao is the rural version and living fossil of the traditional Quadrangle Dwellings in central Fujian.

Traditional defensive rammed earth dwellings and the defensive settlements where they are located have evolved over a long time and are complicated in character; therefore, they cannot be covered by a single discipline. Currently, the authors are conducting a bigger field survey and gathering a multidisciplinary collaborative team to perform a study on the interdisciplinary research problems of the traditional defensive settlements and dwellings pedigree of the southeastern coastal regions of China. Architecture and urban and rural planning majors are practice-oriented, focusing on spatial forms, and the research team is based on typology, summarizing the "prototypes" of traditional settle-

ments and dwellings and utilizing them as a catalyst [67–72] to inspire spatial effects. Geography focuses on theoretical discernment and quantitative analysis, and we employed multi-scale geographically weighted regression (MGWR) [73–76] to study the spatial and temporal distribution of these traditional defensive settlements and the factors influencing them. Sociology and anthropology emphasize human-centered thinking, and we studied the behavior patterns of village residents and visitors using the Public Space and Public Life Survey (PSPL) [77] and bottom-up mapping [78] to develop an optimization strategy for the association of traditional spaces with particular people.

The defensive rammed earth vernacular architecture in the southeastern coastal regions of China, represented by Fujian Tubao, are impregnated with traditional Chinese ethical thinking from feng shui imagery and site selection, to decorative components and colorful furnishings. With the rapid development of urbanization, the defensive vernacular architecture that was abandoned in the mountains and forests can no longer meet the material needs of contemporary residents, and their cultural values are gradually fading away. In view of this, the study of defensive vernacular architecture remains, on one hand, has an important practical role in the continuation of traditional Chinese ethical implications, which allows us to better interpret the language of traditional architecture and its unique forms of expression and has an important academic reference value in terms of cultural connotations and traditional aesthetics. On the other hand, it has also become an effective way to trace the origin of regional culture and to protect and develop regional culture as a non-renewable resource.

Author Contributions: Conceptualization, X.L. and Y.W.; methodology, X.L. and Y.W.; software, X.L.; validation, X.L. and Y.W.; formal analysis, X.L. and Y.W.; investigation, X.L. and Y.W.; resources, X.L.; data curation, X.L. and Y.W.; writing—original draft preparation, X.L.; writing—review and editing, X.L. and Y.W.; visualization, X.L.; supervision, X.L. and Y.W.; project administration, X.L.; funding acquisition, X.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Guangzhou Philosophy and Social Science Planning 2022 Project (Grant No. 2022GZYB51), the Guangdong Province Philosophy and Social Sciences "14th Five-Year" Plan 2022 Annual Discipline Co-construction Project (Grant No. GD22XYS23), and the 2021 Guangzhou Huali University Research Project (Grant No. HLKY-2021-SK-1).

Data Availability Statement: Not applicable.

Acknowledgments: The author would like to thank Guan Ruiming (School of Architecture and Urban-rural Planning, Fuzhou University, Fujian, China) and Chen Li (School of Architecture and Urban-rural Planning, Fuzhou University, Fujian, China) for their guidance and assistance during the author's studies at Fuzhou University. We also want to thank P. Porretta and his teams (Department of Architecture, Roma Tre University, Rome, Italy) for providing literature assistance. The photo of Zhailu in Figure 1 was provided by the author's mentor Guan Ruiming (School of Architecture and Urban-rural Planning, Fuzhou University, Fujian, China) and Chen Li (School of Architecture and Urban-rural Planning, Fuzhou University, Fujian, China), Figure 13 was drawn by the authors based on our field research and the content of the paper *Study on The Earth Fortress in Fujian. Master's thesis*, and the rest of the figures are self-created by the authors.

Conflicts of Interest: The authors declare no conflict of interest.

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