

Inheritance and Innovation of Folk Textile Mending Techniques under the Traditional Concept of Cherishing Things

DOI: 10.5604/01.3001.0015.6467

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Abstract

Economised, thorough and skilful utilisation with the concept of cherishing things as its core thought is the basic design concept of traditional creation activities, implying profound philosophical thinking and life philosophy. This article, based on a theoretical interpretation of the traditional concept of cherishing things and combining methods including documents, material objects, manual restoration, etc., firstly expounds the influence and meaning of traditional Chinese folk textile mending in carrying out the concept of cherishing things in the contemporary era; secondly, it focuses on summarising the origin and development of the textile mending industry, pointing out the application prospects of hand darning techniques in nowadays market; and finally, via interpreting the comprehensive design of materials technology, pro-phase protection of preventive mending “smart creation” mode innovation of textiles, etc., this study specifically analyses the inheritance and innovation of folk textile mending techniques, so as to provide references for relevant industries and handicraft enthusiasts in the future.

Key words: concept of cherishing things; handicraft techniques; textile mending; inheritance and innovation.

Introduction

Mending is a kind of needlework phenomenon that has traditionally existed and been practiced for a long time among the Chinese people. The nature of mending is a deeply-rooted life philosophy in the concept of cherishing things of the Chinese people. According to textual research, the word “Xi Wu” (cherishing things) was first seen in the records of *Chuang Tzu*, which read that “according to my observation, you were not a wise man, for food can be found in the soil dug out from the rat hole”. Guo Xiang of the Jin Dynasty wrote in his explanatory notes that the above-mentioned words by Chuang Tzu meant “not cherishing things” [1]. The concept of cherishing things that advocated frugality was highly praised by successive dynasties and folk people. Bai Juyi of the Tang Dynasty described in *Bai Kong Liu Tie* that the prime minister Song Jing “loved people and cherished things” [2]. Among folk people, especially in terms of making clothes, since it was not easy to weave fabrics and it consumed many working hours, the concept of cherishing things could be observed everywhere. It was recorded in the *Biographies of Ancient and Present Women*, written by Xie Jin of the Ming Dynasty, that “whenever making clothes, the Empress had the silk offcuts

stitched into towels or mattresses, and said that ‘if a person lived in a rich and noble family, it was his/her duty to cherish things for Heaven and Earth. A reckless waste of things was what the ancient people definitely opposed’ [3]. In modern society, higher attention has been paid to textile mending techniques in order to implement the sustainable design concept and meet the individualised and aesthetic requirements of modern people.

Currently, little explanatory work on the inheritance and innovation of textile mending techniques has been conducted by academic circles. Research results are found in these now and then, which mainly center on three major aspects: firstly, discussion on textile darning techniques, such as *On the Mending Method of Holes in Knitted Garments* [4] by An Hongli and others; secondly, research on restoring traditional handed-down textiles, such as *On the Preservative Restoration of the Textile Cultural Relics in Japan* [5] by Gao Yan, *Methods of Using Silk Crepe in the Conservation of Ancient Chinese Textiles* [6] by Wang Shujuan, etc.; and thirdly, research on the re-design and application of discarded waste and put-aside costumes from the perspective of sustainability, such as *Design Application of the Waste Old Jeans in Modern Cloth Art* [7] by Yuan Jinlong and others. Another example is the “ragged aesthetic” derived from Japanese Boro fabrics, which has become the current fashion trend. Japanese fashion

designers Arata Fujiwara and Shinichiro Ishibashi have taken the Boro aesthetic as their inspiration, redesigning popular clothes with vintage collections. Boro folk fabric has been passed down for a hundred years. It is made of different fabrics with dense and multiple generations of stitches becoming the simple aesthetics of human life craft and the aesthetics of cherishing things [8]. Based on researches of former scholars, this article introduces the traditional concept of cherishing things which features respecting things and advocating frugality in modern textile mending to inherit and innovate China’s traditional mending techniques, with the expectation of providing references for darning and reclaiming textile costumes.

Practical significance of the concept of cherishing things featuring “making the most of things”

China’s traditional thoughts on creation stress Heaven and human beings united as one, which means the harmonious co-existence of human beings and nature. For example, it was recorded in *Zhangzi Zheng Meng* that a “man that made great achievements was always inclusive of things and did not discard things casually, loved things and did not sacrifice things. This was the natural way of Heaven”. The Taoists believe that all creatures in nature, including human beings, are created by Tao, which is summed up as

“all creatures have Tao”, and therefore all creatures in the world enjoy the same value of dignity as human beings [9]. Thus, while respecting their own lives, human beings should have a sense of awe towards other types of lives and a sense of mission to continue their existence. Influenced by such thoughts and concepts, the culture of cherishing things is naturally derived and further developed into one of the traditional virtues of the Chinese nation, which is constantly incorporated into the habits of our daily life and traditional creation techniques. Kong Qi of the Yuan Dynasty recorded a case of “advocating frugality for clothes” in *Jingzhai Zhizheng Zhiji*. “My deceased father always preferred common silk, spun silk and silk cotton clothing and only had one or two pieces of high-end fur, Zhushi silk and fine silk garments for each type. His white common silk coat had been worn for 30 years, old but not dirty. Throughout his life, he cherished things in such a way. He even carefully preserved a piece of paper, and spent every penny appropriately” [10]. We can conjure up the thoughts of cherishing things which feature making the most of things of ancient people in utilising costumes and textiles.

The concept of “cherishing things” is similar to the current green and ecological concept advocated by the whole world. The viewpoints of “making the most of things”, “loving things” and “cherishing things” comprise a positive, scientific, green and ecological concept. Moreover, it can help save resources, protect an ecological environment and pass on an attitude towards life which advocates frugality and simplicity. On the other hand, from the perspective of the folk textile mending industry, it can play the role of protecting and inheriting the talents and wisdom of our forefathers, bringing traditional Chinese handicraft back into public view with new artistic forms.

Origin and development of folk textile mending under the concept of cherishing things

Textile mending refers to processing damaged fabrics or garments with traditional folk handicraft to realise the value of re-utilisation. It implies a profound mending culture, and reflects people’s plain feeling for old things and cherishing things. Judging from documentary records such as “Xie Kuang Jie Shi Hao

Feng Qiong, Shi Zhi Xian Xian Bu Zhan Gong” (poor woman known as the sewing woman carried baskets to the markets, sewing and mending clothes for others to make a living with her thin fingers) written in *Beijing Lantern Streets Zhu Zhi Ci* (seen in *On Beijing’s Customs*), textile mending techniques and related industries have emerged in history for a long time.

Traditional folk textile mending industry

Traditionally, worn-out articles of everyday use, as long as they can be mended, will be mended as far as possible by folk people. This virtue of “cherishing things” and “simplicity” especially prevails in regions where toiling masses are gathered. This kind of mending industry consists of a large number of sectors, including cobbler’s stalls, and making food steamers, sticking fans, hooping barrels, etc. Mending textiles is also called “Feng Qiong” [11], referring to a poor woman in the past mending clothes for others. The origin of this sector is attributed to the development of traditional needlework. Since ancient times, “Nu Gong” (needlework) has been regarded as a symbol of feminine virtue, and a basic skill regulated in “Fu Gong” (women’s tasks). Therefore, females abiding by traditional Chinese “Si De” (four fundamentals in girls’ education, including behaviour, speech, appearance, and tasks) should all be proficient in the work of needle and thread [12]. However, in the past, due to social chaos and economic collapse people lived a hard life and most of the females of poor families would earn a humble income from their special skills of needlework to help support the family. Since those engaged in this sector were mainly women, it was popular to call them “Feng Qiong Po” or “Feng Qiong Fu” (a sewing woman engaged in mending clothes for others) by folk people.

In *Zhong Ya Tang Collected Works* written by Jiang Shiquan of the Qing Dynasty, there was a ballad with a special theme called *Sewing Woman*, which read “the thin clothes of the lonely woman were so ragged that even the elbow could not be covered, and the hands sewing the garments were frozen to cracking in the snow. Wind along the eaves blew down upon the face while she sat on the ground, with children crying around. The husband was unable to feed the wife, and she had to rely upon herself, earning a living by the needle with her own

hands. The frivolous may conceive the thought of intimacy, and the libertine offered money to flirt and seduce her. Did not you gentlemen see the noble ladies who lived in large houses and never touched the needle and thread? You mocked at her for being fond of needlework as a woman, but never knew she was obliged to mend clothes for others by poor life” [13]. This ballad described a scene of suffering sewing women in Beijing in a prosperous era [14]. It can also be concluded that sewing women engaging in mending clothes for others to make a living due to poverty in ancient times were a social group living at the bottom of the heap, and extremely lacked material resources.

In addition, the business cost of the traditional clothes mending industry is very low, which only needs a stool and a bamboo basket that can be carried around. Needles and threads needed for sewing and mending clothes and clean old pieces of cloth for patches are put in the basket. *Figures 1* and *2* show that folk sewing women solicited customers and mended clothes for them on the street in the Qing Dynasty and the Republic of China period, respectively. The old pieces of cloth were classified based on their colour, size and pattern. They were collected from old clothes or reclaimed from the poor at extremely low prices by the sewing women, which were supposed to be thick, solid, clean, strong and durable. Clothes with patches may not be pleasing to the eye, but they can give new life to ragged clothes. Besides, the sewing women also did some sewing work on certain key parts of new clothes, such as collars, elbows, knees, buttocks, etc., which played a certain role of reinforcement. New clothes processed in this way would be more durable, which was warmly welcomed by labourers engaged in physical work.

On the basis of traditional embroidery, weaving, cloth sewing and hand stitching, traditional textile repair techniques, such as embroidery mending, weaving, patching and sewing were also derived.

In general, the clothes mending industry is a special product of the old society, which was short of materials. There are some folk proverbs such as “a new piece of clothing becomes old being worn for three years, an old piece of clothing becomes ragged after another three years, and ragged clothes will be mended to



Figure 1. “Sewing women” on the street in the late Qing Dynasty (handed-down photo).



Figure 2. Sewing women on the street of Shanghai in 1948 (handed-down photo).

wear for another three years”, and “the first child enjoys a new piece of clothing, the second child has to wear old clothes left by the first child, and the third child can only wear mended clothes left by the former” etc., from which we can conclude that it was near impossible to own a piece of clothing without patches in the context of extreme shortages of materials at that time; hence, the impoverished social economy promoted the development of the clothes mending industry. Later, with the founding of the People’s Republic of China, people’s living conditions were gradually improved and the need for clothes mending became less and less. The industry gradually disappeared, replacing tailor shops and the darning industry with physical stores.

Modern textile mending industry

With the development of the social economy, people’s living standards have constantly improved. The textile mending industry is no longer the product of an impoverished life. With the inheritance of traditional handicraft techniques, the upgrading of mending categories and the innovation and development of mending technologies, this industry has become an “old”, “high-end” and “emerging” industry.

Firstly, “being old” is reflected in the long history of mending techniques. The mending industry came into being from the moment when handicraft appeared, which was earliest seen in the mending of official robes, divine robes

for the occasion of sacrifices, and stage costumes. Modern textile mending continues to adopt traditional handicraft technologies. On the basis of traditional embroidering technology, knitting technology, cloth paste technology and garment hand-stitching technology, various forms of mending techniques are derived, such as “Xiubu” (mending by means of embroidering), “Zhibu” (mending by means of weaving), “Tiebu” (mending by means of pasting) and “Fengbu” (mending by means of sewing), etc.

Secondly, “being high-end” is reflected in the mended objects on the one hand. The mended objects of this industry have changed into all kinds of high-end items, including brand name garments, etc., and customer groups have changed from salaried to high-end customers. Taking the example of the Hangzhou-based darning studio run by Wang Suzhen and Dong Huaili, mother and son, in addition to some ordinary clothes, their mending business more involves the mending of international brand garments, shoes, bags, sofas and even canvas tops. On the other hand, the textile mending industry has developed a “pyramid” industrial structure. Its business model has become regularised, transforming from the former “street” handicraft into self-employed family workshops, studios and private enterprises. Its service objects are no longer confined to the working class, but are more engaged in the high level consumption group. Technological requirements are more precision- and

high-quality-oriented, and multi-level services are provided.

Thirdly, “being emerging” is mainly reflected in the mending concept and technologies. Traditional mending technologies are simple and have certain practicability, but they lack various forms and a sufficient sense of aesthetics, possessing limitations of design. While modern textile mending stresses the concept of “destroying the old and establishing the new”, it changes the former idea of “mending the old with old materials and piecing together with several pieces”. Based on the types of “damage”, it skillfully applies all types of technologies and combines fashion and aesthetics from the perspective of designing to add a new decorative artistic effect to textiles, endow new fashion of the era with traditional handicraft, and regain the artistic vitality of mending objects while achieving the goal of mending the damage.

Application of hand darning techniques

In the current mending industry, the major form of textile mending technology is hand darning, which is complemented by machine darning. In hand darning, weft and warp yarns are woven onto the damaged spots of textiles in accordance with the texture of the fabrics by hand needlework, which is usually combined with embroidering stitches, presenting an overall style of individualised primitive simplicity. Compared to machine darning, this form takes more time and

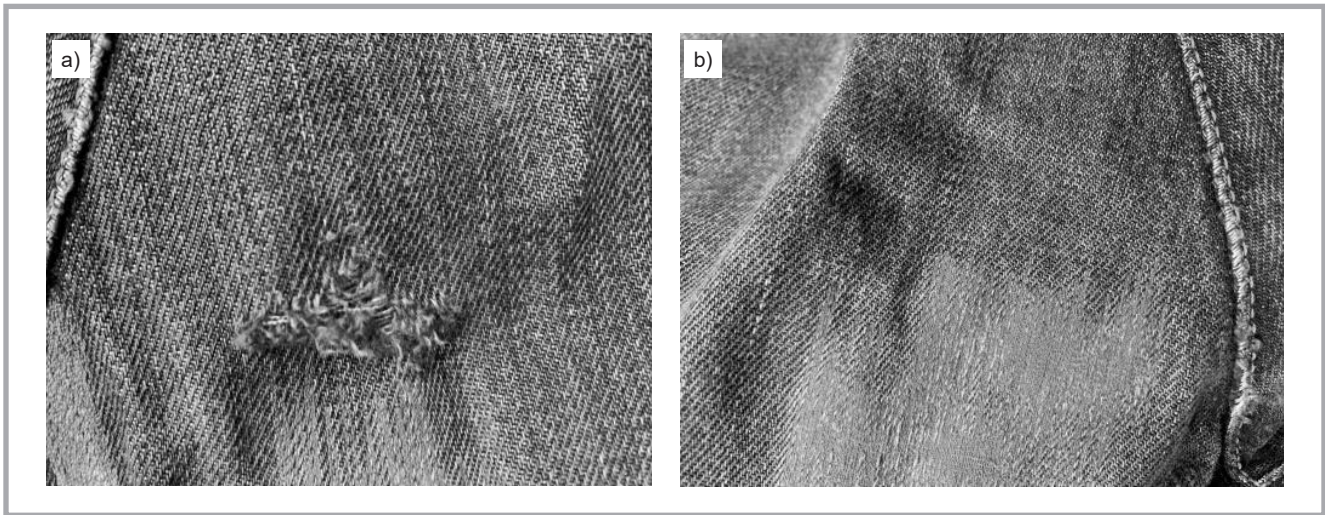


Figure 3. Effect of machine darning (mended by the author): a) before mending; b) after mending.

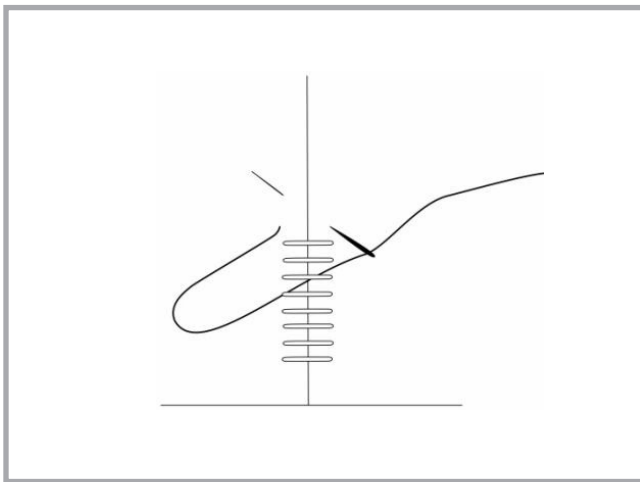


Figure 4. Yizizhen sewing method (drawn by the author).

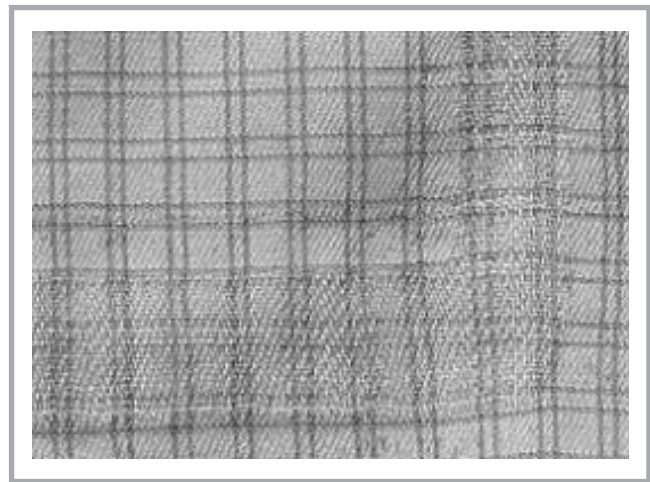


Figure 5. Rendering of simple darning (mended by the author).

is more costly; but it is flexible and especially of great significance for mending and sewing some high-end garments [15]. Machine darning applies sewing machines to mend damaged spots by imitating the colours and texture of textiles with special imitating mending technology. It presents a better effect boasting no more marks on fabrics with densely arranged patterns than with sparsely arranged ones. While for fabrics with big flowers or sparse patterns, embroidery mending by machines is more suitable. As a powerful supplement to hand darning, machine imitating mending technology can deal with jeans and all types of clothes with floral prints for which traditional hand darning cannot achieve good effects, as shown in **Figure 3**. However, although this kind of darning technology effectively saves time in darning, regarding the high precision and delicacy of hand darning, the diversity of materials and stitches as well as the convenience

of gathering materials on the spot alone cannot be fulfilled and entirely replaced by industrial machines.

Hand darning can be divided into three types according to mending requirements; namely, sewing, simple darning and delicate darning. The sewing method is the major mending way of the early stage clothes mending industry. It is easy, convenient and fast to operate the stitches, only needing a needle and thread to sew up the holes. However, comparatively it does not look very beautiful. The hand needling technology shown in **Figure 4** is Yizizhen (the stitches take the shape of horizontal line segments after mending), which is mainly applied in splicing and sewing up fabrics, flat features, and thin seams. Simple darning refers to covering or mending holes by weaving the weft and warp yarns into plain weave or twill weave, while not following the former texture or density.

The former textile shown in **Figure 5** is a plaid pattern. After darning, it seems to be similar to the former texture, but there exists a lack of yarn feeding and supplementing. Due to the lack of yarns, the texture is rougher than the former textile, and the seam around the hole is not closely connected and cannot be combined with the surrounding structure, which looks unnatural and has obvious marks. Although the final effect is not that satisfactory, simple darning is indispensable in the current darning market for its rapidness, high efficiency and low charge.

Delicate darning refers to a restoring method of complete restoration in accordance with the former texture of fabrics. The number of warp and weft yarns that will be supplemented should be exactly the same as the absent ones in the holes, and an error of even one more or one fewer will not be allowed. Seiko darning is a repair method to completely restore the

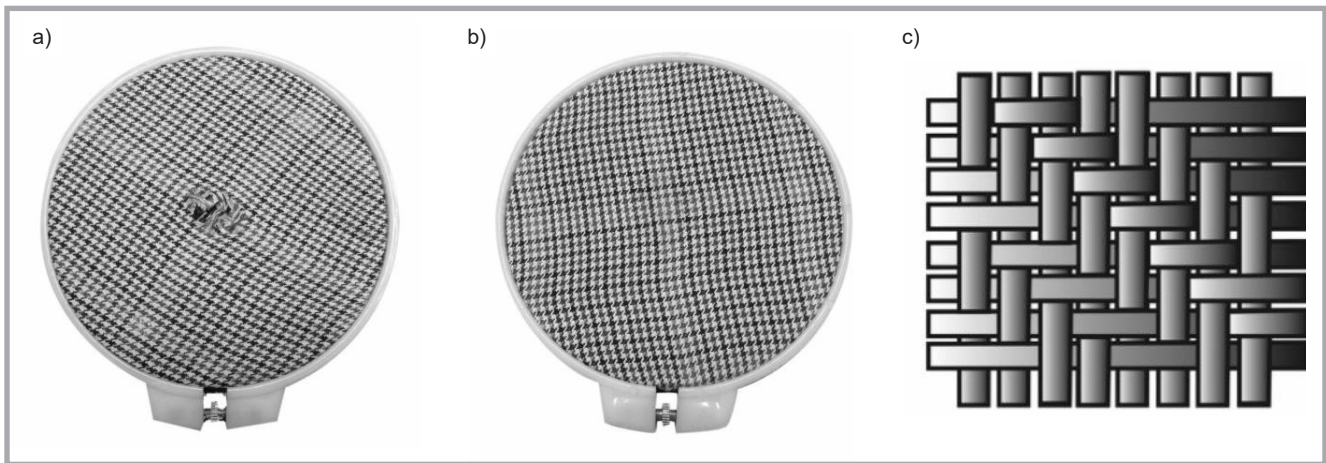


Figure 6. Effect of delicate darning (mended by the author): a) before mending, b) after mending, c) structure of repairing.

original texture of the fabric. The broken warp and weft yarn must be filled up with as many as is missing, no more, no fewer. The supplemented weft and warp yarns should be a perfect match with the absent yarns, which will neither be in the wrong rows nor lines. The mending effect is shown in **Figure 6**. As the saying goes, “the texture is connected”, which means that the edges of the mended area and the hole should be closely connected and the former texture be completely restored. In addition, the tightness of yarns should be alike, which requires the effect of being neither loose nor tight as seen by the naked eye. Delicate darning was introduced in *Brave Qingwen Mended the Peacock Feather-Gold Coat with Illness*, Chapter 52 of *The Dream of Red Mansion*. Jia Baoyu wore a Russian-made peacock feather gold coat to attend his uncle’s birthday banquet, but due to carelessness, a hole the size of a fingertip was burnt in the back of the robe. Since it was too late to find a skilled tailor, Qingwen, disregarding her illness, darned the coat with peacock feathers and golden threads by herself. In terms of being a specific darning process, it was described in the novel as follows: “first of all, she tore open the lining, used a bamboo embroidery hoop the size of a tea cup mouth to hold the back, and then scraped the four edges of the hole loose with a gold knife. After that, she sewed two lines with a needle to mark the weft and warp, just like the method of dividing boundaries which segregated areas first, and then darned it back and forth in accordance with its former texture. After darning, one would not be able to realise that it had been darned if not observed carefully” [16]. Compared with simple darning, this darning form is more delicate and boasts a better

darning effect. After darning this way, the areas around the hole have no obvious marks. The mended area can fit together perfectly with former fabrics. But it exerts higher requirements on the skills of darners and consumes more time and energy. Currently, it is mainly applied in the field of high-end garments.

However, it is noteworthy that delicate darning technology is not suitable for all mending occasions. It should be chosen in accordance with the specific fabric texture of textiles and in regard to the yarns. The fabrics of textiles mainly consist of knitted, woven, and non-woven (for example, non-woven fabric) fabrics. Usually, all weft knitted fabrics, especially wool material fabrics, can be processed with delicate darning, and the effect is good. But for weft knitted chemical fiber fabrics, other forms of darning are usually applied, such as simple darning, or Huanbubu (mending with different fabrics), Shejibu (mending by means of designing). Xiubu, etc. That is because chemical fiber fabrics are usually thin and have a high density, requiring interweaving and pulling yarns back and forth during the darning process. If the yarns are thin and not strong, the fabric tends to pill when pulled in and out. Therefore, the delicate darning method is not usually applied in darning chemical fiber fabrics. Meanwhile, for special materials, such as fur, non-woven fabrics, etc., other forms should be applied to mend as far as possible.

With the improvement of people’s living standards, more and more high-end clothes are purchased by the masses, and people tend to pursue the perfection of clothes more and more. The darning

marks of simple darning and sewing technology are obvious, which leaves a “scar” influencing the beauty; thus, they cannot meet people’s expectations of life. While through delicate darning, the holes can be mended with such an effect of there “being a seamless heavenly robe” and a higher use value. Therefore, delicate darning technology enjoys vast development prospects in the mending market and is a kind of handicraft technology worthy of inheritance and being promoted.

Innovation and tentative ideas about folk textile mending techniques

Currently, society is rapidly changing from an industrial civilisation to one of information i.e. the intelligent science and technology era. Textile-related technologies and techniques have been upgraded significantly. Therefore, while inheriting traditional textile mending techniques, we need to explore new types of textile mending techniques from multi-dimensional perspectives of materials, technologies, aesthetics, functions, etc., in the context of “development” and “modernisation”.

Comprehensive materials and technology re-design add beauty and practicality to mending

It is the most common mending requirement to find, as far as possible, raw materials to implement “original state restoration” (mending without marks). But not all old items can be restored with the effect of seeming like new ones. Comprehensive material mending can effectively avoid such kinds of problems. Different

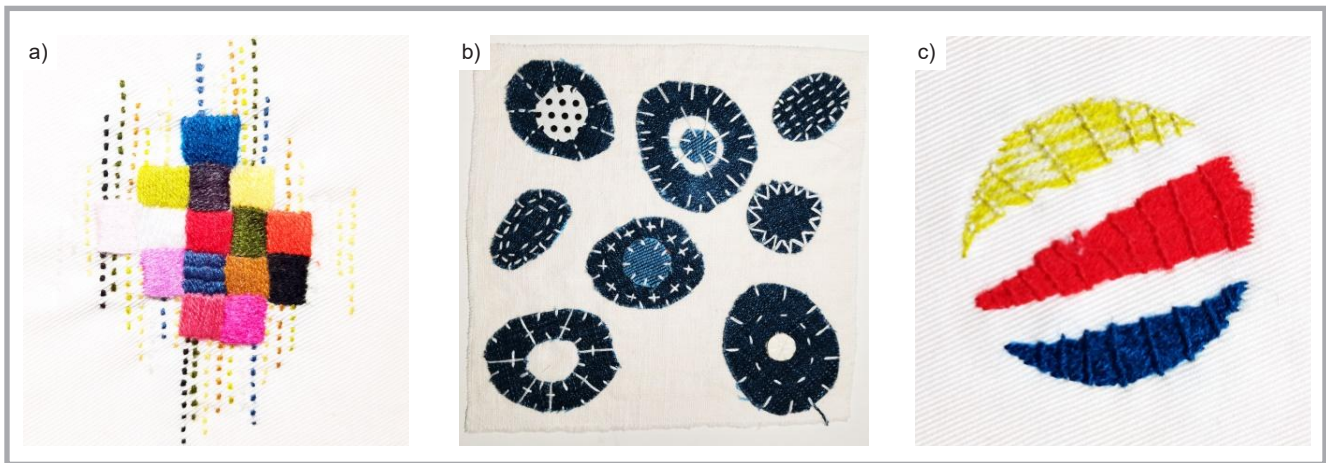


Figure 7. Creative mending cases (designed and mended by the author): a) case 1, b) case 2, c) case 3.

from traditional mending technologies, it can not only restore items in accordance with the original state but also implement artistic expression in an unrestrained and vigorous style [17], that is, mending with marks. As with the mending philosophy of Kintsukuroi (a kind of technology that applies natural materials to mend damaged utensils), for restorers, the technology of mending with marks is not only a matter of restoration but also a kind of life attitude to implement the re-creation of the original items, which can fully reflect the restorer's heart of cherishing things. This kind of mending technology organically integrates traditional handicraft with modern design, representing the stage of being upgraded from "industry" to "art", and increasing the pleasure of mending [18].

From the perspective of artistic design, regarding textiles with different types of damage, diversified technologies and material mending methods can be applied to implement the "re-creation" of damaged textiles, combining the characteristics of texture, veins, colours, textile styles, etc. The "creation" can be implemented with two types of mending forms i.e. flat and three-dimensional forms on the basis of the structure and colour of the former textiles, combining the technological forms of hand sewing, crocheting, embroidering, etc. **Figure 7.a** shows flat form mending, which applies yarns with contrastive colours to sew weft knitted weave, plain weave, twill weave, etc., so as to cover the holes by crocheting and hand knitting forms, and finally present an effect of colourful plaid. In **Figure 7.b** the most original mending method or cloth paste form is applied to patch a piece of figured cloth or cloth with the same tones of colours inside

the holes or on the surface, combined with simple running stitches as decoration, and finally a kind of original and fashionable style is presented [19]. This mending form can repair holes and, at the same time, create highlights on clothing. **Figure 7.c** shows the mending method of modern-style pattern collective embroidering of stitches, which presents a strong sense of modern art.

Applying preventive mending methods to implement early-stage protection measures on textiles

Currently, textile mending usually applies the way of solving problems when problems appear, while little attention has been paid to the protection of textiles. Therefore, in the future, the textile mending industry should change the direction of mending. In addition to mending damaged textiles, preventive protection can be implemented on textiles to extend their service life and enhance their practical values. Preventive mending is different from traditional mending technologies, aiming at reinforcing and protecting textiles. Therefore, in terms of mending technologies, it should abide by the principle of reducing intervention and moderate intervention. Generally speaking, it can be started from the yarn materials and costume structures of textiles, etc. For example, the re-twist method can be applied for certain areas of garments that are easily damaged, such as armpits, back collars, cuffs, etc. Yarns will be twisted into threads with the same size as those of the original yarns to reinforce and mend the damaged spots. Another choice is to apply embroidery technology to the edges and certain parts of textiles to decorate them, and also play the role of protection.

Starting from the origin of textile "intelligent manufacturing" to updating mending models

Traditional hand mending techniques are limited by social production conditions. Simply depending on hand mending has obviously been unable to meet the needs of modern society development. A combined form of modern materials with traditional hand mending technology can be properly applied to mend items. Modern new materials are being developed with the tendency of high performance, high functionalisation, high intelligentisation, composite, performance limitation, and being environmentally friendly. The application of new materials can usually improve the quality and durability of products. For example, traditional woven mulberry silk fabric is easy to split, but after adding an appropriate amount of spanned fiber, the fastness of the sewing part will be further increased, and the phenomenon of fabric splitting also reduced. Therefore, textile mending should also be based on such new types of materials, understanding their serviceability and exploring the possibility of their application in textile mending. For example, the new types of self-healing fabrics are very suitable to be applied for outdoor products. Besides this, the new types of mending tools, such as self-healing coating materials developed with self-healing nanotechnology, can mend the damage by themselves. The development of new types of fabrics is an inevitable trend in the textile industry. The combination of traditional textile mending techniques with new types of fabrics will create new user experiences, which is worth exploring and researching.

■ Conclusions

Guided by the concept of cherishing things, which features respecting things and advocating frugality, China's traditional folk textile mending techniques have a long history and a far-reaching influence. Currently, in the context of the sustainable development concept of the times, mending techniques are not only an important means of protecting and restoring textiles but also an important way to meet the requirements of a diversified fashion life for modern people. On the basis of inheriting and revitalising traditions, the modern textile mending industry presents high-end and innovative features, and starts to pay attention to the decorative artistry and practical functions of mending as well as the design and creation of a mending personality. It also actively innovates and introduces emerging technologies in the field of science, technology and intelligence, expecting to form a more professional and industrialised development mode of a larger size in the future, which has important reference value for inheriting and innovating traditional handicraft.

Acknowledgements

This work was supported by "Research on the Inheritance and Innovation of Traditional Costumes Techniques under the Perspective of Ecological Culture", a humanities and social sciences research program of the Ministry of Education (Z2019103009907), "The Regional Characteristics and Cultural System Establishment of Costumes

of Jiangsu", a key philosophy and social sciences research program of colleges and universities (2018SJZDA130), and the 'Second-tier Young and Middle-aged Leading Talents Program of the "333 Project" of Jiangsu Province (BRA2016366).

References

1. Notes by Guo Xiang, Pronunciation And Explanation by Lu Deming. *Chuang Tsu* [M]. Shi De Tang edition, Ming Dynasty, 10: 110.
2. Bai Juyi. *Bai Kong Liu Tie*[M]. The Complete Library in the Four Branches of Literature edition, 100: 92.
3. Xie Jin. *Biographies of Ancient and Present Women* [M]. The Complete Library in the Four Branches of Literature edition, 3: 53.
4. An Hongli, Li Manyu, Chen Lingling, Zheng Wei, Yang Minghui and Liu Mengru. *On the Mending Method of Holes in Knitted Garments* [J]. Light and Textile Industry and Technology, 2020, 49 (09): 85-87.
5. Gao Yan. *On the Preservative Restoration of the Textile Cultural Relics in Japan* [J]. Relics and Museology, 2017 (01): 85-88.
6. Wang Shujuan. *Methods of Using Silk Crepe in the Conservation of Ancient Chinese Textiles* [J]. Sciences of Conservation and Archaeology, 2016, 28 (02): 67-72.
7. Yuan Jinlong, Wang Yue, Qian Xin, Wu Huiyi and Wu Yan. *Design Application of the Waste Old Jeans in Modern Cloth Art* [J]. Journal of Clothing Research, 2020, 5 (04): 316.
8. Zhao Jiaqin. *Interpretation of Japanese traditional Boro craft* [J]. Journal of Folk Art, 2021 (02): 112.
9. Chen Li. *The Durability Design of Modern Commodity Under The Traditional Concept of "XIWU"* [J]. Design, 2017 (11): 118-119.
10. Yuan Dynasty] Kong Qi. *Jingzhai Zhizheng Zhiji* [M]. The Mao Manuscript, Qing Dynasty, 4: 68.
11. Cheng Shanqing. *Historical Records under the Heavenly Bridge* [M]. Beijing: Joint Publishing Press, 1997: 107, 406.
12. Xu Jia. *Knitting and Needle s* [J]. Art Research, 2017 (01): 119.
13. Jiang Shiquan. *Zhong Ya Tang Collected Works* [M]. Block-printed edition of Cangyuan, the 21st Year of Jiaqing Regime, Qing Dynasty, 30: 126.
14. Xu Guohua. *Being Upright Regarding Loyalty and Filial Piety, Being Happy to Die as a Good Official – On the "Loyalty and Filial Piety" Awareness and "Good Official" Complex in Jiang Shiquan's Poems* [J]. Social Sciences in Ningxia, 2008 (02): 167.
15. Wei Xiaojun. *On the Rebirth and Development of Traditional Costumes Handicraft* [D]. Soochow University, 2005:10.
16. Cao Xueqin and Gao E. *The Dream of Red Mansion* [M]. Foshan: South Sea International News Publishing Center, 1993: 236.
17. Wei Qian and Ouyang Xuefen. *The Unique Performance of Fiber Materials in Ancient Ceramic Restoration* [J]. Art&Design, 2019 (01): 140-141.
18. Yin Jie. *Application Research of Gold Restoration Process in Ceramic Art Design* [D]. South China University of Technology, 2018:32.
19. Liao Ruhan. *The Changes of Patch Forms and the Birth of Fashion Meaning* [J]. Tianfu New Idea, 2017 (06): 126.

□ Received 26.04.2021 Reviewed 12.07.2021

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- processing, modifying, and application of biopolymers,
- techniques and technologies of manufacturing, processing, and application of chemical fibres and other polymer materials and related products,
- techniques and technologies connected with manufacturing, processing and application of products of the pulp and paper industry and related branches

R&D activity includes the following positions, among others:

- biopolymers – modifying and processing,
- functional, thermoplastic polymers,
- biodegradable polymers and products from recovered wastes,
- industrial biotechnology, e.g. bioprocesses for modifying and processing polymers and fibres, and biosyntheses of nanobiomaterial polymers,
- biomaterials for medicine, agriculture, and technique,
- nano-technologies, e.g. nano-fibres, polymer nano-coatings, nano-additives for fibres.
- processing of polymer materials into fibres, films, micro-, and nano- fibrous forms, and nonwovens,
- paper techniques, new raw material sources for manufacturing paper pulps,
- environmental protection,

The Institute is active in implementing its works in the textile industry, medicine, agriculture, plastic processing, filter and packing materials manufacturing, as well as in the cellulose and paper industries.

The Institute has the following five laboratories, which have accreditation certificates PCA:

- Laboratory of Microbiology
- Laboratory of Biodegradation
- Laboratory of Environment Protection
- Laboratory of Metrology
- Laboratory of Paper Quality

The Institute's offer of specific services is wide and differentiated, and includes:

- physical, chemical and biochemical investigations of biopolymers and synthetic polymers,
- physical, including mechanical investigation of fibres, threads, textiles, and medical products,
- tests of antibacterial and antifungal activity of fibres and textiles,
- investigation in biodegradation,
- investigation of morphological structures by SEM and ESEM
- investigation and quality estimation of fibrous pulps, card boards, and paper products, including paper dedicated to contact with food, UE 94/62/EC tests, among others.
- Certification of paper products.

The Institute is member of domestic and international scientific organisations, the following, among others: EPNOE Association-European Polysaccharide Network of Excellence, Polish Chitin Society, Centre of Advanced Technology of Human-Friendly Textiles 'PROHUMANOTEX', Polish Platform of Textile Technology, Polish Platform of the Forest-Wood Technology Sector, International Scientific Network 'Environment versus Technology' ENVITECH-NET.

The Institute participates in the following strategic research projects: KEY PROJECT: 'Biodegradable fibrous goods', BI-OGRATEX – PO IG 01.03.01-00-007/08; FORESIGHT PROJECT: 'Modern technologies for textile industry. A Chance for Poland' – UDA – PO IG 01.01.01-00-005/09-00 (as a leader); STRATEGIC PROJECT: 'Technology for the preparing of biodegradable polyesters using renewable raw materials', BIOPOL – PO IG 01.01.02-10-025/09; STRATEGIC PROJECT: 'Application of biomass for production of environmentally friendly polymeric materials', BIOMASS – PO IG 01.01.02-10-123/09.

The Institute organises educational courses and workshops in fields related to its activity.

The Institute is active in international cooperation with a number of corporation, associations, universities, research & development institutes, and companies from Austria, Germany, Finland, France, Sweden and the United States among others.

The Institute is a publisher of the scientific journal 'FIBRES & TEXTILES in Eastern Europe'; the journal is since 1999 on the 'Philadelphia List' of the Institute for Scientific Information.

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