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Structural study of character isomorphism in Chinese character graphics

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Abstract. Character isomorphism is a prevalent form in Chinese character graphics design. Compared to other techniques, the arrangement of internal components plays a more prominent role in conveying meaning, making structural factors pivotal to design success. The aim was to explore the formal mechanisms of isomorphic character design in Chinese graphics and explain how positional layout based on the characteristics of Chinese characters can enrich visual expression. An interdisciplinary approach was used, integrating the morphology of Chinese characters, Gestalt psychology, and semiotic theory. Representative examples were systematically studied through literature review and formal analysis. Findings indicated that character form, arrangement sequence, and metaphor constitute the three primary dimensions influencing structural composition. Character form compatibility forms the foundation of isomorphy, determining the feasibility of component combinations; arrangement sequence directly impacts information reception accuracy via linear and non-linear spatial relationships, while metaphorical mechanisms effectively convey cultural connotations and abstract concepts through the projection of visual imagery. Based on the analysis of these three dimensions, recommendations and methodology for enhancing the graphic expressive efficacy and cultural recognisability of Chinese characters were summarised. These findings not only provide creative strategies and formal guidelines for Chinese character graphics design but also chart viable pathways for visual communication across cultural contexts, thereby facilitating the efficient transmission of thematic information

Keywords: formal mechanism; arrange order; metaphor; visual cognition; cultural connotation

INTRODUCTION

Character isomorphism in Chinese character graphics links multiple character elements through structural reorganisation to express unified thematic meaning. Common in logos, posters, and publications, it combines form and meaning, reflecting the unique morphology and ideology of Chinese characters. Each component relates to the whole, and changes in form, position, or proportion alter semantics. Exploring structural laws is essential for creation, offering designers creative guidance and helping audiences interpret Chinese character graphics in cross-cultural contexts. In ancient China, character isomorphism was primarily used in the design of traditional auspicious patterns, adorning the living environment. B.B. Song & J. Zhou (2024) pointed out that the essence of national design concepts and techniques is embedded in these works, which have a

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profound influence on contemporary design. On the other hand, M. Yang & C. Gao (2024) contended that as China's cultural exchanges with the world intensify, numerous outstanding Chinese character graphics have gained prominence on the international stage, demonstrating a clear tendency towards an internationalised graphic language. This showed that the form of character isomorphism began with the inheritance of tradition, while it was developed and improved in the multicultural mingling.

In terms of practical creation, F.Y. Liu (2023a) mentioned that the design key point of character isomorphism is the structural disassembly and reorganisation of each character, based on its own morphology. This requires designers to conduct in-depth research during the preliminary design phase into the origins of Chinese characters, the structural patterns of individual characters, the rules governing compound character formation, and the habits of the people in using Chinese characters. According to A.P. Zhang (2020), the inherent nature of Chinese characters dictates that each component invariably carries semantic information. Research in character study provides a robust theoretical foundation for structural decomposition and recombination, ensuring characters retain legibility amidst formal transformations. Z.Y. Jiang & S. Dong (2024) further elaborated: structural frameworks must share similarities and intrinsic semantic relevance between characters, thereby enabling their potential connection. Within the framework of design objectives, the selection of Chinese character elements is often strictly constrained, while the character form exerts a decisive influence on the application of isomorphy strategies. Both represented immutable factors, thereby highlighting the pivotal role of flexible typesetting techniques in design. J.R. Pan (2022) noted that traditional Chinese character graphics design lacks the fixed structural constraints of grid systems. Under its influence, contemporary design seldom employs geometric analysis or proportional calculations, instead adapting dynamically to varying conditions and requirements to devise suitable organisational solutions.

S.G. Cui (2022) categorised several fundamental types of character isomorphism based on the differing points of structural connection between their components, including character composition, shared strokes, and figure-ground relationships. These techniques possess distinct stylistic characteristics, capable of being employed independently or combined to generate novel forms. J. Zhu & C.T. Wang (2021) summarised multi-character structural design into two dimensions: firstly, the orderly arrangement of characters; secondly, the proportion, shape, and angular treatment of internal components within characters. These elements maintain an interdependent relationship within the overall composition. Originating from distinct independent entities, their connection necessitates meticulous adjustment to achieve a high degree of harmony at the junctures. In ancient China, characters were arranged vertically in everyday writing. H.P. Li (2024) analysed the advantages of vertical arrangement in ancient Chinese writing from the perspective of character morphology, arguing that this orientation reduces structural confusion in visual recognition. He extended the consideration of factors influencing arrangement from traditional writing media to functional levels, offering insights that broaden the scope of research into Chinese character graphics. Moreover, aesthetic creation remains a crucial consideration. Despite the diverse organisational forms of Chinese character structures, they all adhere to principles of balanced symmetry and stable order (Liu, 2023b).

Judging by the outcomes, prior research has predominantly focused on formal classification and design processes, tending towards macro-level summarisation. In contrast, studies exploring common characteristics under variable factors based on the form and meaning of Chinese characters, and thereby deducing structural strategies, remain relatively scarce. To address this, the present study was grounded in analysing the mechanisms of structural composition. It aimed to elucidate how effective decisions should be made during the conceptual phase, whilst explaining the rationale behind such decisions.

MATERIALS AND METHODS

The study used visual analysis to examine the isomorphism of symbols in Chinese hieroglyphic graphics, focusing on compositional techniques, structural features, and functional aspects of signs in various design categories. The analysis covered traditional forms, including paper cutouts, as well as contemporary examples of logos and posters, which made it possible to assess the expressive potential of symbol isomorphism in cultural and communicative contexts. In terms of research methodology, this study adopted an interdisciplinary and comprehensive analysis strategy, organically combining Chinese character morphology (Wang, 2015; Feng & Zhan, 2017), Gestalt psychology (Arnheim, 1974; Gombrich, 2015; Jiang & Dong, 2024), and semiotics theories (Barthes, 2008; Van Mulken *et al*., 2010; de Saussure, 2011) to form a three-dimensional and in-depth analysis system. In addition, contemporary approaches to visual semiotics (Bolognesi, 2017; Guo, 2018) have been taken into account.

In the preliminary stages of this research, a systematic review of prior scholarly work was conducted through literature analysis, establishing a robust academic foundation for subsequent investigations. Subsequently, various common formal types were presented in tabular form, illustrating the structural connections between textual components within works and their consequent semantic functions. Building upon this, formal analysis is then employed to conduct an

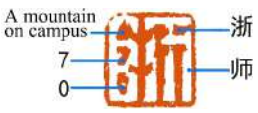
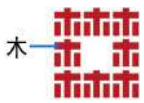
in-depth deconstruction of representative cases, focusing on the three key dimensions: character construction, arrangement order, and metaphorical expression. Among these, the morphological characteristics of textual components, their combinatorial logic, and their ideological functions are dissected, with selected exemplars undergoing experimental deconstruction and reconstruction. The authors focused on examining the spatial relationships, scale, and visual hierarchy of components, comparing the similarities and differences between the original work and the reconstructed work from both visual presentation and expressive effect perspectives. This process not only reveals the dynamic generation mechanism of character isomorphism in visual communication but also verifies the effectiveness of the design strategy, which helps to effectively interpret the designer's design intention. In this research, Chinese character morphology established the foundational principles of form composition for graphic design. Gestalt psychology focused on revealing the constitutive relationship between the whole and its parts, alongside its guiding role in visual cognition. Semiotic theory, meanwhile, emphasised elucidating the formation mechanisms of visual metaphors within structural relationships, and their expressive function in conveying cultural connotations and abstract concepts.

RESULTS AND DISCUSSION

Visual structures in Chinese character design. As highly abstract and simplified visual symbols, characters are the basic building blocks of Chinese character graphics. In the form of character combinations, their meaning mainly relies on the synthetic effect of characters in their organisational relationships, rather than on borrowed figurative patterns. In character isomorphism, structure is the carrier of text components, and the so-called internal relationships are also formed within the structure. Even in pictorial works composed of characters, the images and their meanings are the result of structural presentation. There is no denying that structure is one of the core decisive factors in the synthesis and transformation of meaning.

In Chinese character graphics based on character isomorphism, most text components often exist in structural inclusion or connection relationships. Inclusion can be partial, one side including the other, or even mutual interweaving. Connections can form when the strokes of different characters are connected, or when multiple characters are combined to form a complete pattern. Even components that lack direct stroke connections may, through deliberate organisation of adjacent areas, be integrated into a visually coherent structure. These methods of combining characters are very common in actual design (Table 1).

Table 1. Common forms and examples of character isomorphism in Chinese character graphics

Structural form	Work	Structural decomposition diagram	Design explanation
Non-inclusive relation			The protruding point above "大" is embedded in the depression below "北".
Figure-ground relation, inclusion relation			The figure is "浙", the ground is "师", and "70" is embedded within "浙".
Inclusion relation			"吉" is inside "圖", Forming "吉图", the abbreviation for Jilin Provincial Library.
Repetition of characters			Eight "木(wood)" form a square, resembling a building and suggesting interior design.
Sharing and interweaving of components			Using sharing radicals and interweaving strokes to show "拥抱 (embracing)".
Picture composed of characters			The teapot's shape resembles "喜气满堂," which means auspiciousness fills the hall.

Source: based on Xinwenhua Daily (2009), Peking University (n.d.), Zhejiang Normal University (n.d.), Interior Design (n.d.), WeChat (2020), Huaban (2024)

However, to create a successful piece of work, simply understanding the types of techniques is insufficient. The design content related to structure involves various visual elements and their attributes of the components. Furthermore, the relationships between components, as well as the relationship between components and the whole, are all aspects requiring consideration. Based on the ideographic objective, design strategies are typically developed and implemented around three core dimensions: character form, arrangement order, and metaphor. In practical projects, the key indicators for evaluating the feasibility and effectiveness of formal applications also lie within these dimensions.

Character shape as a determining factor. The meaning of a symbol is not determined exclusively by the linear combination of symbols, but also depends on the category to which the symbol belongs; choosing the corresponding components is important (Corro, 2018). In character isomorphisms, characters are arranged according to grammar in a linear relationship on the Syntagmatic Axis. The choice of specific character components depends on the category relationship on the Paradigmatic Axis. In a paradigmatic relationship, there may be more than one character option that meets the meaning requirement. However, not all of them have the prerequisites for shape combination in the overall system. This means that the suitability of Chinese character components in the structure depends not only on their semantic relevance, but also on the shape relationship between the components. Since characters are the main structural elements in character isomorphism works, in many cases, there are no other forms of graphics that intersect with them, and the character shapes are fully displayed. Therefore, the influence of character shape factors on the structure is particularly prominent.

R. Arnheim (1974) mentioned that the so-called shape has two distinct visual properties: one is the artistically created boundary; the other is the structural skeleton created in visual perception. The two often do not coincide. Following this line of thinking, the shape of Chinese characters is also manifested by their overall contours and the layout framework. The contours of the characters are the external manifestation of the layout framework, indicating the internal structure by outlining the edges. The layout framework is the internal support of the contours and provides them with rationality and order. The outline of a single stroke is the smallest constituent unit of the overall outline of a character. In character construction, there are eight basic strokes in Chinese characters, including horizontal (一), vertical (丨), left-down stroke (丿), right-down stroke (㇏), dot (丶), up-stroke (㇀), hook (亅, etc.), and bend (乛, etc.). These basic strokes can be expanded in type through composite construction and deformation, forming higher-level character components – radicals (Fig. 1). Although writing implements and typefaces may influence stroke contours, provided the path of the stroke lines remains unchanged, the fundamental characteristics of the contours remain constant and contribute to visual recognition.

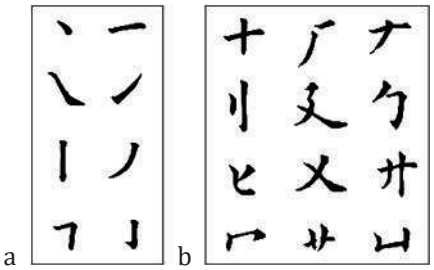


Figure 1. Components of Chinese characters
Note: a – 8 basic strokes; b – some common radicals'
Source: drawn by the authors

Furthermore, from the perspective of the structural framework, Chinese characters, as a typical type of square script, essentially divide the rectangular space. These layout variations are extremely rich. Based on the Unicode Consortium (n.d.) character set international standard, N. Wang (2015) summarised seventeen common frameworks, including single-body structure, left-right structure, upper-lower structure, and surrounding structure (Fig. 2). Z.W. Feng & H.W. Zhan (2017) further subdivided these into eighty different types. In horizontal comparisons between components, the complexity of character contours and spatial layout does indeed present significant challenges. However, in terms of plasticity of form, this characteristic does provide more possibilities for rich combinations in design.

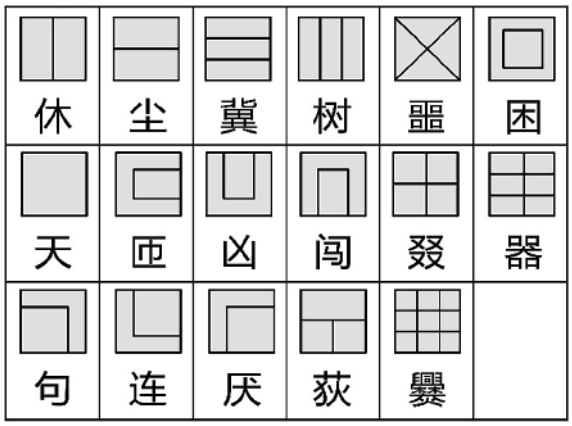


Figure 2. 17 basic frame patterns of Chinese characters and examples of their forms
Source: N. Wang (2015)

In design, attention to character forms is actually integrated throughout the entire process, from formal decisions to specific operations. At the beginning of a project, considerations of character isomorphism are often based on the physical similarity of character components. That is, in an aggregation relationship, Chinese

character components with semantic connections must have identity or similarity in terms of stroke contours or frame structures. This identity or similarity can be between character components or between components and the whole. For example, the poster "韩朝统一 (Korean Reunification)" (Fig. 3) combines the characters "韩 (Korea)" and "朝 (North Korea)", which face opposite directions, to represent the political status of the two countries. Both characters belong to the left-right structure and share the same radical "卓 ". Coincidentally, "卓 " has a symmetrical shape both horizontally and vertically, creating conditions for the rotation and combination of the characters. This coincidence is irreproducible and is one of the reasons why this work has become a classic. In addition, different combinations of Chinese characters have different shape conditions. In some cases, the same or similar conditions that rely on isomorphism can undergo formal transformations, manifesting as echoing relationships such as complexity and simplicity, concavity and convexity, and presence and absence. In any case, the formulation of character isomorphism schemes must be based on character shape compatibility.

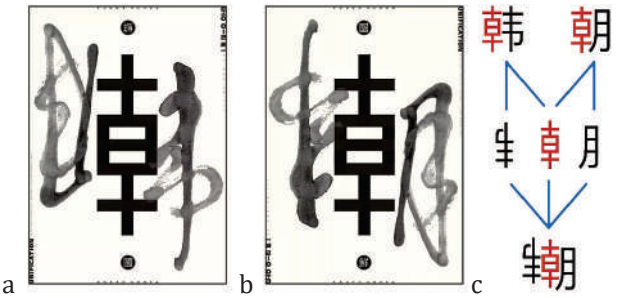


Figure 3. Poster "Korean Reunification", author Kan Tai-keung, 1997
Note: a, b – poster rotated 180 degrees; c – separation and combination of "韩" and "朝"
Source: Most Design (2019)

The subsequent deep processing involves establishing a composite framework and adjusting the details of the contours. To achieve a fusion effect, designers will perform various decompositions and reconstructions within the character isomorphism, causing the character shapes to deviate to a greater or lesser extent. If the shape of the characters cannot be effectively recognised, it is difficult to construct meaning. It can be seen that character shapes are not only the basis of character isomorphism, but also a key factor influencing formal effectiveness. At this point, what designers need to do is to combine the characters and then highlight them through necessary separation and contrast techniques. For example, in the poster "Korean Reunification" (Fig. 3), designer Kan Tai-keung deliberately designed the shared radical "卓 " in the middle in a modern, unadorned style to distinguish it from the handwritten calligraphy effect of the radicals "月" and "韦" on the left and right. It is important to note that in graphic design, the core elements influencing structural perception and reader comprehension are not limited to geometric forms but also include colour. As E.H. Gombrich (2015) noted, in picture design, a single colour can be effective in establishing a sense of order, while combinations of multiple colours can have the effect of disrupting order. Traditional Chinese character graphics with character isomorphism mostly use a single colour, and the text components are mainly distinguished by their shape. However, in contemporary works, the superimposition of shapes has increased significantly. In this case, the use of multiple colours can strengthen the visual grouping of components and facilitate text recognition in complex hierarchical relationships.

In summary, the determining role of character shape reveals that the visual structure of Chinese characters is not merely a passive container of meaning but an active generator of formal and semantic relationships. The interaction between contours, frameworks, and component compatibility forms a systematic foundation for character isomorphism, enabling designers to achieve both recognisability and expressive transformation. Ultimately, the effectiveness of such design depends on the designer's ability to balance structural coherence with creative manipulation of form, ensuring that meaning is communicated through both visual unity and intentional variation.

Efficient ordering of character elements. Arrangement order is a key factor in the meaning of character isomorphism works, directly affecting the synthesis of meaning and the accuracy of information reception. According to F. de Saussure (2011), symbolic meaning does not exist independently; it depends on the position of the symbols in the system, as well as the relationship between the symbols. The surface structure of a symbolic system is composed of syntagms. Syntagms emphasise the co-occurrence and order of symbols in the temporal or spatial dimension, manifested as directly observable symbolic arrangements. Segmenting syntagms into combinatorial units for decomposing meaning can effectively help to understand the mechanisms by which combinations correspond to meaning (Barthes, 2008). In character isomorphism systems, Chinese characters themselves are independent combinatorial units. Their special structural properties inevitably cause the arrangement of syntagms to inherit the characteristics of the language system, which is partly manifested in a linear structure. On the other hand, visual works have their own characteristics. Combination segments are not only manifested as the adjacent arrangement of components but also as spatial relationships. Under different organisational treatments, the meaning of textual components can also present different hierarchical structures and sequential orders. These spatial relationships can ultimately be

converted into a logical arrangement, influencing the formation of semantic relationships and the reinforcement of key information.

In ancient China, due to the combined influence of writing tools, reading habits, and cultural traditions, Chinese characters were generally arranged from right to left and from top to bottom. In the 1950s, under the influence of reforms initiated by official state-run newspapers, people gradually adapted to the horizontal arrangement from left to right (Gong, 2011). In the 21st century, vertical arrangement has not disappeared and is still widely used in Hong Kong, Macao, Taiwan, and other regions. Some classical publications in mainland China also use it to highlight cultural characteristics. In practical applications, the arrangement of Chinese character graphics is influenced by the readability of the text and presents a flexible and diverse artistic appearance. As a graphic style widely used in China throughout history, the interpretation of character isomorphism has long been subconsciously formed into a national visual experience. Typically, such compositions include a limited number of characters, most often ranging from two to four. Even when the reading order is not immediately recognised, readers are usually able to adjust their interpretation rapidly. Consequently, the recognition of reading order in the context of Chinese character design is generally met with a high degree of tolerance and adaptability.

The shape of Chinese characters provides excellent conditions for the varied layout of Chinese character graphics. The rectangular framework of the characters is extremely malleable, making it easy to round the contours or change the ratio of length to width. In the Chinese character system, many characters can express meaning independently. The final meaning of a group of Chinese characters must be determined based on the order. In a non-linear spatial environment, readers may interpret a group of Chinese characters in different orders, leading to significant differences in meaning. In the early stages of design, experienced designers filter out text components that may cause ambiguity. In addition, based on the basic character structure and project requirements, they also employ flexible design techniques to guide the reader's visual flow. This approach undoubtedly reduces the time spent by the general public in exploring arranged order and avoids misinterpretation of meaning.

Taking a four-character combination as an example, if the text is divided into two lines with both horizontal and vertical alignment, the arrange order typically follows one of three patterns (Fig. 4a). In the poster "两岸同福 (Blessings on Both Sides) (Fig. 4b), the creator leveraged the similarity of strokes between horizontally arranged Chinese characters to establish a visual connection through partial overlap (Fig. 4c). Under the Gestalt psychology principle of proximity, these interconnected characters form alliances with each other. The four Chinese characters, which were originally balanced, are transformed into two groups of characters with an upper-lower relationship. After reading the first line, people will continue to the second line, thus establishing a horizontal reading order. This consideration leads to a further question regarding the rationale behind the creator's choice of a horizontal arrangement. Indeed, a vertical arrangement can similarly direct the reader's eye by means of stroke connectivity. This observation returns the discussion to the morphology of individual characters, which is determined not only by the configuration of adjacent strokes but also by the relative density of those strokes. In an isomorphic system, the number of strokes between characters can sometimes vary greatly, and inappropriate combinations of shapes can easily cause an imbalance in density. The two characters "两岸 (both sides)" have a relatively equal number of strokes and are easy to handle in terms of shape. However, the character "福" has the most strokes, which can easily lead to excessive density. Combining it with the relatively simple character "同" helps to adjust the space ratio by taking advantage of complementary factors. Placing the two characters side by side allows the dividing line between them to be moved to the left, leaving more space for the strokes of "福". On the other hand, multiple adjacent vertical strokes also create favourable conditions for overlapping. In contrast, in vertical arrangement, there are fewer identical or similar strokes between adjacent characters (Fig. 4d). Especially between "同福 (shared blessings)", it is challenging to use shared strokes to balance density. Although reducing the thickness of the strokes in the character "福" can alleviate the issue of uneven compositional force, the overall visual comfort of the arrangement still falls short of the horizontal layout's ideal effect.

In Chinese character graphics based on character isomorphism, different structural methods have different effects on the arrangement order. For example, in positive-negative graphics, the background and image are composed of different but related Chinese characters. In the visual process, the text that is seen as the image is usually recognised before the text that is seen as the background. Another example is that, in some works, one Chinese character contains another Chinese character. When observing, characters that appear externally in an enveloping manner have greater visual weight and thus often occupy the forefront of visual order. Such cases are not uncommon. Additionally, different formal techniques may be applied simultaneously. Although structure only plays a guiding role in visual order, and visual order does not equate to a hierarchical relationship of meaning, the influence of structure on meaning is undeniable. It is worth noting that regardless of how the form changes, Gestalt psychology always plays an important role in visual organisation in shape recognition. This is precisely the core difference

between written characters and ordinary text in their grammatical structure, reflecting the characteristic of linear and non-linear mixed arrangement for the translation of meaning.

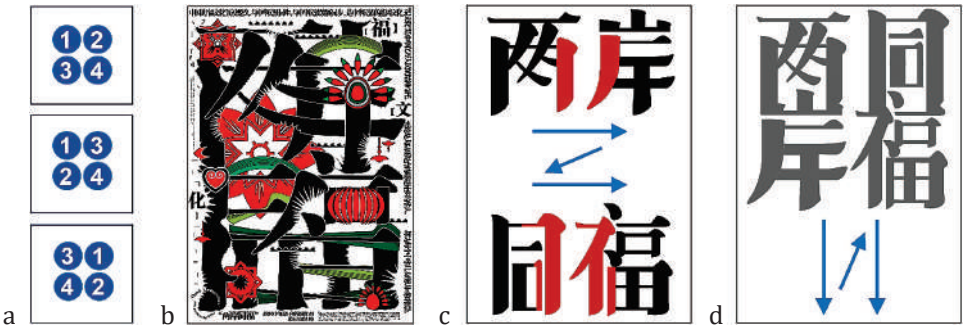


Figure 4. Syntactic analysis of four-character homophonic structures
Note: a – possible arrange order for four-character arrangements; b – poster "两岸同福 (Blessings on Both Sides); c – blue arrows indicate arrange order, red indicates overlapping strokes; d – vertical arrangement, connecting strokes between upper and lower words
Source: interpretation drawn by the authors, Character Creation Alliance (2023) poster

The role of structural metaphors. A metaphor is the use of components or overall imagery to project one thing onto another, thereby conveying cultural connotations and abstract concepts. Visual metaphors use images as a medium of transformation, i.e., they use visual language to make comparisons (Guo, 2018). In Chinese character graphics design, structural factors shape metaphors, mainly in the form of visual metaphors that combine linguistic elements. Among these, spatial layout determines the relationships and hierarchy between elements, guiding the viewer's gaze and emphasising the focus of the metaphor. Proportion and scale determine the relative sizes of visual elements, conveying information such as strength and importance. Additionally, the formation of Chinese characters originated from pictograms, and their forms are concrete, visual graphic symbols. For example, the shape of the Chinese character "山(mountain)" is a depiction of a real mountain. It is both an independent character and a radical. In compound Chinese characters, all characters with the radical "山" have meanings related to mountains. Furthermore, depending on the position of the radical, the meaning of the character will also differ. This pictographic feature of Chinese characters extends to character isomorphism, which can also be a powerful factor in the creation of metaphors.

Compared with linguistic metaphors, visual metaphors have their own expressive advantages. Images are intuitive, making it easier for observers to agree on the shared characteristics of metaphorical terms (Bolognesi, 2017). Relevant experimental studies have shown that cultural factors do not constitute a prominent influence in the cognition of visual metaphors (Van Mulken *et al*., 2010). Even in different cultural contexts, when faced with purely graphic works, the patterns of mental associations triggered by image structures are relatively similar. However, for textual graphics, the formation of metaphors must be based on language cognition, which in turn heavily relies on cultural factors. Therefore, understanding such metaphors requires the combined influence of psychological consensus, cultural cognition, and individual experience. During the cognitive process, people read shape and structural information, integrate it with the meaning of the words, and advance their associations and deepen their understanding, thereby successfully interpreting the meaning of the metaphor.

In the logo of the College of Economics and Statistics, Guangzhou University (Fig. 5), the main graphic was composed of two characters, "經 (economics)" and "統 (statistics)". As the common radical of these two Chinese characters, "糸" was originally a pictographic character, imitating the shape of a bundle of silk threads. The original meaning of this radical was "silk thread", which was later extended to mean "connection". The structure on the right side of the logo is formed by the overlapping strokes of the characters "巠" and "充". Figure 5a showed the final design scheme, where the internal lines are uniformly thick. This implies that "economics" and "statistics", as distinct academic disciplines, are integrated and collaborative in the development of the college. The shared use of the radical "糸" is a clever design choice by the artist, leveraging the coincidental similarity in character forms, to subtly reinforce the intended meaning (Fig. 5b). Compared to the final solution, the discarded design solution (Fig. 5c) was identical in terms of the layout arrangement of the text components. However, the strokes of the character "統" use thinner lines, which could easily be interpreted as shadows or spatial depth for the character "經". It unnecessarily adds a hierarchical relationship between the two characters, leading to an incorrect interpretation where "economics" is the primary meaning, and "statistics" is secondary. While

the varying line thicknesses aid in visual distinction between the characters, this design deviates from the requirement to clearly convey the core theme, thereby dooming it to failure.

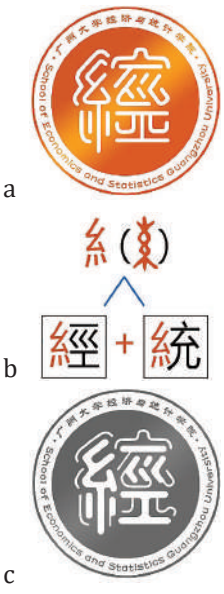


Figure 5. Logo of the College of Economics and Statistics, Guangzhou University
Note: a – final design; b – common radical "糸" and its pictographic pattern; c – in the rejected design, the strokes of the character '統' are thinner
Source: interpretation drawn by the authors, Baijiahao creators (2022)

As one of Kan Tai-keung's masterpieces, the success of the poster "Korean Reunification" (Fig. 3), can also be attributed to the use of structural metaphors. In the image, the characters "朝 (North Korea)" and "韩 (South Korea)" share the same radical, "卓 ", but are rotated 180 degrees and facing away from each other. The shared structure of the characters represents the unavoidable similarities between the two countries, while the direction reveals the stance of the people. Therefore, the structure of this work essentially implies that North and South Korea are two countries of the same ethnic group but are currently in a state of political opposition. In character isomorphism, metaphors derived from structure can be expressed in many other ways, such as inclusion, repetition, and size, involving various visual elements. These include implied subordination, limited repetition meaning infinite quantity, and size being interpreted as importance, which are familiar to the general public. It is important to note that these structural elements do not exist in isolation or as rigid formulas. For example, in the logo of the Jilin Provincial Library (Table 1), the character "吉" is contained within the character "图", but interpreting this as a subordinate relationship would be a misinterpretation. This demonstrates that structural metaphors only function effectively when combined with character meanings, thereby accurately conveying the intended thematic information. In addition, there is a special type of character isomorphism called "Picture composed of characters". This type of work uses multiple Chinese characters to form a complete and figurative image. Direct shape modelling can present more specific meanings. The visual rhetoric may be metaphorical, or it may be a direct description or explanation. The meaning here is essentially the result of communication between text and images, which makes the metaphorical nature of pictures composed of characters unique, forming a clear distinction from other forms of character isomorphism.

Within academic circles, research into the graphic design of Chinese characters is grounded in the theoretical framework of Chinese character morphology. For instance, A.P. Zhang (2020) took the pictogram nature of Chinese characters as the foundational condition for their graphic meaning, whereas Z.Y. Jiang & S. Dong (2024) focused on the similarity of character outlines and their impact on the applicability of design techniques. Their attention to form essentially centred on the shape of individual characters, with comparisons of form being limited to partial aspects rather than encompassing the whole. This study centred on structural issues, aiming to move beyond isolated discussions of component shapes and further emphasise the grasp of systemic relationships. Within isomorphous design, the impact of overall frameworks on cognition is more easily overlooked than that of partial contours. P.Y. Lu (2023) presented a set of experimental works in his article, where the meaning of departure is conveyed through significant misalignment of internal components within characters. As the creator himself noted, when multiple characters are combined, their positions become closely intertwined; altering the fundamental framework of a single character thus renders text recognition challenging. The structural issues examined in this study are discussed within the context of the overall system, concerning both the internal organisational relationships within individual characters and the relationships between characters themselves, as well as between characters and the work as a whole. This reflects a quintessentially systemic approach to thinking.

Moreover, maintaining textual legibility within multi-character combinations cannot be achieved solely through knowledge of Chinese character morphology. The introduction of Gestalt theory provides operational guidance for design and offers formal explanations. Z.Y. Jiang & S. Dong (2024) emphasised that within isomorphous works, the principle of wholeness plays a positive role in achieving visual unity. However, they do not mention that effective visual separation of character forms by Gestalt principles is equally essential for recognising text within such combinations. Y. Zhou & M.Y. Xie (2020), meanwhile, employed

principles such as proximity and closure to explain mechanisms enabling character recognition despite deformation, partial omission, or occlusion. Regrettably, this research was confined to single Chinese characters and paragraph-level texts serving linguistic documentation purposes. The present study examined how character recognisability is maintained within character isomorphism works under Gestalt theory, alongside the guiding role of connecting forms in visual order. Compared to prior research, this paper adopts a distinct focus.

Regarding research on arrangement sequences, N. Chen (2021) utilised textual combinations found on seals, roof tiles, and bronze coins as case studies, demonstrating that ancient Chinese individuals possessed conventionalised arrangement patterns and reading habits when encountering works characterised by character isomorphism. Meanwhile, H.P. Li (2024) compared the visual effects of horizontal versus vertical arrangement of Chinese characters, explaining ancient Chinese preference for vertical layout from the perspective of preserving text legibility. Both scholars focused their research on traditional formats. However, as contemporary Chinese characters have undergone significant transformations in their application mediums and dissemination methods, the arrangement of their Chinese character graphics now exhibits new characteristics shaped by the era. Drawing upon the essence of prior research, this study posited that contemporary Chinese character graphics design represents a fusion of traditional and modern features, thereby fostering diverse developmental trajectories. From the perspective of contemporary practical application, the influence of multiple factors on the formulation of arrangement strategies, alongside the integration of character form variation techniques, is analysed.

In the field of Chinese character graphic metaphor design, scholars have generally shown greater research interest in pictorial-textual integration, primarily due to the perceived expressive advantages of imagery. C. Zhu (2022) contended that pictures serve as a vital vehicle for metaphor; embedding them within Chinese character graphics facilitates the breaking down of cultural cognitive barriers, thereby enabling cross-ethnic and cross-regional cultural dialogue. C.Z. Yuan & B. Liu (2024) contend that the relatively rigid correspondence between Chinese character form and meaning limits their expressive extensibility, whereas pictorial elements can compensate for this deficiency by guiding readers towards rich associations and imaginative interpretations. Nevertheless, the primary element in character isomorphism remains the character itself.

Although Chinese characters possess pictograms, most forms have become highly abstracted and are not entirely identical from an effective recognition perspective. In such instances, the role of structural metaphor, detached from figurative elements, becomes particularly prominent. This study demonstrated through case analysis that strokes and radicals – as abstract elements within characters – can form metaphors through alterations in proportion, position, or orientation. This confirmed that structural patterns can induce complex cognitive effects in viewers. Whilst currently in its preliminary stages, this research reconstructs the generative logic of Chinese character graphics metaphors at a theoretical level, whilst its feasibility has been validated in practice.

CONCLUSIONS

It has been found that in Chinese character graphics design with character isomorphism, character shape, order, and metaphor are intrinsically related. The shape of the character provides the necessary precondition for the use of techniques. The arrangement of the characters, on the other hand, takes the matching degree of their interconnection as the core consideration, and fully considers the result of the overall layout of the purposeful reading. Thus, the expression of abstract concepts is realised in the projection of imagery, highlighting the sensual qualities of graphics. Comprehensively speaking, the structural design principle of character isomorphism can be summarised by the use of systematic thinking.

The study also showed that design approaches related to sign isomorphism are not limited to Chinese writing, but share common patterns with practices in other cultures and language systems. This is particularly noticeable in multilingual logo design, where the combination of Chinese and foreign fonts has become a practical necessity. It has been found that many designers tend to favour structurally conservative solutions – for example, a clear separation of English and Chinese text, as in the emblem of the School of Economics and Statistics at Guangzhou University. Although such configurations minimise the risk of visual confusion, they often turn out to be too straightforward and can create an effect of aesthetic fatigue. Overcoming these limitations requires methodological innovations – the use of positive-negative graphics, figurative images, or combinations of strokes. The perceptual overlap between letters and components of Chinese characters in mixed compositions creates both challenges and opportunities: on the one hand, clear formal differences are needed to maintain recognizability; on the other hand, it is this feature that opens up the possibility for flexible structural combinations and the formation of new meanings.

Despite successful precedents, academic articulation and systematic summarisation of such design experiences remain limited. Given the expanding scope of international exchange, the topic of cross-script character isomorphism is poised to grow in scholarly relevance, with potential to enrich creative practice and support more effective intercultural communication. Future research may focus on developing a more formalised theoretical model of mixed-script

isomorphism, clarifying how structural and perceptual mechanisms operate across different writing systems.

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Структурне дослідження ізоморфізму символів у графічному дизайні китайських ієрогліфів

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Анотація. Ізоморфізм символів є поширеною формою у графічному дизайні китайських ієрогліфів. У порівнянні з іншими техніками, розташування внутрішніх компонентів відіграє більш важливу роль у передачі значення, що робить структурні фактори ключовими для успіху дизайну. Метою було дослідити формальні механізми ізоморфного дизайну символів у китайській графіці та пояснити, як позиційне розташування, засноване на характеристиках китайських ієрогліфів, може збагатити візуальне вираження. Використано міждисциплінарний підхід з інтеграцією морфології китайських ієрогліфів, гештальтпсихології та семіотичної теорії. За допомогою огляду літератури та формального аналізу систематично вивчено репрезентативні приклади. Результати показали, що форма символів, послідовність розташування та метафора становлять три основні виміри, що впливають на структурну композицію. Сумісність форми символів є основою ізоморфізму, визначаючи можливість комбінацій компонентів; послідовність розташування безпосередньо впливає на точність сприйняття інформації через лінійні та нелінійні просторові відносини, а метафоричні механізми ефективно передають культурні коннотації та абстрактні поняття через проекцію візуальних образів. На основі аналізу цих трьох вимірів було сформульовано рекомендації та методологія для підвищення графічної виразності та культурної впізнаваності китайських ієрогліфів. Ці висновки не тільки надають творчі стратегії та формальні рекомендації для графічного дизайну китайських ієрогліфів, але й окреслюють реальні шляхи візуальної комунікації в різних культурних контекстах, сприяючи тим самим ефективній передачі тематичної інформації

Ключові слова: формальний механізм; порядок розташування; метафора; візуальне сприйняття; культурне значення