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Research Article • DOI: 10.2478/ftee-2022-0035 FTEE • 30(4) • 2022 • 43–53

Research on the Creative Application of Origami Performance Techniques in Clothing

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This paper was financially supported by Social Science Foundation of Jiangxi Province (20YS37)

Abstract
Origami has various manifestations and rich production techniques, and it is regarded as one of the indispensable contemporary art forms. In order to enrich the creative expressions of fashion design, this paper summarises the creative application forms of origami art in fashion design from the external and moulding characteristics of origami, studies the fabric characteristics through experimental verification, and summarises the applicable techniques of expression. The results show that the folding application forms of origami art and clothing modelling can be realised by using the expression methods of ironing and crimping, stitching texture moulding and repeated combination moulding, that is, pattern deformation folding application, fabric transformation folding application and modular combination folding application. The application of the folding form in clothing three-dimensional modelling and surface texture can give full play to the unique modelling beauty and artistic style of origami art and provide a reference for creative ideas in clothing design.

Keywords
origami art, origami technique, clothing modelling, creative design.

Introduction

Since the invention of papermaking by Cai Lun in the Han Dynasty, China, origami has been developing and changing, and is still one of the indispensable cultural and artistic forms today. Origami was originally used in religious activities,; it can be seen in Japanese sacrifices and Chinese Buddhist tributes. With the improvement of papermaking technology, origami technology gradually flowed amongst the people and was applied in daily life. In Guizhou, Dong people (an ethnic minority group) have a unique sewing bag which uses origami technology. It can be unfolded and continuously closed like a sandwich, and it is compact and portable (Fig. 1). It can be seen that origami art is a very flexible art form and can be applied in a wide range, showing its unique creativity and interest in the long history. The application of origami in various fields not only reflects the unique creativity of the working people, but also increases the practical value of goods to meet people's higher-level aesthetic needs.

This paper takes origami art, with its long history as a guide, to study its creative application in clothing. In recent years, origami art has been applied in many fields such as furniture design, creative education, architectural design and packaging design. However, in the field of clothing, most of design related to origami art still stays in conceptual design and exaggerated show design, and for that of ready-made clothing it is not widely used. The main reason for this is that the materials and experience of clothing fabric and technology in combination with clothing design are insufficient, Therefore, the best solution is to continue to experiment and explore the creative application of origami in garment design.

Therefore, this paper carried out an in-depth study on the application of origami art in garment design. It studied the design law from the perspective of geometry and garment structure, sorted out a set of effective application methods through theoretical research, and conducted a large number of experiments to try suitable fabrics and folding techniques, and finally recreated origami art in terms of shape, pattern, colour and process techniques in combination with garment design techniques.



Fig. 1. Origami sewing bag

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1. Research Status

1.1. Research Status in China

Research on the application of origami art in clothing in China has attracted much attention in recent years. Many designers, scholars and students in China have conducted investigations and studies from different angles. However, there is no unified induction and summary of some professional terms used in the application of origami art in clothing, and the application research in the field of garment design needs to be improved.

Through the collection and collation of relevant literature, the current research materials related to this study mainly derived from the following: Deng Yanan [1] started from origami art and explored and studied the pattern design and its cultural meaning; Liu Dongyun and Zhang Ting [2] explored the realisation of concrete origami in women's clothing through direct imitation and indirect refinement from the bionic folding technique; Wu Jihui and Huang Xiaolu [3] adopted the deconstruction style and considered the combination form of design elements, the difference in physical properties of fabrics and the requirements of different processes according to the structural characteristics of geometric origami, trying to achieve the optimal design solution; Yu Linyan and Zheng Shenghong [4], Zhou Lixia [5], Li Yi [6], Lv Jing [7], etc. analysed the development of origami art on the creative design in clothing modelling from different angles, but mainly analysed the application and impact of origami art in clothing modelling design; Zou Ping and Ma Ning [8] discussed the specific technical techniques that can be used in the application of origami art in clothing, and summarised the specific folding techniques such as the fan-shaped folding process, curved surface folding process, folded surface folding process and geometric three-dimensional folding process, which provided practical experience for the application of origami art in clothing. In addition, Xu Xubing and Zhao Mengchao [9] selected the crimping process as the main folding method for induction and research, and showed the categories and structural characteristics of the crimping process in detail; In addition to exploring directly from the perspective of clothing, some designers also explored from the perspective of fabrics. Zhang Dezhi [10] studied the combination of the innovative design of clothing fabric re-engineering. In Chapter 4-2, he discussed a variety of ways of fabric re-engineering, among which the pleating method is the expanded expression of origami art on fabrics.

These studies explore from multiple angles and carry out experiments in various forms which have strong reference significance for the creative application of origami. However, most of the studies hitherto have only stayed at the creative stage, and this study focuses more on the practical application of origami art in clothing to explore the service value of origami art. Therefore, Zou Ping and Ma Ning's paper *Application of paper folding and molding technique to women's dress* is the main reference article for the research.

1.2. Research Status in Other Countries

Compared with China, other countries have relatively mature research in the field of origami art. Many origami masters have made origami brilliant in various fields through tireless exploration. Among them, Japanese origami master Yoshizaki, not only invented the special language of origami - crease map, which spread origami all over the world, but also devised a special folding method - wet folding. This folding method makes the creases softer, gives more possibilities to origami, and makes it more attractive in concrete expression. The American Robert Lang brought origami art to the space stage. With the efforts of his team, origami was cleverly applied to the solar panel of a spacecraft, enabling it to provide a larger surface area within a smaller one (Fig. 2). After that, he also published a series of books summarizing the categories, methods, material experiments and drinking methods of origami art. In the book *Design Folding,* Robert Lang introduced in detail two folding methods that can be implemented on fabrics, namely the "crimping method" (Fig. 3) and "shadow folding method" (Fig. 4), which are also widely used in various shows, perfectly presenting the new creativity brought by the combination of origami and clothing.

In addition to the research and experiments of the masters in the field of origami, many foreign designers have also applied origami elements to fashion shows. In 2007, John Galliano showed the "Lady Butterfly" series at the Dior spring and summer show. This series absorbed Japanese elements and applied a large number of folded flowers and paper cranes to clothing. The modelling was exaggerated and bold, and the colours were harmonious and bright, perfectly showing the charm of origami art. Most of the origami elements that have appeared in the show in recent years come from the Japanese design master Issey Miyake. Issey Miyake is like a folding magician, who uses the characteristics of origami to show his free and disordered design concept. In 2010 he established the 132.5 series, which ingeniously realised the conversion from a two-dimensional plane to three-dimensional modelling. This series provided more possibilities for clothing creative design. Zhu Lei [12] in *Application and Research based on Design Method of ISSEY MIYAKE "132 5." in FASHION*, commented that this series "combines eastern design aesthetics and western design aesthetics, and also has both functionality and practicality. In this design, it also reflects the space aesthetics between the origami structure and the human body, and gives different architectural concepts and visual aesthetics to fashion."

It can be seen that other countries have formed a complete system for the practical application of origami art in clothing, but the theoretical research on origami art is inadequate and no actual laws have been summarised.

2. Application Methods of Origami in Clothing

Origami provides a variety of application effects for clothing design, but the impact

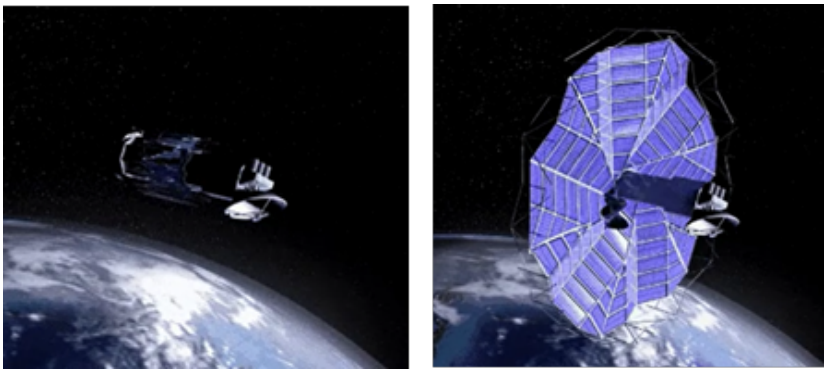


Fig. 2. Satellite solar panel



Fig. 3. Crimping method

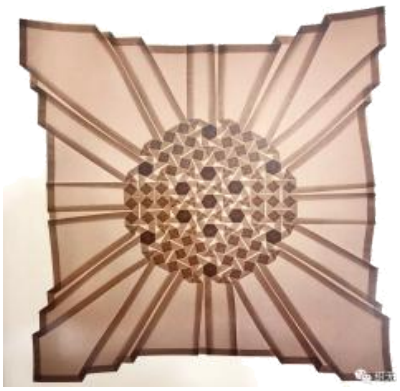


Fig. 4. Shadow folding method

of fabric characteristics on folding still needs to be considered in practical application. Therefore, this section explores the application effects and application methods of different origami through a large number of fabric folding experiments, and summarises the impact of different methods on fabric selection and effect.

2.1. Shaping Through Ironing and Crimping

Shaping through ironing and crimping is placing the fabric between two folded templates and pressing it with an iron. It is the main application method of pattern deformation and folding. Through data collection and experiments, we found that this technique has great restrictions for fiber materials. Fabric containing polyester fiber is the most suitable. This is because polyester fiber has "thermal plasticity", that is, it can be shaped again after high-temperature ironing. Therefore, the folds in ironed fabric with polyester fiber will remain folded even after washing. Other fabrics, such as common natural fabrics like cotton, linen, wool and silk, have almost the same effect as polyester fiber at the beginning of ironing, but the crease effect will be greatly reduced after placing for a while or washing; PU coated fabric can also be reshaped at high temperature, but it lacks good heat resistance. Once the temperature is too high or the ironing time is too long, its surface will melt and stick together. Therefore, when we iron and crimp PU coated fabric, the temperature needs to be strictly controlled, which brings restrictions to the practical application of PU fabric. The test effect is shown in Table 1.

In addition to the fact that the fabric composition will have an impact on the final effect, the softness and hardness of the fabric will also have an influence on the final presentation effect and style. As for the same polyester fabrics, 40g/m^2 organza can show a light and soft state after ironing and crimping, which is suitable for sweet style clothing; while the twill polyester of 300g/m^2 presents a sharp and layered effect, which is more suitable for clothing modelling of a neutral style. In addition, if you want to further strengthen the stiffness and sharpness of the ironed fabric, you can compound linings with different densities; but this is only suitable for opaque fabrics, and not for slightly transparent fabrics, such as yarn. See Table 2 for a specific style effect comparison after ironing.

When crimping with clothing patterns, we need to preset the spacing of the required patterns and their effect after folding in advance. Taking the combination of stripe patterns and snake belly folding as an example, in order to achieve the effect of changing the direction of stripes, we have to calculate the folding spacing of the crimping template in advance according to the desired effect, and then adjust the stripe spacing of the fabric according to the folding spacing of the template. The influence of the initial thickness of the fabric and the thickness of the added lining on the folding effect must be taken into consideration. After the test, we get the following findings about it. When the stripe spacing of the fabric remains unchanged and the fabric becomes thicker, the folding spacing of the paper mould needs to be increased by a certain amount on the basis of the stripe spacing. The test effect is shown in Table 3.

When we are trying innovative actions in fashion design, the use of ironing and crimping techniques combined with various patterns seen in our daily life can provide us with band new pattern design inspiration. Their combination adapts to the aesthetic development of the times and meets the needs of wearers for personalised expression.

2.2. Stitching Texture Moulding

The stitching texture moulding technique refers to the process of fixing the pre-designed fabric overlap with a needle and thread to achieve the effect of reshaping

Fabric change	Polyester	Cotton	PU coated fabric
Initial effect of ironing			
Effect after washing			

Table 1. Pleating retention of different fabrics

Types of fabric	Un-ironed lining	Description	Ironed lining	Description
40g/m² organza		Irregular shape; light and soft effect		Regular shape; can show the colour of adhesive lining
300g/m² twill polyester		Relatively regular shape; hierarchical effect		Regular shape; sharper creases

Table 2. Style characteristics of Organza and polyester FDY fabric after ironing

the fabric texture. It is the corresponding moulding method for fabric reconstruction and folding application.

Through practice, we find that when using fabrics for folding, they cannot be folded or ironed directly because most fabrics do not have the touch and characteristics similar to paper. However, such a kind of fabric can be folded into various forms through the stitching texture moulding method, that is, using a needle and thread to stitch fabrics to form a texture effect similar to paper folding, which is similar to the process of the smocking technique. This technique does not have too many fabric restrictions, hence it can express a variety of clothing modelling, and thus it is widely used in fabric reconstruction and folding. Figure 5 shows that using cotton fabrics will bring a simple and primitive style feeling; silk fabrics - a heavy hand-made, luxurious and noble visual feeling; and PU leather - a sense of order and architecture.

The type of origami corresponding to stitching texture moulding is "inlaid origami". The final effect of both of them is similar to that of the regular non-overlapping and no-gap pattern, which can be continuously and infinitely recycled in four directions. The difference between stitching texture moulding and traditional origami lies in the "drawings" used for folding or sewing. The origami drawing is a crease map generated in the folding process, while in the stitching texture folding drawing, a connecting line needs to be sewn between the two intersections. When the connecting intersection changes, the corresponding

Fabric paper mould size	Initial fabric 255g/ m²	Description	Initial fabric lined with plain paper	Description	Initial fabric lined with hard resin lining	Description
Paper mould spacing 6.5cm		Proper paper mould spacing; creases and stripes match very well; dislocation-free		Distance between paper moulds is appropriate; creases and stripes match well; slight dislocation		Paper mould spacing is too small; creases and stripes do not match; there is dislocation
Paper mould spacing 6.8cm		Paper mould spacing is too large creases and stripes do not match There is dislocation		Distance between paper moulds is appropriate creases and stripes match well Slight dislocation		Proper paper mould spacing creases and stripes match very well, dislocation-free

Table 3. Relationship between fabric thickness and folding spacing (example: snake belly origami)



(a) Cotton (b) Silk fabric (c) PU coated fabric

Fig. 5. Comparison of different fabric styles in stitching texture moulding

texture will also change accordingly. Therefore, stitching texture moulding is full of extension deformations. The moulding effect and drawings of them are shown in Figure 6.

It can be seen from the Figure 6 that the basic line of the stitching drawing forms countless squares of the same size, and the size of the unit texture is proportional to the side length of these squares. After experiments, we find that the size of the unit texture will also have a greater impact on the clothing style, in addition to the influence of the fabric on the final style. For the same fabric and texture type, the smaller the unit texture, the stronger the sense of refinement of the finished product. Therefore, we can affect the modelling style of the final clothing by controlling the side length of the square formed by the basic line. In addition, the use of the stitching texture moulding method will produce more overlap. Therefore, when we use this method for design, we have to estimate the size of the fabric required for making texture, so as to prevent the problem of insufficient size of the fabric required for the finished product due to fabric folding and stitching during actual production.

According to the experimental results in Table 4, the size of the finally formed texture fabric is closely related to the size of the basic square in the drawing. At the same fabric size, the size of the finally formed texture fabric is inversely proportional to that of the basic square. The larger the basic lattice, the smaller the finally formed fabric.

When we are using stitching texture moulding, we reshape the fabric language from a two-dimensional plane fabric to a three-dimensional one, bringing a sense of rhythm, space and fashion to the original plain fabric, thus forming a novel design language for the fabric.

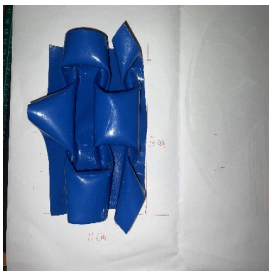
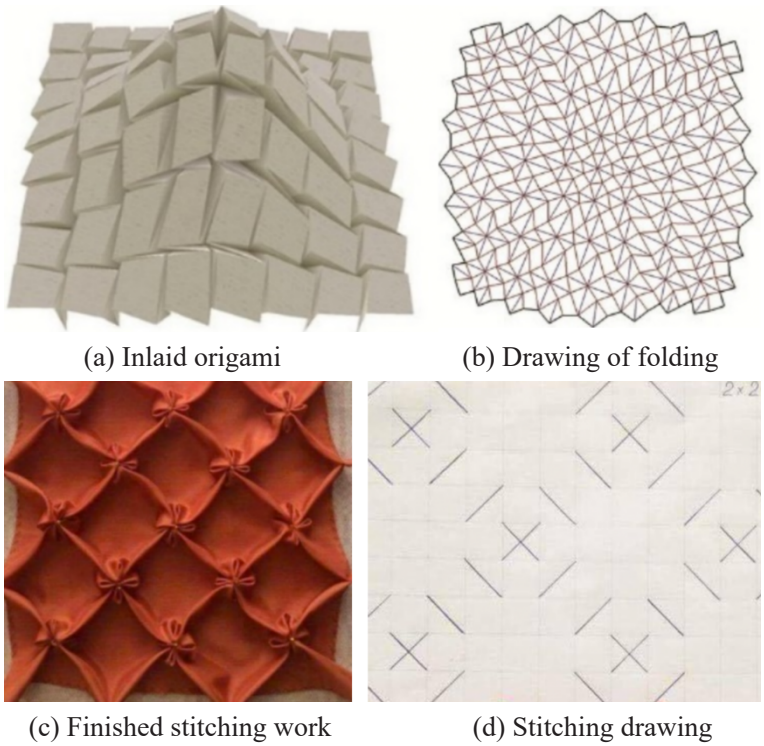
Size influence	Basic lattice 2 cm*2 cm	Conclusion	Basic lattice 3 cm*3 cm	Conclusion
Style		Delicate style		Rough style
Size of fabric		Initial fabric 20 cm * 20 cm Final work 12 cm*13.5cm		Initial fabric 20 cm*20 cm Final work 11 cm*13 cm

Table 4. Effect of cell size on the moulding effect in stitching texture moulding



(a) Inlaid origami (b) Drawing of folding

(c) Finished stitching work (d) Stitching drawing

Fig. 6. Moulding effect and drawings of the two types

2.3. Repeated Combination Moulding

Repeated combination moulding is a new method of combining small units formed by independent folding into a new fabric and structure. It is the main application method of modular combination folding. The shape of small units is mostly folded directly. After folding, whether to use a needle and thread to fix the shape can be considered according to the final shape requirements. Small units are usually fixed after direct folding, and both sides of the fabric will appear on the front of the finished fabric after folding; consequently the fabric cannot change its shape through composite lining. Therefore, the fabric needs to be screened before folding. For further discussion of the result, we did some specific experiments. During the process, we tested the folding difficulty, crease sharpness and shape retention of the fabric and compared them with different fabrics using the square rotating structure. The test results are shown in Table 5.

In addition to fabrics, the combination mode of repeated combination moulding is also an important factor for affecting the final moulding effect. After exploration, we find that the combination mode of small units can be divided into a parallel structure and overlapping structure according to their different shapes. The parallel structure can be formed directly by itself, or it can be spliced and sewn on the lining cloth as the bottom. As the latter is more time-saving and convenient when fixing, it is commonly used in the actual production of ready-made clothes; the overlapping structure means that there is a certain amount of overlap between the two units, which can be sewn together directly, or the overlap between small units is designed as a mortise- and tenon-like splicing structure. Both these two methods have their advantages and disadvantages. Direct sewing can obtain good fastness, but it lacks flexibility. On the contrary, for the splicing structure, we can choose an appropriate method

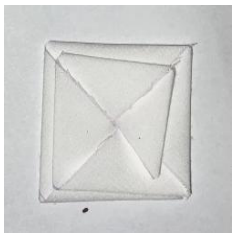
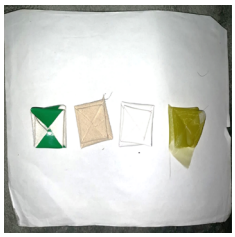
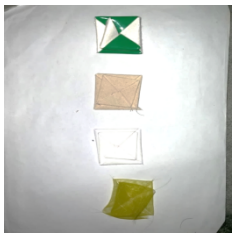
Fabric	Folding time	Crease sharpness		Effect	Conclusion
White cotton cloth	34s			Not ironed: creases are clear and moulding is stable. After ironing: ironing effect is obvious and creases are clear.	Low folding difficulty; moderate thickness of fabric after folding and ironing; shape is easy to fix; very suitable for direct folding when making small units.
Polyester fabric	43s			Not ironed: creases are clear and moulding is stable. After ironing: ironing effect is obvious and creases are clear.	Low folding difficulty; moderate thickness of fabric after folding and ironing; shape is easy to fix; very suitable for direct folding when making small units.
PU coated fabric	29s			Not ironed: creases are relatively clear and moulding is stable. After ironing: ironing effect is not obvious, and creases are relatively clear.	Low folding difficulty; the fabric is still thick after folding and ironing, and it is not easy to fix; more suitable for direct folding when making small units.
Organza	79s			Not ironed: creases are not clear and moulding is unstable. After ironing: ironing effect is not obvious, and creases are not clear.	High folding difficulty; after folding and ironing, the fabric is too thin and the shape is not easy to fix; not suitable for direct folding when making small units.

Table 5. Effect comparison of direct folding technique in different fabrics

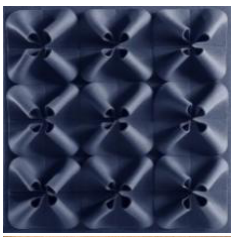
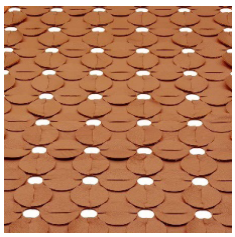
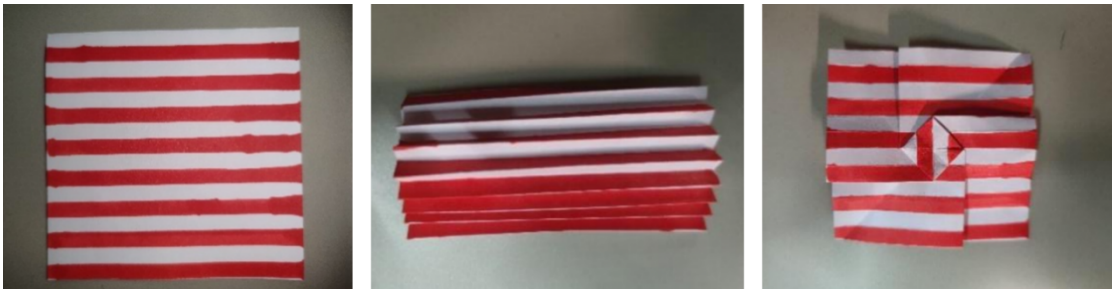
	Parallel structure		Overlay structure	
Combination mode	  Single direct moulding	Backing sewing	 Sewing moulding	 Splicing moulding

Table 6. Repeated combination form



(a) Classic stripe pattern (b) Horizontally folded stripe pattern (c) Twisted and folded stripe pattern

Fig. 7. Visual effect of stripes in different folding techniques



Fig. 8. Creative application of pattern deformation and folding method in trousers (made by the author)

according to the actual clothing shape. The effects of different combination methods can be seen in Table 6.

In practical application, it is also necessary to consider the influence of error caused by manual folding on fabric thickness. For the parallel structure, the influence of the number of folding layers on the thickness of the fabric and the size of the combined finished product needs to be considered when folding the separate small units. The higher the number of folding layers, the greater the thickness of the fabric, and the larger the gap that needs to be left in the corresponding combination. In the overlapping structure the influence of fabric thickness on the splicing gap needs to be considered. The thicker the fabric, the greater the demand for a splicing gap. In order to reduce the error, the required fabric needs to be cut at one time using manual cutting or laser cutting to avoid the error caused by the size of the fabric. When folding, a special template needs to be made for constant comparison. The use of repeated combination moulding fully demonstrates the power of repetition, and small units are interspersed and combined in different forms, bringing rich innovative inspiration to the design of clothing silhouettes and patterns.

3. Creative Application Analysis of Origami in Clothing Modelling

3.1. Pattern Deformation and Folding Application

Pattern deformation and folding application refers to the application of pattern design combined with the technique of origami art so as to give the pattern a new semi-stereoscopic visual effect. Numerous folding experiments with classic stripe patterns show us that horizontal or vertical stripes without changes in thickness distribution will give people a dull and mediocre feeling; however, the amount of overlap generated after folding will shrink and stretch the fabric, can break the dull feeling brought about by the original monotonous pattern and make the stripe pattern more vivid and flexible; In addition, twisting and folding can also be used to make a change in the angle of the pattern , so as to form a misperception effect, as shown in Figure 7.

When folded together with clothing patterns, through rich light and shadow changes, they can not only give us a sense of three-dimensional relief, but also make the patterns follow the folding direction to change the original track, so as to achieve a variety of deformation effects of a single pattern. The combination of the origami technique and clothing pattern and the use of ironing and crimping is often applied to the partial modelling of clothing. The arrangement density and distribution proportion of patterns and the composition and texture of fabrics directly affect the final modelling and dressing effect. For example, in the Issey Miyake 2013 spring and summer high-end ready-to-wear collection, such a technique was widely used at the waist to achieve the effect of waist retraction. It was very rhythmic and changed the monotony and dullness brought about by the application of lots of stripes. The pattern deformation and folding method is suitable for the local design of clothes, such as cuffs and trouser legs. This method can be compared with the unfolded part in that it guides the visual focus and highlights the three-dimensional effect of the pattern. In this practical application, it is necessary to predict the folding range and effect, and then sew it up at the overlap, as shown in Figure 8.

3.2. Fabric Transformation and Folding Application

In fabric transformation and folding application, origami technology is used to transform the fabric first, and it is then applied to the design process as a whole. Through fabric reconstruction,



(a) A sense of rhythm is formed by regular arrangement (b) A sense of ventilation is formed

Fig. 9. Comparison of different application effects of fabric stitching (handmade by author)



(a) Overall creative application (b) Local creative application

Fig.10 Overall and local creative application in different fabrics (handmade by author)

clothing fabric can obtain a rich surface texture through folding. It is designed to remould the fabric shape and give the clothing form a novel visual feeling and three-dimensional space effect. Through experimenting with fabric stitching, we find that when combined with the folding effect of the repetition principle, the fabric can not only visually extend the space, but also change the hand feel of the original material. In practical application, there are many ways of expression, such as regular stitching on the back of the fabric, so that the front can have a unique sense of rhythm, and the tactile elasticity is increased, or stitching and fixing on the front of the fabric to form a hollowed-out effect and, at the same time, increase the air permeability of the garment, as shown in Figure 9.

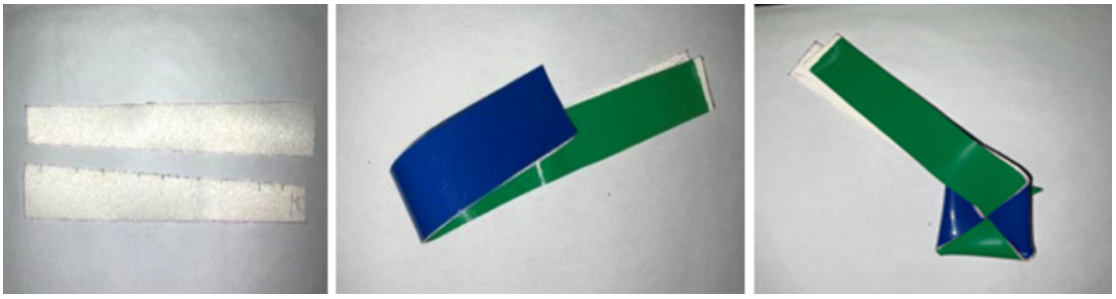
The method of fabric transformation and folding commonly used is the stitching texture forming method, shown in the Figure 9; that is, to fix the fabric overlap designed in advance with a needle and thread, so that the surface effect of origami can be obtained without directly folding the fabric. This technique is mostly used in the overall fabric texture design of clothing. Japanese designer Noir Kei Ninomiya launched a spring and summer collection in 2017 where in the whole collection of clothing only the colour black was used; but they were designed with the fabric transformation and folding method. By doing it this way, a single colour had the advantage of highlighting the design as a whole. Designers use the repeated regular folding texture to bring a shocking visual impact while taking into account the actual wear, fabric innovation and special structure together, and finally innovatively showing the clothing texture effect with rich folding techniques.

Application of the fabric transformation and folding technique is mainly to shape the surface texture of clothing, which is applicable to the overall and local application of clothing. Changing the texture of fabric and the change of distribution density both can bring new visual effects. In the overall application, shown in Figure 10(a), we only need to process the texture fabric in advance, and it can be cut and made as a normal fabric according to the template; Local application, figure 10(b), requires the additional treatment of texture edges, which is relatively more complex.

3.3. Modular Combination Folding Application

Modular combination folding application refers to the process of making units by using folding techniques, and combines these regular units by way of splicing or sewing to form a whole. This whole can be reconstructed to form fabrics before garment modelling design, or it can be directly spliced to form a new garment structure. This is a highly comprehensive application form. The combination of small units has a great degree of freedom. After experiments, we found that even small units with exactly the same structure can get a completely new texture or structure as long as the combination mode is changed. Different colours can also be used to make different units form a visual error effect through splicing. Figure 11 shows the manufacturing process.

Modular combination folding application corresponds to the repeated combination forming technique, and it can be comprehensively applied to clothing. Whether it is the overall structure or local splicing, it subverts the unchanging design logic of clothing and stimulates



(a) Cut the fabric to the required size

(b) Put the two fabrics with different colours opposite to each other

(c) Twist and fold the first layer



(d) Small cell folding completed

(e) Fix the small cell with a needle and thread to form the final effect

Fig. 11. Process of making a two-colour combination sample (handmade by author)



Fig.12 Creative application of modular combination folding method in simple silhouette

designers to generate new design inspiration. Take the "metabolism" collection of clothes as an example, they were created by Sydney designer, Bolor Amgala, who drew inspiration from Japanese architecture. The collection takes folded semi-solid blocks as the basic unit and form a unique external shape of the garments through splicing. The folding part is convex outward, the splicing part - concave inward; the convex and concave are intertwined, and light and shadow flow continuously with the change of the human body. In addition to the rich changes in texture, the modular splicing method also brings the possibility of more colour combinations. The "metabolism" collection of clothing adopts the colour contrast treatment of spacing, which not only enriches the colour but also plays the role of emphasising the structural line. Modular combination folding application cannot be adapted to complex styles and is only suitable for simple structures and profiles. In style design, the module size is usually fixed, and it can be matched with a variety of popular colours to produce rich visual effects. In practice, the combination mode and number of modules should be planned in advance, and then the garment parts should be spliced and combined, respectively, according to the garment structure. The application effect is shown in Figure 12.

4. Summary

When combining origami techniques to undertake modelling design in clothing, we need to comprehensively consider the relationship between origami techniques, clothing fabrics, patterns and structures, and the use of innovative thinking to carry out structural changes and creative design. Through case analysis, comparative research and practical exploration, we have come to the main research conclusions as follows:

First, we divide origami into two categories according to their external forms: concrete origami and abstract origami. With the help of actual cases, we summarise the three main characteristics of origami - three-dimensional space, flexible realisation structure and regular geometric arrangement - which provides a solid theoretical basis for its application in clothing.

Second, combined with the pattern, fabric and structure of clothing, this paper summaries the application of origami in clothing modelling, and

finally summarises three application forms: pattern deformation and folding application, fabric transformation and folding application, and modular combination and folding application. Through practical exploration, we studied the characteristics of different application forms: Pattern deformation and folding application endow patterns with novel expression forms; the application of fabric transformation and folding enriches the three-dimensional texture of fabrics; modular combination and folding application can be used locally to emphasise the sense of rhythm, and it can also be used in overall clothing modelling, providing new design inspiration for the clothing structure.

Third, we explored the application techniques according to the application methods, and can summarise the application effects and limitations. Ironing and crimping combined with light and shadow can produce rich changes, but there are great fabric limitations in practical application; "stitching texture moulding" can change the original characteristics and style of fabrics, giving clothing a sense of rhythm and sculpture. However, as we need to fix them manually on the back of the fabric, the time and labour cost are increased. "Repeated combination moulding" combines small units to form a texture effect, which has a flexible combination form. Combined with colour, it can produce a "visual error" effect, but manual combination will produce a certain error.

The above summarizes the application forms and techniques with origami art as the basis, gradually understanding the relationship between pattern and folding, the conversion of colour and bump, the combination of fabric and folding, and the unity of structure and form in continuous practice and exploration. We aim to make origami present in a new visual image that conforms to modern aesthetics, highlight the advantages of three-dimensional space modelling design, and play an enlightening role in the application of darts and folds in modern clothing design.

Conflict of interest statement

All authors disclose no conflict of interest.

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