Application of Field Survey and Graphic Language in Cultural Relics Building——Taking Liuzi Temple as an Example

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Abstract. This article is a comprehensive and in-depth study of the shape and cultural connotation of cultural relics to achieve the protection and utilization of cultural relics. Using modern measurement techniques and advanced equipment, such as laser range finder and electronic theodolite, traditional measurement methods such as leveling surveying and detailing surveying are used for Liuzi Temple to obtain a large amount of actual data. At the same time, the stone carvings, textures and murals of the Liuzi Temple were investigated through close-range photography. In addition, through computer-aided data processing, it is transformed into a graphical form to deeply analyze the Liuzi Temple, providing a reference for the basic data mapping of cultural relics.

1. Introduction

Cultural relics are usually witness to a certain period of history and have important historical significance and research value. A monumental building is a house or structure built to commemorate a character or an event. Its functional requirements are mostly purely spiritual symbols[1]. Building conservation is the process of managing change to best sustain a building’s significance[2]. Protection of cultural heritage like ancient buildings, in term of the survey work, we should use advanced equipment and comprehensive measurement, to protect ancient buildings from man-made damage[3]. In addition, in order to better protect and utilize the cultural relics, the construction of the building is measured in the field and interpreted in graphical language, providing new ideas for the protection of ancient buildings.

Liuzi Temple is located in Liuzi Street, Lingling District, Yongzhou City, Hunan Province, China. It is an ancestral temple built by Liu Zongyuan, a famous literary master of the Tang Dynasty. After many repairs and maintenance, Liuzi Temple is the largest commemorative building in China to commemorate Liu Zongyuan. (Figure1). Liuzi Temple is located inside Liuzi Street, facing the Yuxi River in the north and backing the West Mountain, and it covers an area of more than 2,000 square meters, with brick and wood structure. There is a stone arch bridge transformed by later generations in the temple square, later called Yuxi Bridge.
2. Analysis of the shape of the Liuzi Temple

2.1 The stage

The Liuzi Temple is mainly composed of the temple gate, the stage, the front hall, the main hall and the apse, become a group of three-in-one courtyard buildings. In addition to the stage and the pavilion, the roof forms of other single buildings are hard mountain double-sloping roofs, covered with blue tiles, and the volcanic walls are installed at the end of the room to form a rich sense of hierarchy and rhythm.

Entering from the temple gate is a beautiful all-wood double-double eight-column stage, facing the front hall and inserting a spacious courtyard between the front halls. The stage was built in the Qing Dynasty. It is more than 100 years old. The whole stage is made of wooden structure. The most prominent place of the stage is its roof, which uses three layers to rest on the top of the mountain. At the front desk, the roof of the mountain is connected to the hard mountain roof in the background, and the curved top of the ear is used to form a rich layering. At the same time, a large number of paintings and carvings are used for decoration. The specific dimensions of the stage are shown in Table 1, and the data is collated and graphically expressed. The main entrance, side door and stage of Liuzi Temple are related proportionally (Figure 2, Figure 3). The height of the outer wall is 6.9m, which is about 1/3 of the total height of the stage. At the same time, the distance from the main entrance to the side door is 10.8m, which is roughly 1:1 with the height of the stage.

Table 1. Stage measurement data of Liuzi Temple

| Building width(mm) | Spatial depth(mm) | Area (㎡) | Height (mm) | Total height (mm) | Area (㎡) | Building width (mm) | Spatial depth (mm) | Area (㎡) |
|--------------------|-------------------|-----------|-------------|------------------|-----------|--------------------|-------------------|-----------|
| Front desk         | Platform base     | Backstage |             |                  |           |                    |                   |           |
| 3 rooms            | 3 rooms           | 24.10 ㎡  | 2000mm      | 11500mm          | 24.10 ㎡  | 5 rooms            | 2 rooms           | 25.87 ㎡  |
| 6010mm             | 4010mm            |           |             |                  |           | 9950mm             | 2600mm            |           |

2.2 Individual buildings of the Liuzi Temple

The front hall is the Liu Zongyuan memorial mall, which consists of the front hall and the east and west hatchbacks. The width of the south outer gallery is 2.00m. In the north of the front hall is the pavilion, and the gray blue tile echoes the roof shape of the stage. The pavilion continues to the north is the main
hall, the east is the Temple of the God of Wealth, and the west is the Niangniang Temple, which is now used as an exhibition space. The east and west sides of the pavilion are naturally surrounded by two white courtyards, forming a semi-open space. As the important exhibition space of the entire Liuzi Temple, the main hall is open and generous, clear and solemn. The east and west sides are 14.10m wide and 14.60m deep and it is roughly a square plane. The corridor between the main hall and the pavilion is 2.40m wide. The roof form is a hard mountain double-sloping roof with three wide sides. Each room has a volcanic wall at the end, the internal wooden structure is beam-lifted, and the wooden shed-style ceiling is exquisite and chic. The corridor connects the apse with the main hall. The back wall and the corridor surround the open courtyard, and a small pavilion is placed in the middle. Behind the main hall is a spacious courtyard and corridor, with the elevation of the entrance stage as a relative elevation of ±0.000. The measurement data for each building unit is shown in Table 2.

| Table 2. Individual building measurement data |
|---------------------------------------------|
| **Roof form** | Front hall | Pavilion | Main hall | Corridor |
| Hard mountain double-sloping roof | Double eave hipped-roof | Hard mountain double-sloping roof | Hard mountain single-sloping roof |
| **Room size(m)** | 14.10m × 4.85m | 4.87m × 5.10m | 14.10m × 14.60m | 2.40m × 45.70m |
| **Area(㎡)** | 68.39 ㎡ | 24.84 ㎡ | 205.86 ㎡ | 109.68 ㎡ |
| **Elevation difference(m)** | 1.20m | 2.72m | 4.21m | 4.05m |

2.3 Color and material applications

The multiplicity of colors bears the lightness and weight of emotions. The color in nature is both objective and subjective. Different colors bring different feelings to people and produce different emotional associations[4]. At the entrance of the Liuzi Temple, large white walls and dark doorways form a sharp contrast. The height of the white wall, the height of the stage roof, and the distance between the partial door and the main entrance are proportional to each other. This makes the matching of white, black and gray colors more harmonious, avoiding the monotony of large white walls. The interior pillars, doors and windows, trusses and other parts are made of vermilion wood, which makes people feel warm and emotional, and resonates with emotions. The interweaving of multiple green courtyards not only enriches the building space, but also plays a transitional role in the process of emotional change (Table 3).

Because of the convenience of wood, adaptability and many other advantages, it has a pivotal position in the history of Chinese architectural development. Therefore, the main components and interior decoration of the Liuzi Temple are made of wood as the main material, with distinctive Chinese traditional historical architectural features (Table 4).

| Table 3. Color sentiment analysis of Liuzi Temple |
|-----------------------------------------------|
| **Color classification** | **Colors in Liuzi temple** | **The proportion (%)** | **Emotional expression** |
| Cold colors | white | 35%-40% | elegant and holy |
| | blue-gray | 30%-35% | solemn, mournful |
| | black | 3%-5% | solemn, serious |
| Warm colors | red | 25%-30% | warm and friendly |
| | multicolor | 2%-4% | memorial |
| | green | 35%-40% | nature, kindness, comfort |

| Table 4. material analysis of Liuzi Temple |
|------------------------------------------|
| **Material type** | **Construction site used** | **The proportion (%)** | **Corresponding color** |
| Timber | pillar, algae, roof truss | 40%-45% | red |
| Stone | door, inscription, stone carving, step | 10%-20% | black, gray |
| Tile | roof | 30%-35% | blue-gray |
| Lime | wall | 35%-40% | white |
3. Spatial analysis of Liuzi Temple

3.1 Courtyard space

The courtyard space not only combines the individual buildings into a whole in terms of traffic organization and function, but also retains the different use functions of each building monomer, so that it is not scattered and disorderly. By arranging the measurement data of the courtyard, the height of the stage is $\pm 0.000$, and the data is shown in Table 5, so as to analyze the distribution of the courtyard of the Liuzi Temple. At the same time, the height difference of the terrain is solved by the form of the courtyard. The individual units of the building are raised to a certain height in turn, connected by steps and corridors, and adapted to local conditions, using reasonable construction forms, which not only saves construction costs, but also forms layers on the facade. The high-level visual effect is superb, solemn, magnificent and revered. In the center of the main hall, the statue of Liu Zongyuan is placed in the center of the main hall. It is a portrait of the famous sculptor Mr. Li Lannian. Standing in the front hall and looking north, the line of sight ends with a statue. Because of the height difference, it appears wide and wide, highlighting the tall sacredness of the statue, creating the continuity of space (Figure 4).

Table 5. Courtyard measurement data

| Courtyard location | Aspect ratio | Area($m^2$) | Land occupation (%) | Elevation difference(m) |
|--------------------|--------------|-------------|---------------------|-------------------------|
| Forecourt          | 21:8         | 655.70 $m^2$ | 30.41%              | 1.20m                   |
| West courtyard     | 17:5         | 90.18 $m^2$  | 4.28%               | 2.72m                   |
| East courtyard     | 16.5         | 86.94 $m^2$  | 4.03%               | 4.21m                   |
| backyard           | 14:17        | 232.65 $m^2$ | 10.79%              | 4.05m                   |

Figure 4. Vertical space analysis

Through the measurement of data and access to historical data, the overall space of the Liuzi Temple and its emotional expression were analyzed. In the organization of the building group, the Liuzi Temple has created a constantly changing spatial level from the concept of “starting, supporting, turning and combining”. And each space corresponds to Liu Zongyuan's psychological state in different periods, and emotional factors are injected into the spatial streamline (Figure 5). With the changes of people's emotions and the development of science and technology society, the commemorative space should also adapt to the times and change, but the constant is the appeal of the participants' emotions[5].
3.2 Light analysis

Building to follow the light, like space to pursue the soul. Light has been inherited and enriched architectural elements in architectural design, is the way the architects to create emotional atmosphere[6]. The light changes in the Liuzi Temple create different emotional atmospheres, allowing people to feel Liu Zongyuan's life experience more clearly (Figure 6). People move from a bright environment to a dim environment, and psychologically turn from excitement to heavy. The semi-bright pavilion space in the middle acts as an emotional buffer to guide the arrival of the next emotional climax. The final bright courtyard space, releasing the feelings of history also hints at the good expectations of the future.

4. Conclusion

Historic buildings are usually characterized by a particular microclimate due to their high thermal inertia that may require the use of mechanical systems to control the environment [6]. Therefore, in the protection and utilization of such heritage buildings, some modern techniques are often used to maintain the integrity of the building as much as possible. First of all, the mapping of ancient buildings is the primary task of protection [7]. Secondly, through the statistical compilation of the field data, a large number of intuitive and clear charts are drawn to explore the inner spirit and historical culture of the cultural relics building. Finally, the cultural connotation and unique emotion of the cultural relic building are combined to protect and utilize it in modernization.

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