

Font Layout Design Experiment Based on the Context of Wooden Elements in Shanxi Ancient Architecture

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Abstract. As one of the representative section of Shanxi ancient architecture, the wooden elements of Shanxi ancient architecture are the figurative carriers of humanistic spirit and historical civilisation. It has typical regional characteristics, and its remains are complete and diverse, with a more integral chronological span. Using font layout design as a method of visual transformation to carry out research and analysis based on the wooden elements of ancient architecture in Shanxi, the presentation of the theme is more vivid and novel, with a clear venation. In order to explore the font layout design based on the context of the wooden elements of ancient architecture in Shanxi, the wooden elements has been taken as the research object, the composition and characteristics of these wooden elements are analysed through the inductive method, the literature review method, and the case study method. Then the intrinsic grid system is extracted and condensed. These grid systems are used as the basis, and font layout design is used as the entry point to explore the applicability of font layout design in the context of wooden elements of ancient architecture in Shanxi based on the characteristics of wooden elements.

Keywords: Font Layout Design; Wooden Elements in Shanxi Ancient Architecture ; Grid System; Design Context.

1. Introduction

1.1 Shanxi ancient architecture development history and research value

Ancient buildings are attached to the soul of history, and they are the chronicle of local objects, the annals of history and the carriers of culture. Ancient architecture has distinctive regional and historical lineage characteristics, has a very high aesthetic value. In the process of historical development, Shanxi ancient architecture has been one of the main carriers of China's ancient architectural heritage development. There are as many as 531 national key cultural relics protection units in Shanxi Province, ranking first in the country. Shanxi's ancient architectural heritage is complete and diverse, typical and unique, covering various dynasties from the Han Dynasty to the Ming and Qing Dynasties. These different fonts of ancient buildings reflect the artistic characteristics of different historical periods and have considerable research value. In addition, compared to other regions in China, the architectural patterns and relics in Shanxi region are clear and can be dated. It shows the complete presentation of art from various dynasties, while retaining precious physical art treasures from various periods that are rare or disappear elsewhere. The images and content of its ancient architectural patterns have research and design value.

Ancient Chinese architecture, with its unique style, is at the forefront of the Oriental architectural forest and has become the centre of the Oriental architectural culture circle. Shanxi is the "treasure house of ancient architectural art" in this centre. Shanxi Province, because of the number of ancient buildings, high quality, full font, original preservation, known as "China's ancient architecture museum". Among them, the most significant is the wooden ancient architecture. Among the existing wooden ancient buildings in Shanxi, the parts before the Liao, Song and Jin Dynasties account for as much as 75 per cent of the total number of existing wooden buildings of the same period in the country. Ancient architecture is one of the important expressions of traditional Chinese aesthetics, its colour, shape, internal and external structure, decorative patterns and motifs are the essence of traditional aesthetics. The wooden elements of ancient buildings contain rich cultural connotations, including architectural style, structure, carvings and so on, which can reflect the changes and

evolution of local history, culture, economy and society. It has important cultural heritage value. There are various visual forms of wooden elements in ancient buildings in Shanxi, such as window lattice partitions and wooden carvings. It can produce a wide range of reference research value and practical application value for Chinese font layout design in terms of traditional patterns, structures and colour schemes.

1.2 History of Wooden Architecture in Shanxi

1.2.1 Widely distributed quantities and types of ancient wooden buildings in Shanxi.

Due to the long and narrow topography of Shanxi Province and a long history of cultural development, Shanxi wooden ancient architecture has the following distribution. So far, Shanxi has preserved a total of 518 wooden buildings before the Yuan Dynasty, including 30 in the northern region, 89 in the central region, 274 in the south-eastern region and 125 in the southern region. In the historical development and multi-ethnic cultural mingling, Shanxi ancient architecture regional cultural characteristics gradually obvious, the formation of the Yanmen's Buddhist architecture (Xinzhou, Datong, Shuozhou), the Bingzhou's multi-taught architecture (Taiyuan, Lvliang, Jinzhong, Yangquan), the Shangdang's goddesses architecture (Changzhi, Jincheng), the Hedong's ancestor worship architecture (Linfen, Yuncheng), and other prominent religious buildings. Among these ancient buildings, wooden structures are particularly unique.[1] The regional distribution of wooden structures in Shanxi from Tang to Yuan dynasties and their proportion in the whole country are shown in Table 1.

Table 1. Comparison table for grid extraction of partition fan (Self-drawn by the author)

Dynasty	North	Central	Southeast	South	Total	Nationwide	Percentage of the country
Tang	2	-	-	1	3	3	100.00%
Five Dynasties	-	1	3	-	4	5	80.00%
Song	1	7	24	2	34	47	72.34%
Liao	3	-	-	-	3	8	37.50%
Jin	18	19	76	7	120	138	86.95%
Yuan	6	62	171	115	354	427	82.90%
Total	30	89	274	125	518	628	82.48%

1.2.2 Long history and four periods of ancient wooden architecture in Shanxi .

Shanxi is the only province in the country that has a concentration of ancient wooden structures from the Tang Dynasty to all dynasties between the Qing Dynasty, and even all periods of the Republic of China, that is, the only area where the remains of ancient structures have not been interrupted in the past 1300 years. There are 24 buildings from the Song and Liao Dynasties, dating back to the second year of Song Chongning (1103), the year of the publication of the "Construction Method Style". In different times, these remains have undergone different restorations, leaving behind different historical information and forming different layers of architectural culture.

The development of ancient wooden buildings in Shanxi from Tang Dynasty to Yuan Dynasty is divided into four periods, that is, the mature period of Tang Dynasty, with Wutaishan Foguang Temple and so on as typical; the transition period of the Five Dynasties, with Pingyao Zhengguo Temple and so on as typical; the period of perfection and development of Song Dynasty and Liao Dynasty, with Taiyuan Jinci Shengmu Temple and Datong Huayan Temple and so on as typical; the period of inheritance and diversification and exploration in Jin and Yuan Dynasties, which is typified by Shuozhou Chongfu Temple and Taiyuan Dou Daifu Ancestral Hall.[2]

2. Wooden building types and their connection to the grid

2.1 Classification of Wooden Elements in Ancient Architecture

The structural modelling of ancient buildings is realised through the form of the building itself and the various important parts that make up the form of the building, such as the roof, beams,

doors, windows, walls, floors and other components.[3] Combined with field research and literature analysis, this project classifies the elements of wooden architecture in Shanxi, and finally selects four categories for research: partition fans, Sunk panel, roofs, and arches.

2.1.1 Partition fan

Partition fan is a kind of ancient Chinese door, developed from Song-style lattice door, used to separate indoor and outdoor space or indoor space, belonging to the long window in the window style of ancient architecture in Shanxi. Different partition fans have various patterns and structures, reflecting high artistic value. By changing the pattern made of wood lattice arrangement and combination, ancient craftsmen express their feelings or prayers. They play itself in the applicable and functional value, at the same time, also enriched the wall changes, enhance the beauty of ancient architecture and art. Partition fan of Shuozhou Chongfu temple Maitreya hall is a typical representative of Shanxi ancient architecture partition fan.[4] In the book "Shuozhou Chongfu Temple", Mr Chai Zejun has a very high evaluation of the partition fan of Chongfu Temple: "The surviving Jin Dynasty partition fan of the Maitreya hall fills in the blank of the physical partitions of China's Song and Jin Dynasties, and enriches the history of China's ancient architecture with regard to the renovation aspect. Its magnificent pattern, exquisite craftsmanship, can be called a unique case at both home and abroad." According to the description in the book, there are as many as 15 kinds of latticework patterns on the partition fans of the Maitreya Hall of Chongfu Temple in Shuozhou.[5]

2.1.2 Sunk panel

Similar to the partition fan, the sunk panel is also a small woodwork structure of ancient architecture. Sunk panel is vaulted ceilings in buildings, and each square of such ceilings is a well decorated with patterns, carvings, and colourful paintings. Sunk panel often attract the public's attention because of their complex and sophisticated construction, with square, round, polygonal and other forms. Sunk panels in ancient buildings in Shanxi have more distinctive features compared with those in other parts of China: not fancy, not pretentious, rough but fine, simple but generous, it is both decorative and functional, simple and complex. Famous ancient architect Mr Liang Sicheng said during his visit to Yingxian that Yingxian has three treasures, Tiangong Pavilion Sunk panels of the Yingxian Jingtou Temple is one of them. It is well-conceived, exquisite and meticulous, is a national treasure.[6]

2.1.3 Roof

The roofs of ancient Chinese buildings play a particularly important role in the facade. The far-reaching eaves, elastic eaves curve, slightly curved roof formed by the frame, slightly curved roof corners, and the changes of many roof forms such as hard hill, overhanging hill, hiatus, hipped, cross ridge, heavy eaves, etc., together with brilliant glazed tiles, make the buildings produce unique and strong visual effects and artistic infections. Through various combinations of roofs, the building's body shape and contour lines become richer and richer. When viewed from above, the roof has a better effect, which means that the "fifth facade" of Chinese architecture is the most charming. In this project, the roofs of ancient wooden buildings in Shanxi are selected as part of the research and design objects under the perspective of overhead view. (Figure 1)

2.1.4 Bucket Arch

Bucket arch is a unique structure to Chinese architecture. At the top of the columns, frontal square and eave purlin or between the frame, from the square on the addition of a layer poking out into the bow-shaped load-bearing structure called the arch, the arch and the arch between the pad of the square block of wood called the bucket, collectively referred to as the arch. Located in Xinzhou City, Shanxi Province, Wutai Mountain Foguang Temple is one of China's few remaining wooden structures of the Tang Dynasty, but also because of its arch, "the arch of the majestic, out of the eaves far and wide" and reputation. And is located in Shanxi Yingxian County of Yingxian Wooden Pagoda arch to "more" famous, the whole tower as many as 54 kinds, but the arch of the change is

not haphazard, but according to the stability of the structure and the eave scale to adjust the arch out of the number of jumps and changes in the shape, if the Yingxian Wooden Pagoda is a piece of music is a world of surprises, the arch of the arch is undoubtedly the most beautiful notes.(Figure 2)

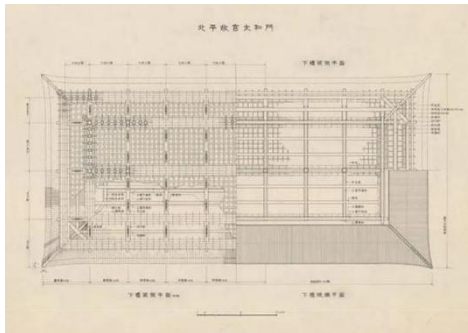


Fig. 1 Plan of the roof of the lower gable of the Taihe Gate of the Forbidden City, Beijing, China
(Figure from Liang Sicheng's manuscripts)

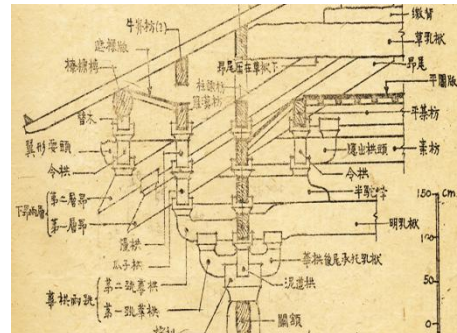


Fig. 2 Outer eaves of the main hall of the Buddha's Light Temple.
(Figure from Liang Sicheng's manuscripts)

2.2 Visual connection between wooden elements and grid system of ancient buildings in Shanxi Province

There is a certain visual connection between the wooden elements and the grid system of Shanxi ancient architecture. Shanxi ancient architecture is famous for its unique traditional architectural style, in which wood elements are one of its important components, while the grid system is a common construction method and a popular design tool for designers in layout design.[7] In ancient architecture in Shanxi, wood elements are often used in the structure and decoration of buildings. They include wooden components such as beams and pillars, doors and windows, mortise and tenon joints, and wooden decorations such as carvings and paintings. These wooden elements and decorations often present precise and regular geometric shapes and patterns, which have similarities with the forms of grid systems. The grid system is also widely used in the structural design of ancient buildings in Shanxi. The timber is arranged at a certain spacing and direction through the planning of the grid system to form a grid-like structure. This structure can provide stable support and the ability to distribute loads, and to a certain extent limit the deformation of the structure. At the same time, the grid system gives the building an aesthetic sense of order and symmetry.[8] The visual connection between the timber frame elements and the grid system is mainly reflected in the following aspects:

Geometric Shapes and Patterns: Wooden elements and grid systems in ancient buildings in Shanxi involve the design of geometric shapes and patterns. Wooden elements and decorations often adopt various geometrical shapes, such as square, circle, diamond, etc., which echo the geometrical patterns formed by the regular arrangement and intersection in the grid system.

Symmetry and balance. The ancient architecture of Shanxi focuses on the expression of symmetry and balance, and both the wooden elements and the grid system are able to achieve this effect through regular arrangement and repetition. Wooden elements and decorations are arranged symmetrically throughout the building, while the grid system creates a stable structure through equidistant and equidirectional spacing.

Sense of space and perspective: The use of timber elements and grid systems can give the building a sense of open space and perspective. The arrangement and geometry of the wooden elements and decorations guide the eye and create a sense of depth and hierarchy, while the lines and structure of the grid system create a perspective effect and give the building a three-dimensional feel.

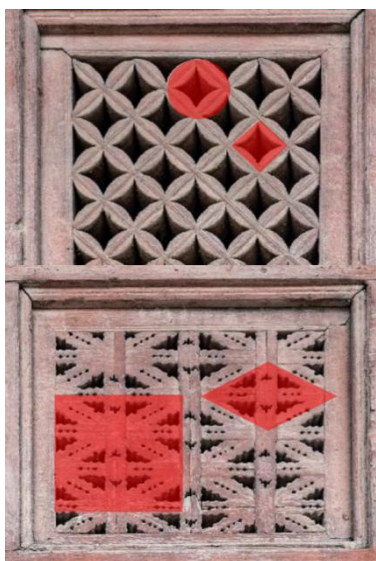


Fig. 3 Geometry - An example of a partition fan in Shuozhou Chongfu Temple (Figure from Baidu website)

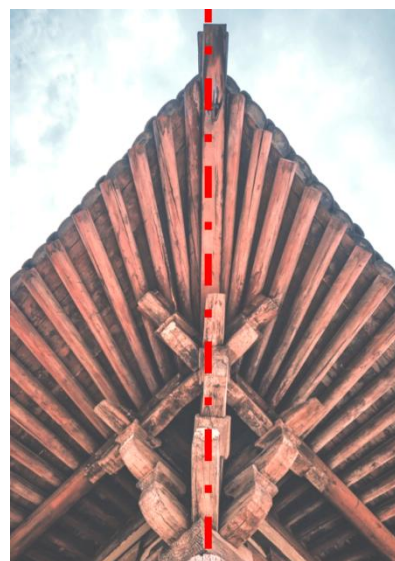


Fig. 4 Symmetry and Sense of Balance - An Example from the Arch of Nanchan Temple in Wutai Mountain (Figure from Baidu website)

In general, the wooden elements and grid system in ancient buildings in Shanxi present a unique and unified visual style through common visual features such as geometry, symmetry and sense of space. They echo each other, complement each other, and together create the unique artistic charm of ancient architecture. It should be noted that, although there is a visual and functional connection between wood elements and grid system in ancient buildings in Shanxi, not all ancient buildings in Shanxi adopt the grid system as the main structural form, and not all wood elements are directly related to the grid system, therefore, four fonts of wood elements, namely, partition fans, sunk panel, roofs, and arches, which are more obviously related to the grid system, are selected for the study and design of the present project. Although wood elements and grid system can present a certain visual connection in ancient buildings in Shanxi, the specific forms of expression and the degree of application will vary according to the characteristics of the building, the context of the era and the architect's design intention.

3. Research Principles and Values in the Context of Wooden Elements of Ancient Architecture in Shanxi

3.1 The significance of the value of the innovation grid for font layout design

Creative grids are of great value and significance in typographic layout design. Typographic layout design refers to the combination of text, images, and other elements to create a visually appealing and easy-to-read typographic layout. And a grid system is an organised structure used to divide and layout a page to ensure an orderly arrangement and visual balance of content. Innovative grids have many valuable implications for font layout design:

Structure and orderliness. The Creative Grid provides an organised structure that allows text, primary information, secondary information, paragraphs and other design elements to be distributed in an orderly manner on the page. By using a grid system, you can ensure that text is consistent and balanced across the page, reflecting a sense of order.

Layout Diversification. Grids can help designers determine the arrangement of text and line spacing to improve readability. Innovative grids can be used to change the structure of the text to affect the corresponding position and composition of the text, forming a new visual layout effect in terms of the length of the text, the direction of the paragraph, the alignment of the line spacing, as

well as the distribution of the information elements. This helps to enrich the reading experience of the viewer, bringing new visual effects and interesting feelings.

Creativity and Culture. The Innovation Grid provides a creative framework within which creative typographic layouts can be created. By making appropriate adjustments and variations to the grid, designers can achieve unique and personalised layout effects. The Innovation Grid can bring a novel visual style to text layout design, providing creativity and variations that are different from traditional typography. This project summarises and innovates the modern grid system from traditional elements, and then applies the modern grid system in the redesign of text layout of traditional themes, reflecting the unending and everlasting innovation of traditional culture.

3.2 Principles of font layout design based on the context of wooden elements of ancient architecture in Shanxi Province

The font layout design principles based on the wooden elements of Shanxi's ancient architecture can mainly start from the structural characteristics and decorative features, as well as the use of traditional wooden colours in several directions.[9,10] Through these design principles, we can create a unique font layout design style that corresponds to the ancient architecture of Shanxi, and show the cultural charm of the ancient architecture of Shanxi.

First of all, the structure of the wooden elements of ancient buildings in Shanxi usually presents the characteristics of distinctive layers and complex structure. In the font layout design, the grid is extracted for the layout design while introducing the sense of hierarchy and structure, and the hierarchical structure similar to the wooden structure is presented through the character shape and arrangement of the text. At the same time, different thickness and size of the strokes are used to form a sense of hierarchy, and the fonts and text arrangement are organised into a complex form of structure.

Secondly, the wooden elements of ancient buildings in Shanxi are often decorated in the form of patterns and decorations, and these decorative elements usually have unique patterns and textures. Correspondingly, in font selection, serif fonts with decorative properties are chosen as much as possible to enhance the visual appeal and artistic sense of the layout.

In addition, the wooden elements of ancient buildings in Shanxi often adopt traditional colours such as red, black and golden yellow. In the design, these colours or similar warm tones can be considered to give the fontface a stronger ancient architectural atmosphere that is closer to the original ancient architecture.

3.3 Grid construction based on the context of the wooden elements of ancient architecture in Shanxi Province

3.3.1 Framing and Feasibility of font layout design based on wooden architectural elements

When font layout design is carried out based on the context of wooden elements of ancient architecture in Shanxi, the design process can be sorted out first and the research process can be divided into five stages.

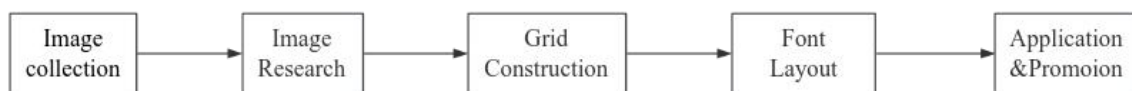


Fig. 5 Framing of font layout design based on wooden architectural elements
(Self-drawn by the author)

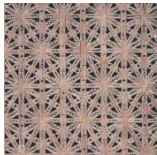
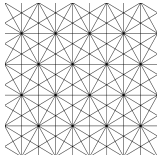

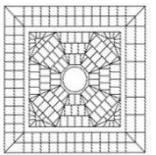

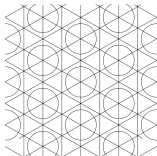

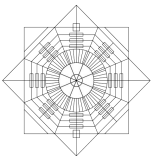

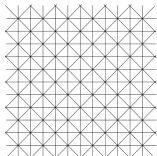

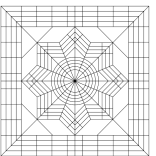

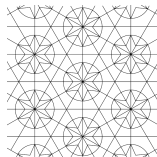

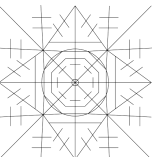
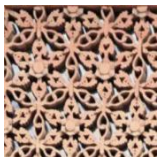
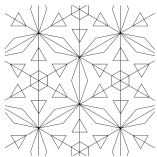

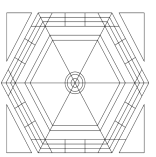
First, the image collection stage, through the field visits and surveys, online and offline image collection, related information reading and literature collation, to integrate the basic image material library. Second, the image research stage, screening, extraction, classification and generalisation of image materials, and according to the overall design planning of Shanxi ancient architectural wooden elements into four major categories: partition fans, sunk panel, roofs and arches. According

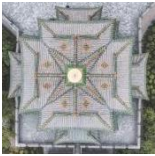
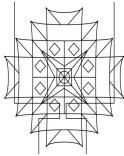

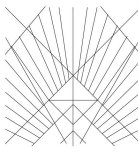

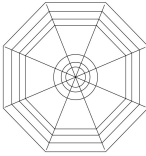

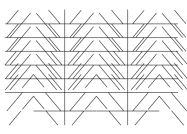

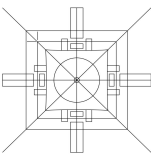

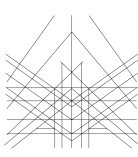

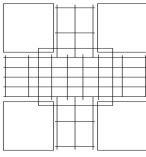



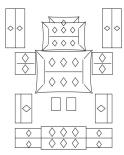

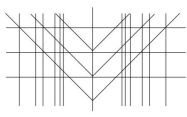
to the representation and other criteria for selection, into the final design material library as the basic image material. Thirdly, the grid system is built. After the skeletal framework of the basic image is generalised and extracted, it is made into a grid system to provide a grid framework for the next step of font layout design. Fourth, the text layout, purposefully find the relevant text, such as the ancient architecture wood elements related to the description and evaluation of the text, as the main body of the filler text. And then font selection, such as according to the ancient architecture in the age of the choice of fonts. After that, according to the characteristics of the wooden elements of the ancient architecture itself to determine the font weight and font size, such as reference to the partition fan in the wood has a thick and thin this characteristic. Finally, after the initial graphics are produced, comprehensive expression methods are used to present a complete series of design works, and their elements are used for derivative applications and promotion.

3.3.2 Grid Construction Based on Wooden Elements of Shanxi Ancient Architecture

There is a certain visual connection between the wooden elements of ancient architecture in Shanxi and the grid system. After preliminary screening and organisation of the images collected from the research, the author filtered and summarised them into four categories: partition fans, sunk panel, roofs and arches. With the help of this similarity, the author firstly extracts the framework of the wooden elements of ancient architecture, and then generates the grid system, and builds twenty pairs of grids as shown in Table 2, which provides the grid framework for the next step of the font layout design.[11,12]

Table 2. Comparison table for grid extraction (Self-drawn by the author)

Type	Original Image	Grid	Type	Original Image	Grid
Partition Fan			Sunk Panel		
					
					
					
					

Type	Original Image	Grid	Type	Original Image	Grid
Roof			Bucket Arch		
					
					
					
					

4. font layout design theory combined with the above innovative grid

4.1 Practical Examples of font layout design based on creative grids.

In order to present the feasibility of the grid system more intuitively, and the effect of its use in font layout design, the author selected four sets of grids in the partition fan category for design practice, mainly from the font, word weight, text arrangement and other aspects for consideration. The final output is as follows.(Figure 6)



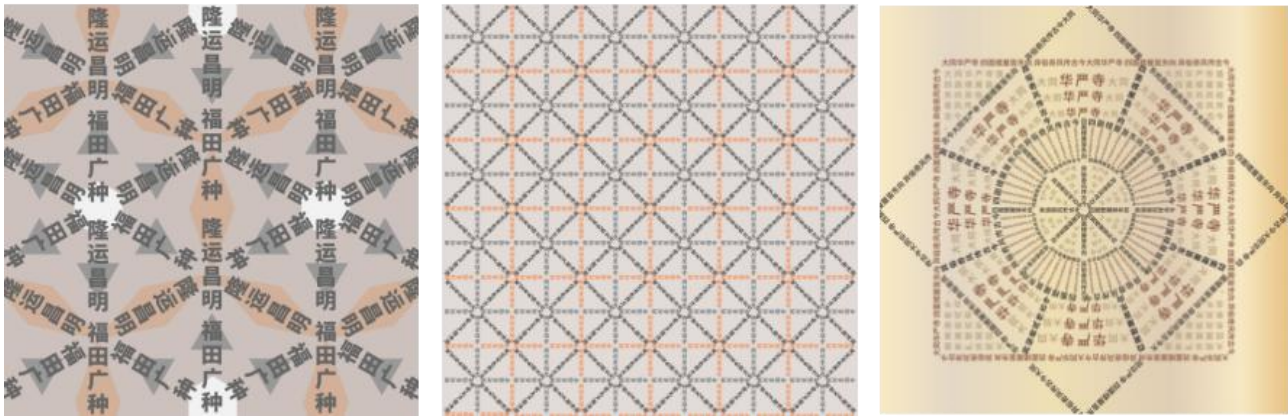


Fig. 6 Typographic layout design practice - examples of a partition fan section
(Self-drawn by the author)






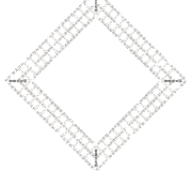
In terms of font selection, in order to reflect the simple texture, delicate structure and heavy historical sense of the wooden elements of the ancient architecture, the author chose the representative font of the dynasty in which the ancient architecture is located, as well as giving priority to the use of serif Chinese characters, in order to strengthen the visual connection with the wooden elements of the ancient architecture and to enhance the visual attractiveness and artistic sense of the layout. In the choice of character weight, the author has subjectivised the font thickness according to the own characteristics of the wooden elements of the original ancient buildings, such as the thickness of each of the wood materials and the relationship between the front and back interspersed superposition. In terms of text arrangement, the author tries to make the combination of content and form closer when complying with the innovative grid specification, such as arranging the text according to the grid division so that it shows the effect of "palindrome", which brings newer and more novel visual and reading experience.

4.2 Using an integrated approach to highlight the connection between typographic works and the wooden elements of ancient architecture.

With the development of digitisation, more and more new technologies are being applied to the popularisation, presentation and dissemination of cultural heritage. Augmented Reality (AR) is a technology that superimposes the information generated by smart terminals (graphics, sound and sometimes touch feedback) on the real environment to provide users with an experience beyond reality. With the help of AR technology, the author converted the flat two-dimensional image into a three-dimensional demonstration of the augmented reality picture.

The wooden elements of ancient architecture in Shanxi have their own unique structure, the geometric pattern of partition fans, the pattern of sunk panel, the shape of the roof, etc. are not composed of flat lines but three-dimensional, complex wooden structures with depth. Therefore, AR can clearly reproduce the structural characteristics of the wooden elements, assist in interpreting the design work, make it more vivid, and bring the viewer a comprehensive feeling beyond the plane. In the specific production link, I layered the font layout design pattern in accordance with the structural characteristics of the original ancient architectural wooden elements (e.g. Table 6), simulated the original structure as much as possible, and then made it into an augmented reality demonstration device through the Internet AR production platform.

Table 3. AR layered diagram - an example of the sunk panel of the Shrine of Dou Daifu
(Self-drawn by the author)

Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
					

5. Summary

Shanxi ancient architecture wood elements are rich in content, diverse remains, the age span is more complete, structural subtlety, is the crystallisation of the wisdom of ancient craftsmen, whether in the domestic arena or the world arena, Shanxi ancient architecture are very research significance. The wooden elements of ancient architecture in Shanxi have not attracted enough attention and curiosity from the audience due to the large number of bases, numerous fonts and wide distribution range. This project promotes the dissemination of ancient architecture in Shanxi by using the professional means of visual communication design through the experimental way of innovative font layout design. Based on the research method of font layout design, the research method of classifying and summarising the wooden elements of ancient architecture in Shanxi and the practical exploration of grid construction seeks to convey the infinite aesthetics and heavy culture of the wooden elements of ancient architecture in Shanxi to the viewers in visual language, and at the same time, explores the traditional culture of the new fontface layout design in the context of the new context of traditional culture and the new fontface layout design in the context of the new fontface layout design. At the same time, it also explores the new expression of font layout design under the context of traditional culture.

From the perspective of fontface layout design, we conduct a theoretical and practical innovative research on the wooden elements of ancient architecture in Shanxi, exploring the innovative methods and practical feasibility of fontface layout design through the analysis of the current research situation, the in-depth compilation and excavation of the contents of the wooden elements of ancient architecture in Shanxi, as well as the grasping of the characteristics and advantages of fontface layout design. According to the established design ideas and processes, we sift through the huge image database, establish a usable basic gallery, classify and summarise the four major categories of wooden elements of ancient architecture in Shanxi, namely partition fans, sunk panel, roofs and arches, and set up a new grid system to complete the visual conversion, so as to promote the academic research of fontface layout design in the field of ancient architecture.

To this day, there are still many ancient buildings in Shanxi that have not been discovered and registered, and there are also many that are gradually being discovered and valued, scholars, architectural culture enthusiasts have never stopped exploring its footsteps, the information on the wooden elements of ancient buildings in Shanxi needs to be constantly explored and updated. At the same time, from the ancient architecture to the font layout design, is an interdisciplinary research, need to involve a large number of interdisciplinary knowledge and learning, the author for some of the professional interdisciplinary content of the research is relatively shallow, in the collection of information, classification and summary of the depth and breadth involved in there is still a big lack of practical part of the larger space for exploration. It is hoped that this valuable design practice will provide samples and ideas for other professional practices in the future, and that the author will strive for excellence and explore more possibilities.

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