The Experimentation of Mosaic Art Fusion in Patchwork Door Curtains in Northern China

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ABSTRACT

This study investigated the integration of mosaic art into traditional patchwork door curtains (PDC) in northern China, a cultural artifact that plays an essential role in daily life. While existing research primarily addresses techniques, shapes, and colors of PDCs, it often lacks artistic innovation. Recognizing the visual similarities between the geometric arrangements of mosaic art and the design of patchwork curtains, this research employed computer software to apply both regular and irregular tile mosaics to PDC patterns. The findings indicate that regular shapes are more effective for enhancing the aesthetic appeal of PDCs. The objective of this study is to elevate the artistic expression of PDCs and improve the taste of life in rural northern China by incorporating mosaic imagery. This research offers practical recommendations for curtain design and sets the foundation for future studies, ultimately contributing new elements to traditional art forms and promoting artistic innovation and sustainability.

Keywords: *Mosaic Art, Patchwork, Door Curtains, Decorative Arts, Cultural Hybrid*

INTRODUCTION

Contemporary society has seen the emergence of a confluence of different cultures, and art, as a silent but far-reaching form of expression, can transcend national boundaries and cultural differences to convey common human emotions and concepts (Liu, 2023). This study explored the integration of mosaic art into the traditional decorative art of PDCs in northern China, with the goal of revealing the

intermingling of these two distinct art forms and the potential insights this fusion may offer to decorative art and cultural exchange.

Northern China has a continental temperate monsoon climate (Ren, 1992). It is often subject to wind and sand in spring and winter and mosquito infestations in the summer and fall, making door curtains the region's most widely used home decoration. Women cut pieces of cloth of different colors into geometric shapes such as approximate squares, triangles, diamonds, petals, etc. (An & Xiao, 2019), then collage and sew them together to form different abstract patterns (see Figure 1). Some women also add a variety of patterns with beautiful symbols and elements of flora and fauna on top of geometric motifs (Wei & Gao, 2019) (see Figure 2). Handmade collage curtains have developed into a unique regional landscape through generations of use by local people. With the improvement of living standards, people began to pay more attention to the aesthetic value and artistry of the products, and the PDCs also became a unique tool for cultural expression.

Figure 1. Abstract Pattern Patchwork Door Curtain
(Source: https://www.7788.com/auction_0/3/2421/, 2024)

However, current research on PDCs mainly focuses on technique, styling, and color expression (Chen & Lv, 2023; Han & Xiao, 2019; Liu, 2017; Ma, 2015); innovative design based on sustainable development (Jinlong et al., 2021); and lacks in-depth exploration of artistic and innovative aspects.

In contrast, mosaic art is one of the oldest, most enduring, and most practical forms (Elber & Wolberg, 2003). Mosaic art, as a decorative art form, is based on the combination of small pieces of materials such as stained glass, stones, tiles, and metals to create an overall image (PHU, 2021) . It has many applications and is especially prominent in floor and murals and vaulted (ceiling) decorations (Elber & Wolberg, 2003) (see Figure 3). One can also apply it to create themed artwork incorporating different layouts, colors, and materials to achieve unique visual effects (Smith & Plantzos, 2018). The versatility and flexibility of mosaic art provide a wide scope for exploring innovative artistic expressions. The presentation effect reveals similarities between patchwork curtains and mosaic art, as both incorporate small pieces or strips of material into collage of various patterns to form visual aesthetics. In addition, the use of mosaic images for visual effects has become an increasingly popular form of creation for artists in the field of computer technology and modern art research (Battiato et al., 2011). Therefore, this study aimed to integrate these two art forms to inject new artistic vitality into the cloth mosaic curtains.

Figure 2. Animal Pattern Patchwork Door Curtain
(Source: https://www.7788.com/auction_0/3/2421/, 2024)

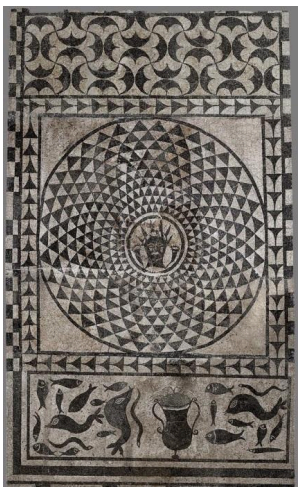

Figure 3. Mosaic
(Source: M. J. Duran Kremer, 2023)

This study explored the fusion of patchwork curtains and mosaic art and proposed a new artistic expression that enriches the decorative effect and visual sensation of traditional patchwork curtains. This study not only enhances the traditional practical function of patchwork curtains, but also elevates their aesthetic value and artistic taste. The experiment was meant to explore the communication and integration between different cultures and art forms, promote the communication and conversation between Eastern and Western art, and promote the innovation and sustainable development of art.

THEORETICAL FRAMEWORK

The combination of mosaic art and cloth-pieced door curtains in the countryside of northern China is a complex process involving multiple disciplines and fields. This process requires the guidance of multiple theories. This study used aesthetic principles, visual perception, and Gestalt psychology to construct a theoretical framework (see Figure 4) to ensure the depth and breadth of the study.

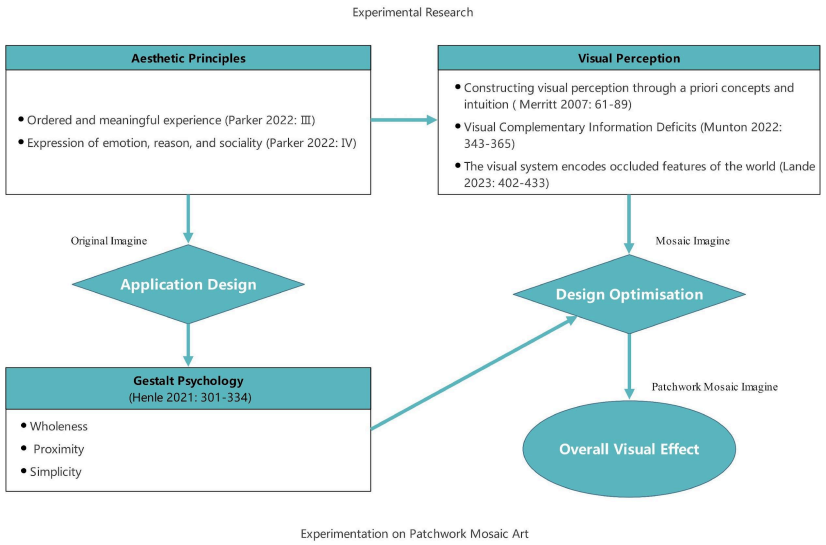

Figure 4. Theoretical Framework
(Source: drawing by authors, 2024)

Aesthetic principles are the foundation of aesthetic and art theories, providing an important framework for studying the nature of beauty and aesthetic experience. Experts such as De Witt (2022); Wang (2021); and Ye (2009) all have profound insights into the principles of aesthetics, and they agree that beauty is an orderly and meaningful organization of human experience. Parker's aesthetic theory emphasizes that art is a deep experience, a unified expression of emotion, intellect, and sociality, and that both color and composition should achieve a harmonious state of balance. In the art of patchwork mosaic, it is necessary to use different colors to express the layers and three-dimensionality of the pattern, as well as use color contrast and coordination to highlight the decorative effect of the door curtain. The principles of contrast and harmony guided the color selection for the PDCs, applying the principles of aesthetics. For instance, complementary colors were strategically used to create a vibrant and dynamic visual effect, while analogous colors were employed in certain areas to maintain a sense of balance and unity in the overall design.

Visual perception theory concerns how humans perceive and respond to visual stimuli. Immanuel Kant asserts that a priori concepts and intuitions construct visual perception, highlighting the role of human cognition in shaping perceptual experience (Merritt, 2007). Psychophysical, neurophysiological, and computational considerations suggest that the visual system specializes in encoding the content of occluded features in the world (Lande, 2023). Although pixelation reduces when an image transforms into a mosaic, vision compensates for the loss of information. Munton (2022) argues that our vision "sees" invisible objects and that memory and perception are interdependent and intertwined. This theory of visual perception can guide our practice. When transforming the source image into a mosaic image, the basic information of the main object must be preserved, enabling visual perception to identify it. For instance, when designing the PDCs, the principles of visual perception were applied, ensuring that the primary colors of the mosaic were distinct and contrasted effectively. This approach helps retain the clarity of the image when viewed from various distances, ensuring that the mosaic design is perceptible and aesthetically pleasing to the viewer.

Gestalt psychology is a theory of human perceptual patterns and information organization. Scholars such as Max Wertheimer, Rudolf Arnheim, and Mary Henle (Henle, 2021) have embodied some of Gestalt psychology's core principles, such as wholeness, proximity, and simplicity. These ideas have profoundly impacted the field of design (Tabakhan Esfahani, 2023). Bruce Mau and Paul Rand are concerned with the wholeness and impact of design. Hence, this study utilized the principles of Gestalt psychology to explore the overall visual effect of a patchwork mosaic pattern. By presenting a complete and self-contained overall effect, it creates a stable and harmonious psychological atmosphere, which leads to a stable and pleasant psychological experience when interacting with the door curtain. The Gestalt principles of proximity and similarity were crucial in arranging the mosaic patterns. The design creates a cohesive and stable visual structure by grouping similar colors and shapes together, which prevents disjointed elements from overwhelming the viewer's eye. This approach ensured that the PDCs not only function as decorative pieces, but also evoke a sense of order and comfort.

METHODOLOGY

Research Design

The research design focused on the combination of mosaic art and cloth-pasted door curtains, specifically exploring the arrangement method of cloth-pasted mosaics. The goal of the research was to enhance the aesthetic value of traditional patchwork door curtains through the application of mosaic art, and at the same time to provide theoretical support and practical guidance for the application of mosaic art in traditional crafts. The study adopted a systematic experimental design, divided into three main steps (see Figure 4. Research Flow) to achieve this goal.

Firstly, the researcher optimized the target image database according to the characteristics of the PDC to ensure that the generated mosaic image meets both the aesthetic and functional requirements of the traditional cloth-pasted door curtain. This step optimizes the importance of target image selection and optimizes on to ensure that the final result complements the integration and representation of traditional culture. Secondly, when generating the mosaic result image on the image processing software, the study automates the whole process through specific algorithms to improve the efficiency and accuracy of the generation. The key to this step lies in the use of mosaic algorithms and intelligent strategies, drawing on the relevant research findings of Battiato et al. (2007), Di Blasi and Gallo (2005), and Aydoğdu and Öz (2023), and optimizing a variety of image forms, such as regular tiled collage images, irregular tiled collage images, and abstract mosaic forms, to ensure that the results are diverse and artistic. Finally, the generated resultant images are adjusted according to relevant theories to optimize their artistic expression and visual effects, thereby enhancing the aesthetic value of the final product.

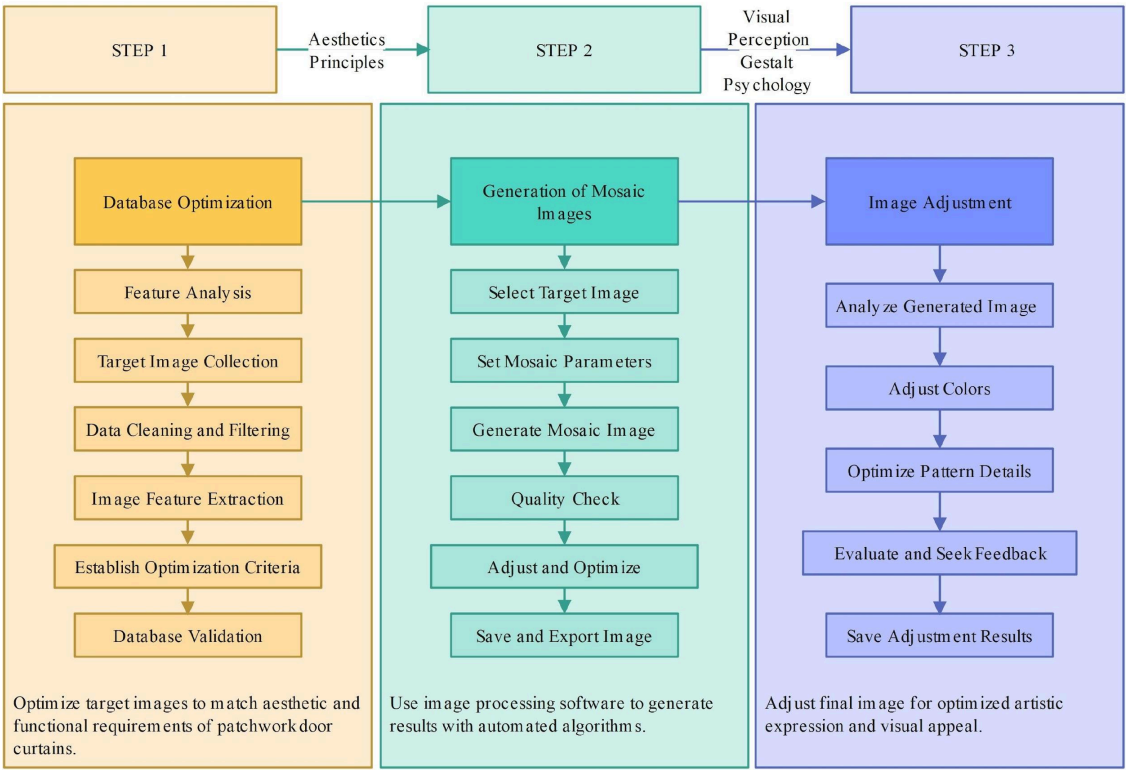

Figure 4. Research Flow Chart
(Source: drawing by authors, 2024)

Data Collection

The arid natural environment, as well as seasonal wind and sand in the northern region of China, affects the local people's color preference, which has a higher preference for high purity, high brightness, and bright colors, which are widely used in PDCs (Han & Xiao, 2019). Considering this limitation, the selection of source images should favor images that are simple, brightly colored, and decorative, so this experiment was based on famous oil painting images. The images of people, plants, animals, and still life were downloaded from the *File of Masterpieces* 2024), as illustrated in Figure 5, and experiments were carried out using various images to create a mosaic effect.

Figure 5. Oil Paintings
(Source: https://www.ss.net.tw/, 2024)

Patchwork Mosaic Generation Process

The composition form of cloth patchwork door curtains usually includes cloth pieces of multiple colors and patterns, creating a rich sense of visual layers and decorative effects. Bai (2015) summarized the basic forms of cloth patchwork craft as octagonal, triangular, petal-shaped, cross-shaped, square grid, and pomegranate shapes (see Figure 6 a-d). When making cloth-pieced door curtains, the size of the doorway must be fully considered. Typically, the size range of doorways for bedroom doors and living room doors in self-built houses in rural northern China is 80-110 cm wide and 190-240 cm high (Li, 2022). Based on the stretchability of the fabric, the door curtain size is usually 5-8 cm larger than the door opening size, so the typical door curtain size is about 85-115 cm wide and 195-245 cm high. For the convenience of this study, the typical size of 110*200 cm and the basic form of the field shape were selected.

Unwanted clothes or worn-out clothes make up the majority of PDCs. With the improvement in living standards and aesthetics, people have begun to buy whole dark or acrylic fabrics as clothes to improve production efficiency and quality (Liu, 2017). Due to the nature of the cloth, it is imperative that the tiles used in the production of fabric-pasted door curtains have a minimum size of 5 centimeters.

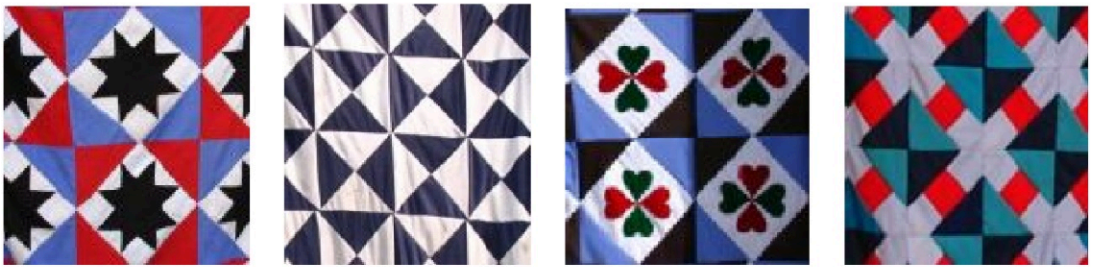

Figure 6. (a-d) The basic form of patchwork craftsmanship
(Source: Bai Xiao, 2015)

Regular tile patchwork mosaic images production

We used planar software to crop and mosaic images. The mosaic command generated only square regular tiles, while regular tiles of other shapes could be created by drawing the tiles in the planar software and filling the tiles with colors based on the aesthetic principles of color contrast and tonality to produce an accurate mosaic image. The mosaic image in Figure 7 displays tiles with a side length of 5 cm.

Figure 7. Rule Tile Patchwork Mosaic Images
(Source: drawing by authors, 2024)

During the image cropping and mosaic generation process, the principles of color harmony from aesthetic theory were applied. Colors were carefully selected to ensure the final image maintained a balance between vibrancy and coherence, aligning with the aesthetic preferences identified in the local culture of northern China.

Irregular tile patchwork mosaic images

Computer software can also generate irregular mosaic images, as shown in Figure 8. We used the same method as Faustino and de Figueiredo (2005) to generate a mosaic effect adaptively and automatically for the image and then adjusted it according to the theory of color contrast and application, and the final image showed a stained-glass effect. Depending on the image's display effect, large color blocks were stitched together with cloth blocks to create the mosaic image, and then stitched or embroidered irregular tile shapes on top.

Figure 8. Irregular Tile Patchwork Mosaic Images
(Source: drawing by authors, 2024)

Abstract patchwork mosaic images

Abstract mosaic images can also be used to design PDCs. The software directly designs these mosaics, which typically adopt an abstract form, without relying on the source image. Considering the local population's preference for bright colors, we used a range of regular and irregular patterns, including even light patterns, but all with layered colors, suitable for an audience that enjoys special effects. The left image in Figure 9 was created with graphics software, while the center and right images were created with the Voronoi generator.

Figure 9. Abstract Mosaics Patchwork
(Source: drawing by authors, 2024)

Design Validation

The design validation process mainly consisted of a systematic assessment of the generated mosaic cloth patchwork door curtains in terms of their visualization, artistry, practicality, and cultural adaptability. A five-point Likert scale (1 for strongly disagree, 2 for disagree, 3 for neutral, 4 for agree, and 5 for strongly agree) was used to collect the final number of questionnaires and to count the mean values of the mosaic cloth patchwork door curtains evaluated by the rural residents in northern China.

The validation results showed that the generated mosaic PDC excelled in visual attractiveness and cultural adaptability, reaching 4.16 and 4.02. The scores in the areas of color coordination, pattern clarity, and practicality were all above 3 points. This indicates that users were more satisfied with the experimental results of mosaic art integration in PDCs, which is in line with the research objective of improving life taste. The design validation provided strong support for the hypothesis of this study and proved that the application of mosaic art to PDCs is not only feasible, but also effective in enhancing their aesthetic value and cultural infectivity.

RESULTS AND DISCUSSION

The experiment aimed to apply mosaic images of both regular-shaped tiles and irregular-shaped tiles to the PDCs, using graphic software to achieve the desired effect more quickly and effectively guide the practical production process. Figure 10 illustrates a 3-step process that transforms the original image into a patchwork mosaic image. This process is guided by visual perception, aesthetic principles, and Gestalt psychology to obtain the final image. It is worth noting that the images in Step 3 need to be adjusted several times to achieve satisfactory results.

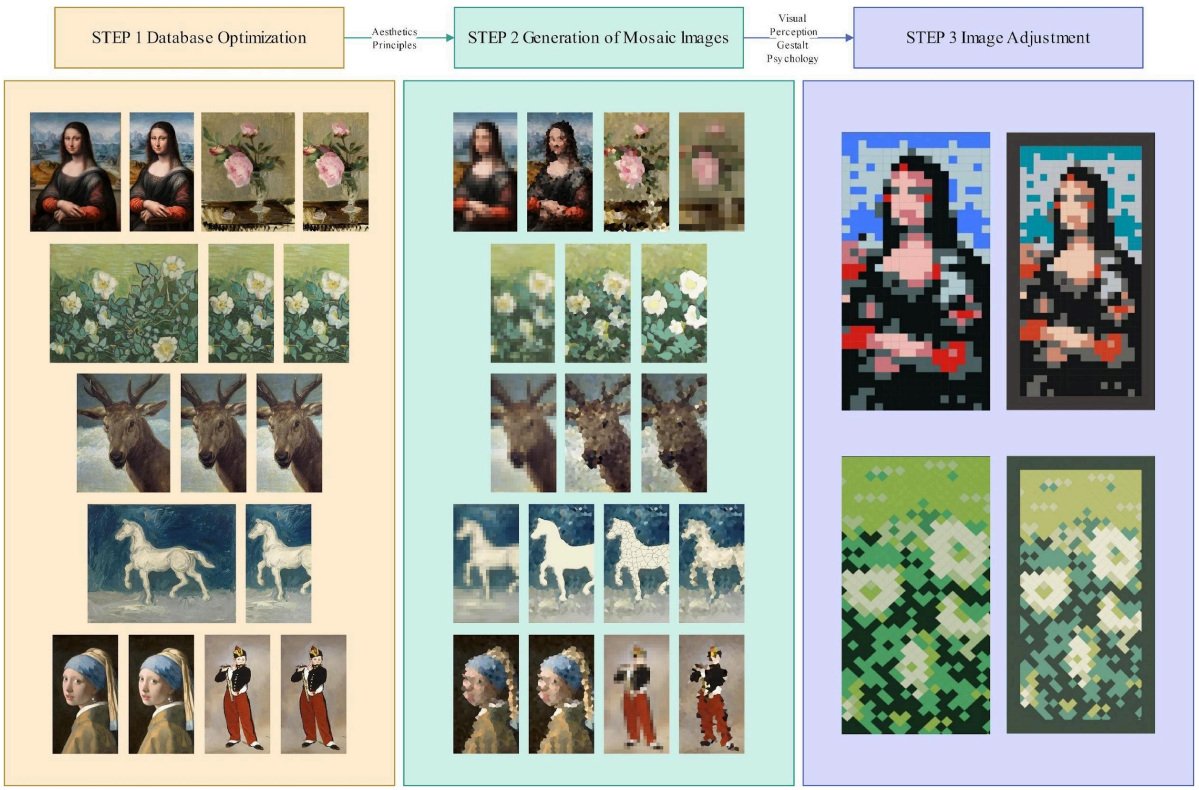

Figure 10. The Creation of the Patchwork Image
(Source: drawing by authors, 2024)

Image Adjustment

Figure 5 (a-e) and Figure 6 (a-d) show that the graphics software generates mosaics with rich colors that can potentially reach hundreds of colors on PDCs. However, rural women face challenges due to the limited availability of color-rich cloth at home and in the market. Therefore, this research needed to subtract color from the resulting image. Lande (2023) argues that the ability to perceive completion allows a person to have a visual experience of certain unseen parts of the world. These obscured features can be labeled in conscious visual experience. Therefore, subtractive color processing should enhance, not lose, the main features of an image to increase one's visual perception. The reduction in the number of colors was guided by visual perception theory, ensuring that even with fewer colors, the primary elements of the image remained identifiable. This adjustment not only made the production process more feasible for local artisans, but also maintained the visual integrity of the PDCs.

In the process of color reduction, it is necessary to consider color aesthetics and local people's preferences. Johann Wolfgang von Goethe believes that the understanding of color should be based on overall and should emphasize the subjective experience of the observer and the emotional response(Sullivan, 2017). De Witt (2022) posits that beauty necessitates achieving a state of harmony and balance. Therefore, in adjusting the color using color matching and similar color matching, these two pictures paid attention to the relationship between the color echoes, simultaneously increasing the color saturation, enhancing the visual aesthetics, and catering to the local people's preference for bright colors. Finally, after mapping the patchwork mosaic, a dark border was added to the resulting image to align with the local population’s habits and enhance uniformity.

The image effect of irregular tiles has more motion and attraction, but it requires more cloth and takes longer to produce, which is suitable for artwork production, such as the works of Yuan et al. (2021) and Silva (2022), but not for commercial use. Therefore, one can use it as a printed color background, while fabric-pasting creates the foreground image. At the same time, large color blocks

can also be pieced together with cloth blocks, on which irregular tile shapes can be sewn by stitching or embroidery to create a mosaic image.

Limitations

Cloth typically lacks the ability to display high-resolution images, which means the door curtains may not fully render high-resolution mosaic images, leading to the loss of some minor image features or details. Only a general impression of the scene was captured in our final imaging image, which may reduce the ability of the general public to recognize the source image. Therefore, when selecting source images, we should choose those that are widely known works or simple and easy to recognize rather than selecting grand scenes or images with overly complicated contents. Figure 11(a-d) illustrates the regular mosaic effect (b) of a rye field of a grand scene (a) and the irregular tile mosaic effect (d) of a set of still life oil painting images (b), revealing a reduction in object recognizability. The source images chosen for this work deliberately avoided these limitations, including the famous Mona Lisa image, flowers, and easily recognizable images such as deer and horses, and the final rendering was more satisfactory.

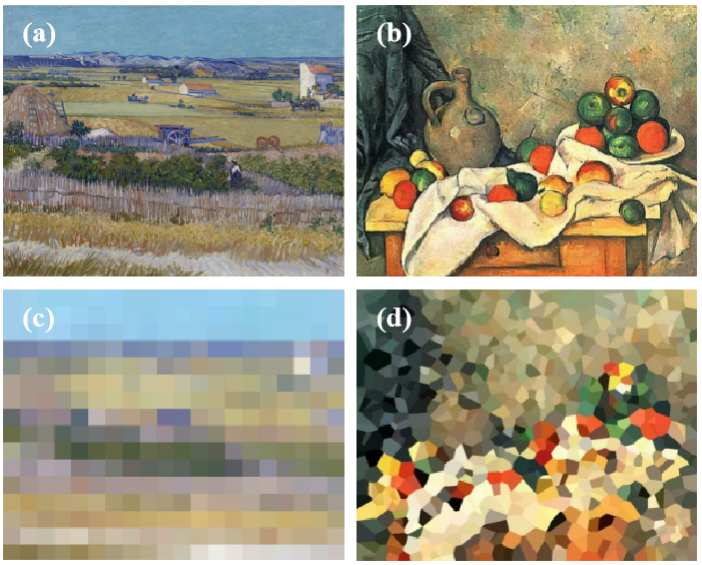

Figure 11. (a-d) Rye field (a) and still life mosaics (b)
(Source: (a) & (b) https://www.ss.net.tw/, 2024; *(c) & (d) drawing by authors, 2024)*

Due to the nature of PDCs, the reduction of color is only a limited option; once a certain limit is exceeded, it will increase the difficulty of production, making this application difficult to promote. Using a limited number of colors in PDCs helps ensure that the overall design is harmonious and visually appealing. This limitation can motivate designers to focus more on creating a clean, unified visual effect, avoiding confusion or clashing colors. There is no clear limit to the number of color categories, and keeping it at three to eight is generally more appropriate.

Mosaic images created with regular tiles on PDCs demonstrate superior results. These images often exhibit a clean aesthetic and color uniformity, leading to smoother transitions between colors and avoiding disjointed or discordant combinations. Additionally, the regular shapes and sizes of the tiles facilitate easier creation and maintenance, making them particularly appealing to rural women. However, this study did not cover these types of treatments, although it is theoretically possible to experiment with more diverse mosaic effects.

CONCLUSION

By fusing mosaic art with the traditional patchwork door curtains of northern China, the present study found that this fusion has potential and can create new door curtain products with rich artistic effects and decorative values. The fused door curtain image not only retains the traditional handicraft characteristics, but also adds elements of modern art, making it more ornamental and fashionable.

In the practice of integration, it is necessary to consider whether the combination of mosaic patterns and patchwork door curtains can retain the basic information about the subject matter, but also whether it can create an aesthetically pleasing and coordinated visual effect. Therefore, when selecting and designing mosaic patterns, it is necessary to consider the theoretical guidance of visual perception, aesthetic principles, and Gestalt psychology. In terms of people's usage habits and imaging effects, mosaic images using regular tiles on patchwork door curtains perform better. Future research can further explore the effect of integrating different types of mosaic patterns with patchwork door curtains, as well as the application and promotion of integrated door curtains in real life.

This study demonstrated the practical application of visual perception theory, aesthetic principles, and Gestalt psychology in the design of mosaic-enhanced patchwork door curtains. By integrating these theoretical frameworks, the study not only contributed to the aesthetic innovation of traditional PDCs, but also provided a model for future research in the intersection of traditional and modern art forms. Overall, this study injects new artistic elements into the traditional patchwork door curtains, promotes the innovation and development of traditional art forms, and provides new ideas and possibilities in the field of decorative arts.

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