An Approach to Extracting Embroidery Patterns of Traditional Ainu Clothes

Masaaki Minagawa
Sapporo Gakuin University, Japan

Abstract

In this paper, a method for extracting traditional characteristic embroidery patterns from Ainu clothes is described. To tracing a digital image and creating a line drawing of an Ainu embroidery patterns, a method for basic pattern element extraction, and an overall pattern extraction for the entire clothes was developed. In overall pattern extraction, it was shown that many patterns that can be drawn with a single stroke could be extracted in the clothes images, when the traditional "one-stroke sewing" hand movement method was used.

Keywords: digital archive, ainu clothes, embroidery pattern, line drawing.

Introduction

The objective of this study is to examine how to digitize materials and to use the digitized information in the process of constructing digital archives of regional folkcraft articles. The targeted materials of archiving in this paper is the clothes traditionally used by Ainu people (Ainu History and Culture:Ainu People (n.d.)), who are indigenous to northernmost areas of Japan. These clothes have characteristic sewing and stitching patterns and are culturally and historically important folkcraft articles worth preserving (Historical Museum of Hokkaido 1999, Ainu History and Culture: Clothing (n.d.), Ainu museum 2001).

By constructing a digital archive system, the author has attempted to record and save images of such materials in digital form, traced patterns of embroideries, created line drawings of them, and saved them for later use. In the pattern tracing work, the photographed image of the material is read to the computer as an input image, and the characteristic lines such as contour lines and embroidery lines are traced and drawn. Compared to the case of manual tracing, it is expected that this trace work using computer will be more efficient. Since the digital data are stored and can be edited and worked with greater flexibility, and it will be easier to utilize in many ways. Fig. 1 shows the framework of digitization process proposed by the author (Minagawa 2017). In the first stage of material digitization, images are created by photography and scanning. After that, it is possible to visualize the data in various forms such as two-dimensional and three-dimensional computer graphics. And, vector data (coordinates information) extracted from the line drawings can be utilized for computerized embroidery drawing.

In the approach made here, the author has extracted two types of patterns. One is the Ainu embroidery patterns (Ainu-siriki (n.d.), Ainu Museum 2009) which have shapes that are easy to distinguish. These can be regarded as basic embroidery elements. The other is the pattern as a whole which supposedly consists of collections of the basic elements. In order to trace embroideries of the entire clothes, just extracting the basic elements and combining them is not enough as shown below. It is necessary to find the rules that make up the pattern, taking into account the needle movement for actual process of stitching embroideries.
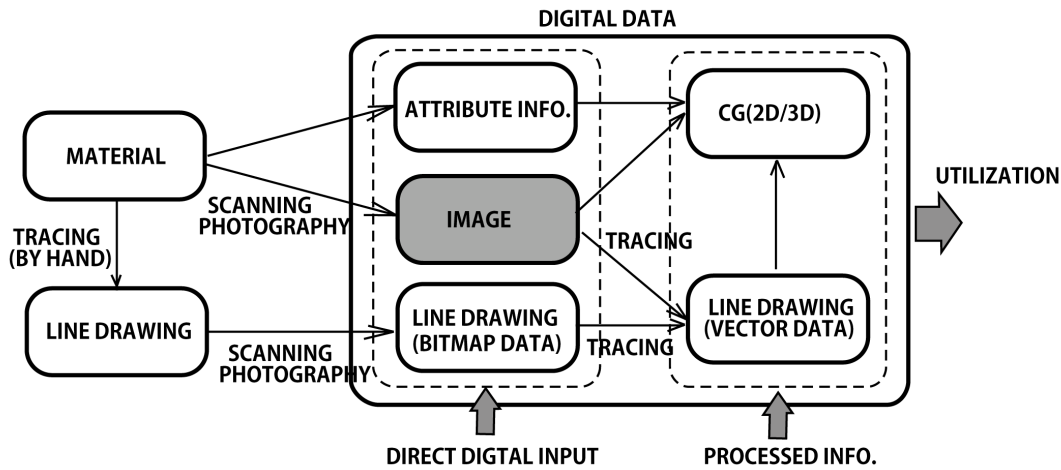
Fig. 1: Digital data creation process

Ainu Clothes

Ainu clothes are characterized by the materials and patterns on the clothes body. From the view point of materials, clothes made by Ainu people are classified as follows.

Clothes made of animal hides and furs
Clothes made of plant fibers
Clothes made of cotton

As listed below, ainu clothes are named after material used and embroidery (Ainu History and Culture: Clothing. (n.d.)).

Attush
Retarpe
Chikarkarpe
Runnpe
Kaparamip

The embroidery patterns are commonly found in bark coats, grass coats and cotton coats. The "kirifuse" pattern is a small linear cloth arranged horizontally and vertically on clothes body, and the embroidery pattern is a pattern made using threads (Ainu Museum 2009). And, there are two types of embroidery patterns: one is embroidered over the kirifuse patterns and the other is embroidered on a clothes body directly. In the example of Fig. 2, the black and thick band-shaped part is a "kirifuse" pattern, and the white and thin part is the embroidery.
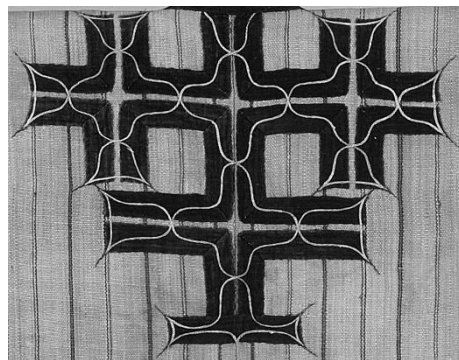

Fig. 2: An example of "kirifuse" pattern and embroidery pattern

Extraction of the basic ainu embroidery pattern

The basic elements of the Ainu embroidery pattern include the Aiushi (ai-us-siriki), which represents the thorns, the Moreu (morew-siriki), which represents the spiral, the shiku (sik-siriki) which represents the eyes, and the Utasa (u-tasa-siriki) which represents the crossing pattern and so on （Ainu-siriki (n.d.). Where "siriki" means "pattern" in ainu language. In the examples below, the basic pattern to be extracted are Aiushi and Utasa as shown in Fig. 3 and Fig.4. As shown in Fig.3, the Aiushi pattern is handled in three patterns A, B, and C here. In the Utasa pattern in Fig.4,, the left is a kirifuse pattern and the right is an embroidery pattern.
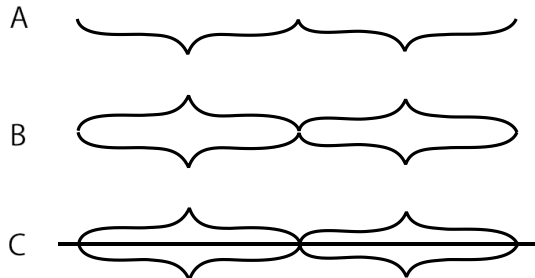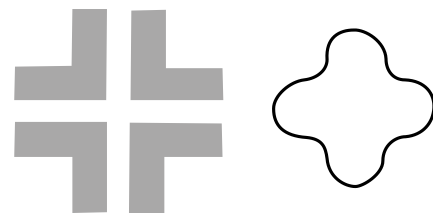
Fig.3 Aiushi pattern

Fig.4 Utasa pattern

Tracing the Embroidery Pattern

To make the tracing work regular and consistent, we adopt the method of "one-stroke sewing" (Nishida 2007, Tsuda 2008). The one-stroke sewing is an empirically established needle movement method for embroidery. In the traditional needle movement method, from the start point to the end point, as shown in the points A and B in Fig.5, the needle does not change the direction of movement in a discontinuous manner such as making a sharp turn. The thread crosses itself at the intersection points. This method is applied to trace the overall pattern
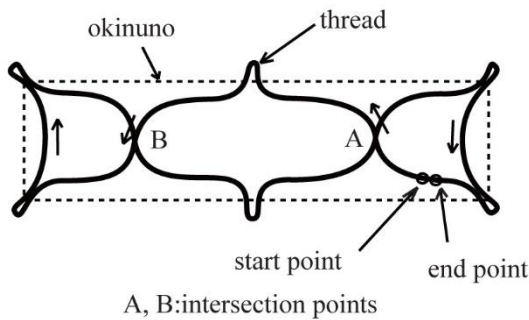
Fig. 5 Basic pattern of needle movement

Results
Results 1

Fig. 6 (left) shows the result of extracting the Aiushi embroidery pattern from the example of fig.2. And Fig.6 (right) shows the result of extracting the Utasa pattern. From these results, depending on how we see the shape of the patterns, both Ayushi patterns and Utasa patterns can be extracted in the same area. When element patterns cannot be extracted in a simple way by just matching the pattern elements, the assumed patterns are extracted by applying an extended rule (Minagawa et al. 2010). This implies that the overall patterns cannnot be constructed in a consistent manner, by simply matching and combining element patterns.
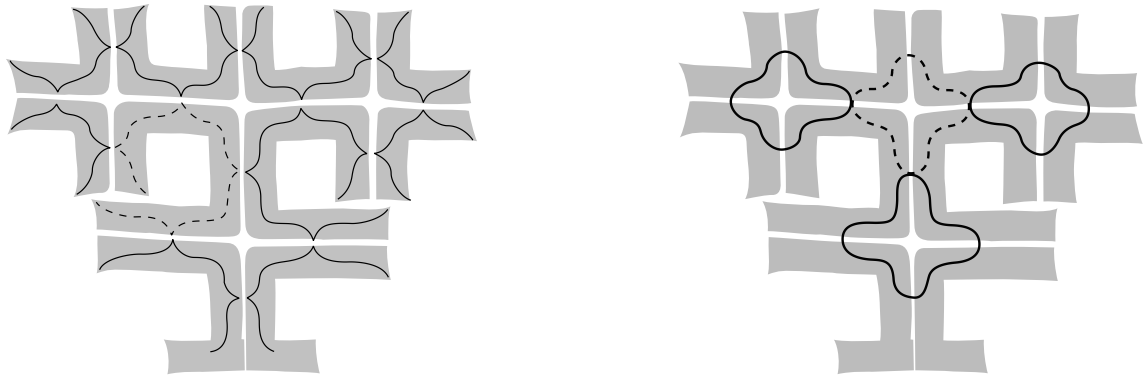
Fig.6 Extracted Aiushi pattern (left) and Utasa pattern (right).

Results 2

Fig.7 shows an apron which has kirifuse and embroidery. The result of extracting the Aiushi pattern for the outer periphery along the arrangement of the kirifuse is shown on the left in Fig. 8. Extracted patterns are drawn in solid line. The result of tracing a pattern with a single stroke is shown on the right of Fig. 8. All the patterns can be drawn using two lines (shown as a solid line and a broken line in the figure). It is observed that the line drawing of the trace result is symmetrical.
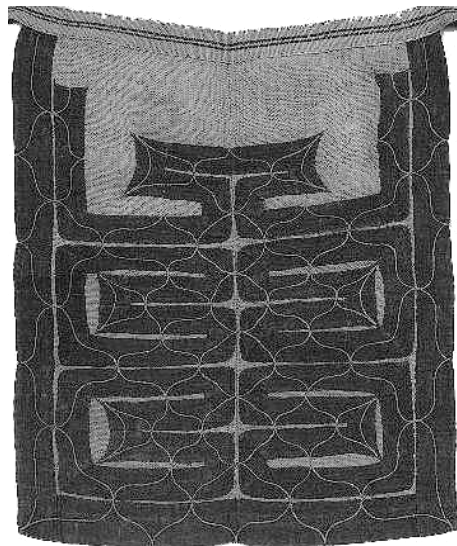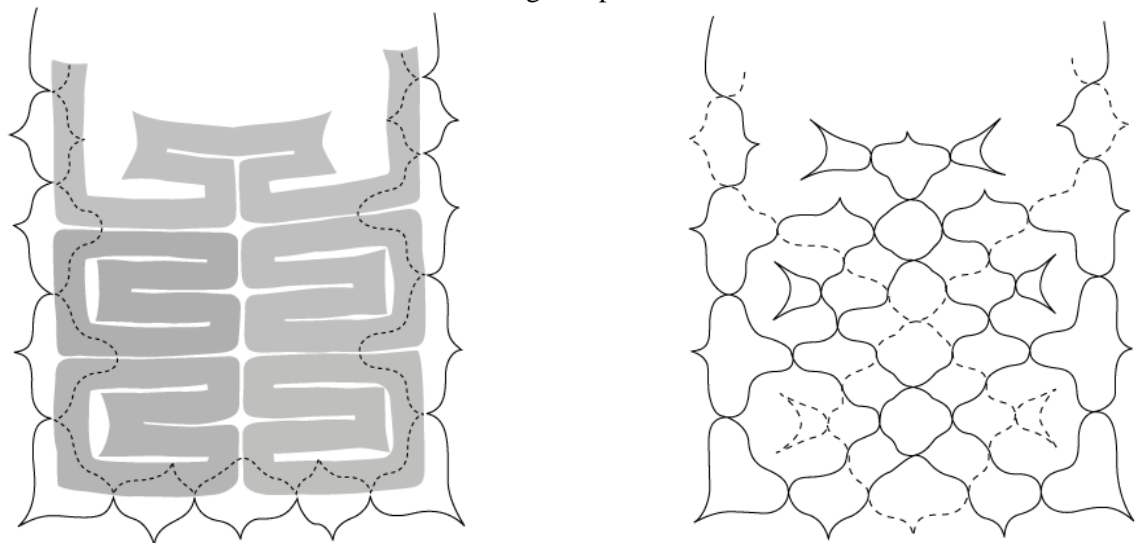

Fig.7 Apron

Fig.8 Extracted Aiushi pattern (left) and overall pattern (right).

Results 3

    Fig.9 shows the result of extracted patterns of Ainu clothes traced according to the rule of "one-stroke sewing". (Minagawa et al. 2010) The pattern of the entire clothes was drawn using back and front images. The number of the extracted "one-stroke sewing" lines is 35, and a large stroke pattern that occupies half of the overall area was extracted in the lower half of the clothing. From the results shown here, "one-stroke sewing" method is applicable to overall embroidery pattern extraction.
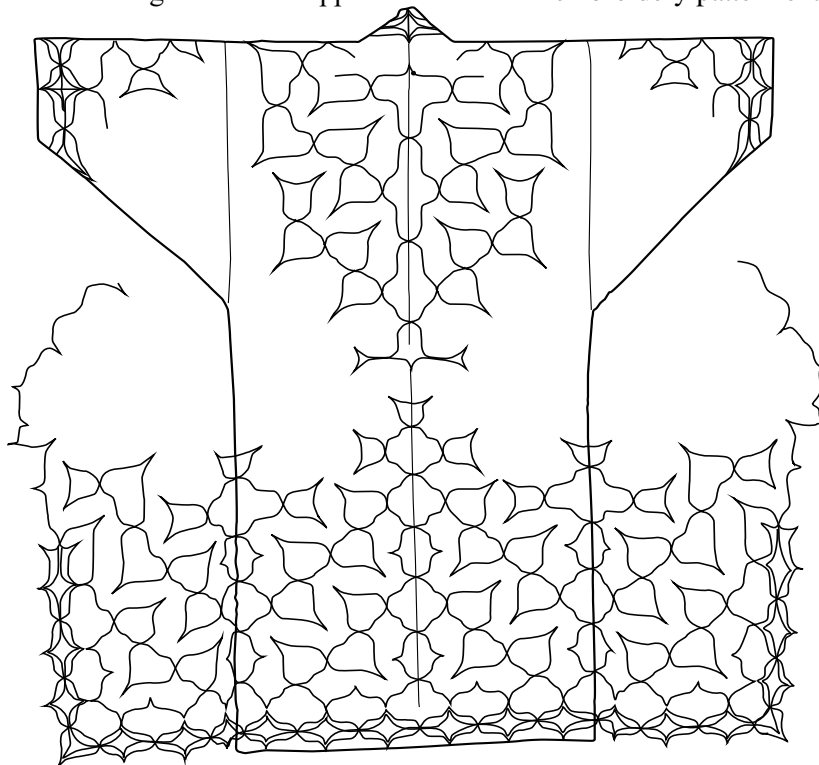
Fig.9 Overall embroidery pattern of ainu clothes.

Conclusion

    In this paper, a method for extracting traditional characteristic embroidery patterns from Ainu clothes was described. To tracing a digital image and creating a line drawing of the embroidery pattern, a method for basic embroidery pattern element extraction and an overall pattern extraction for the entire clothes was developed.

    Through the extraction of the basic embroidery patterns, it was shown that we need to apply extended rule to extract mutually connected pattern elements. And different patterns were extracted depending on how we see the patterns. This implies that the overall patterns cannnot be constructed in a unique manner by simply extrracting and combining element patterns.

    In overall pattern extraction, it was shown that many embroidery patterns were able to be extracted in the clothes images, when the traditional "one-stroke sewing" hand movement method was used. In the series of experiments carried out by the author, the mehod was applied to other examples and applicability was examined. The results will be reported in future.

References

Ainu History and Culture: Ainu People. (n.d.), available at: http://www.ainu-museum.or.jp/en/study/eng01.html (accessed 30 September 2019)

Historical Museum of Hokkaido 1999. Ainu no Yosooi , Dentou to Souzou [Ainu Clothes, Tradition and Creation]:Sanyo Insatsu.

Ainu History and Culture: Clothing, (n.d.). available at: http://www.ainu-museum.or.jp/en/study/eng07.htm (accessed 30 September 2019)

Ainu museum 2001. Ainu no ifuku bunka [Culture of Ainu Clothes]. Sapporo:Hokkaido Kikanshi Insatusyo.

Minagawa M. 2017. Constructing digital archive of folkcraft articles – constructing three-dimensional structure of ainu clothes embroidery using bird's-eye view images, Digital archive research journal,4(1), pp.51-59.

Ainu-siriki(n.d.). available at:

https://www.city.sapporo.jp/shimin/pirka-kotan/jp/kogei/ainu-siriki/index.html (accessed 30 September 2019)

Ainu Museum 2009. Ainu bunka no kiso chishiki [Basic knowledge of ainu culture]. Chiba:Sofukan.

Nishida K. 2007. Nishida Kayoko no tekekarape, ainu shisyu [Nishida Kayoko's Tekekarape , ainu embroidery]. Sapporo: Kuruzu.

Tsuda N. 2008. Ainu sisyu nyumon [Introduction to ainu embroidery]. Sapporo: Kuruzu.

Minagawa et al. 2010. Constructing Digital Archive of Folkcraft Articles – Drawing Attribute Information, Research meeting on digital archive, Gifu Womens' University.