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Nålbinding connections

Making, mapping and describing connections

ABSTRACT

Nålbinding is the collective name for several thousands of stitches formed using yarn and a needle to create a fabric. A nålbound fabric consists of a stitch or a row of loops that is connected to or sewn in the previous row. Only a handful of connections have been documented and described. This paper analyses around 150 swatches made by the author with the purpose of exploring how many types of connections there are and the how different connections change the texture of the fabric using the same basic nålbound stitch. As the number of possibilities identified was greater than expected, this paper also describes a notation system that will make it possible to analyse and compare the different connections. The notation is designed from a crafter's point of view, describing how the connections are made. This will make it possible both to better describe existing connections and to create new nålbound stitches and textures.

Keywords:
Nålbinding, looped, textiles, non-woven.

INTRODUCTION

Nålbinding is the collective name for several thousand stitches formed using yarn and a needle to create a fabric. The stitch is defined as one consisting of a row of loops that is connected to the previous row. The construction of a row varies from single loops to complex, compound combinations of loops with twists and turns. There is still no scientific definition of nålbinding stitches, even though some notation systems have been published that focus mainly on how to describe rows of loops.

Even though the connection is an integrated part of the stitch, most nålbinding books focusing on the craft or describing historic finds only mention a few of the connections. In craft books, the connections have no names. Connections are usually only described in words accompanied by, for example, a drawn illustration (Rothquist Ericsson et al., 2013) or a photo (Westman, 1983). When analysing a nålbound row of loops or the base part of the stitch, the Hansen (1990) notation is the most useful. When it comes to the connection part of the stitch, hardly any research has been published. Hansen (1990) described a few connections, including F1 and F2, which pierce through the fabric under

one or two loops from the front to the back, and B1 and B2, which pierce through the fabric from back to front. M and Mid are also sometimes used for connecting to the middle loop and Bot or Bottom for connecting the bottom loop of the previous row.

As a crafter, I have been experimenting with different connections over the years but have found no publications describing more than a few connections. This paper therefore aims to answer the question of how many different types of connections there are and show how the connections change the texture of the fabric using the same basic stitch or row of loops. Due to the large number of possible connections identified by this paper, it was necessary to create a notation system to be able to describe them.

The method has been making swatches to document the different fabric each connection makes. In this paper, all the swatches in the mapping are made by the author in the same way using the same basic stitch and type of yarn as well as the same number of stitches per row and the same number of rows. That way, it will be possible in the future to compare the impact of the connection stitch on the width, height and thickness of the fabric and the difference between the fabric's front and back.

The stitch used in this mapping is a common and relatively simple compound variant, usually referred to as the Oslo stitch. The Oslo stitch was named after a mitten found in Oslo that was described by Nordland (1961) as made with the same stitch as a mitten from Lund, Sweden. It has since become obvious that the Oslo mitten was not made with the stitch named after the mitten, since the Lund mitten and stitch had already been described in 1945 (Hald, 1945). The stitch type was confirmed by Anne Marie Decker in May 2023 when examining the mitten at the Kulturen museum in Lund in the presence of the author (Figure 1 and 2). The base part of the stitch and the row of loops will therefore be referred to as the Lund stitch in this paper. The connection used in the Lund mitten goes through one loop from the front to the back, defined by Hansen (1990) as F1.

FIGURE 1 AND 2. The Lund mitten (Figure 1) and a closeup of the cuff of the Lund mitten (Figure 2) in the Kulturen museum, Lund, Sweden. The mitten is dated to between 1100 AD and 1250 AD (inventory number KM 64242). Photos by the author.

The Lund stitch (Hansen's notation UO/UOO) was chosen as the base for the mapping because it is a relatively simple compound stitch. As a comparison, one row of the Lund stitch is shown together with one row of three other base stitches in Figure 3.

FIGURE 3. Four types of nålbinding stitches in single rows. Their common names and Hansen's notation from top to bottom: Lund UO/UOO, Mammen UOO/UUOO, Telemark UOU/OUOU and the Omani stitch U(U) (OO/UUU)OOO:UUUOO. Photo by the author.

DESCRIBING CONNECTIONS

Using the Lund stitch as the base resulted in over 150 different swatches with connections made in the technical front of the fabric. To be able to tell them apart, it was necessary to create a notation system to describe how the connections had been made. The following four main aspects of the connection needed to be defined:

- Which loops of the previous row to connect to
- The direction of the needle
- The number of loops
- If the connection starts or ends in front of or behind the working row (when connecting to more than one loop horizontally).

Defining the loops

In the Lund stitch (Hansen's notation UO/UOO), there are five possible loops to connect to on the technical front of the row.

In addition to the loops mentioned below, an X should be added if there are two loops crossing or that connect changing directions. An 'r' should be added if the stitch is connected to the technical back/reverse side of the row. The five loops and three crossings defined in the Lund stitch (Figure 4) are as follows:

- T = the top loop

- T/= the loop beneath and between two top loops
- M = the middle loop
- MB = between the middle and the bottom loop
- B = the bottom loop
- T/X = the crossing of two loops beneath the top loop
- MX = where two loops meet and change direction
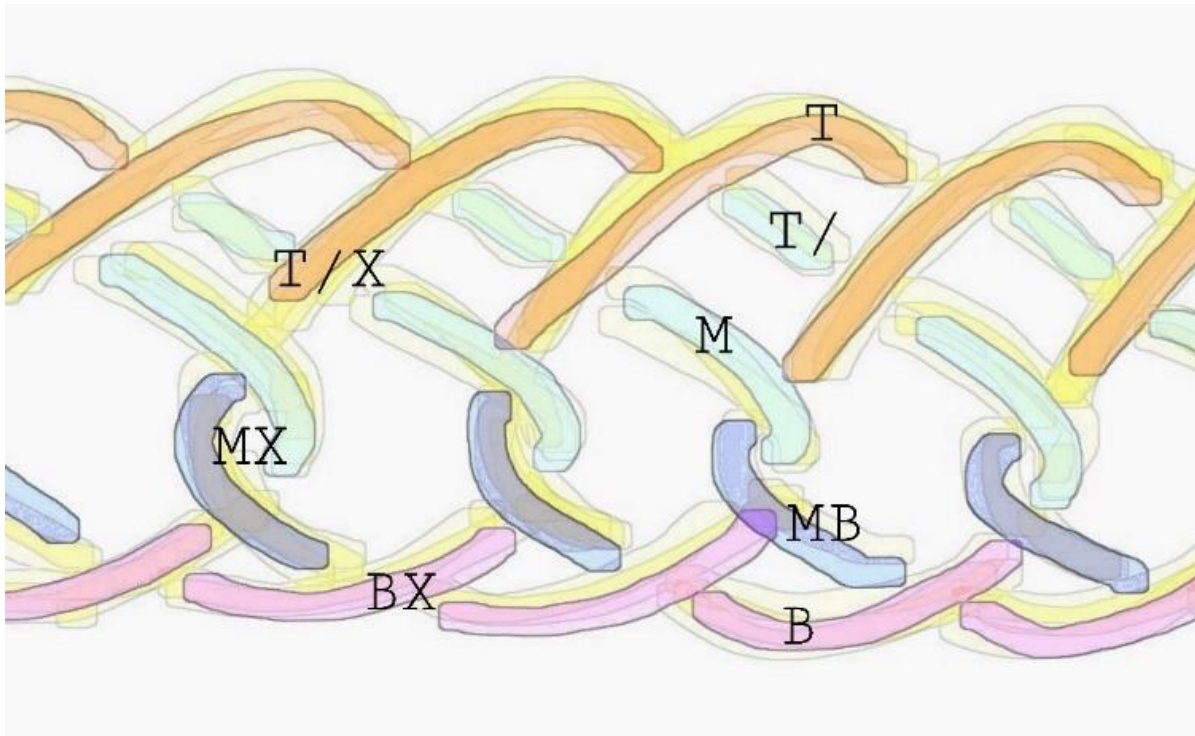- BX = the crossing of the two bottom loops

FIGURE 4. The loops and X's of the Lund stitch. Illustration by the author.

The direction of the needle

To know which way to go under a loop, the direction of the needle should be defined. There are six main directions. In addition to the letters, two symbols are added to describe the movement of the needle and the skipping of one loop, as follows:

- t = towards the working row (Figure 5)
- a = away from the working row (Figure 5)
- u = upwards (Figure 5)
- d = downwards (Figure 5)
- f = from the front to the back, piercing through the fabric (Figure 6)
- b = from the back to the front, piercing through the fabric
- ~ = combining two loops of the same type; for example, the middle loop, going away or towards the working row but picking the up either upwards or downwards while making a wavelike motion with the needle (Figure 7)
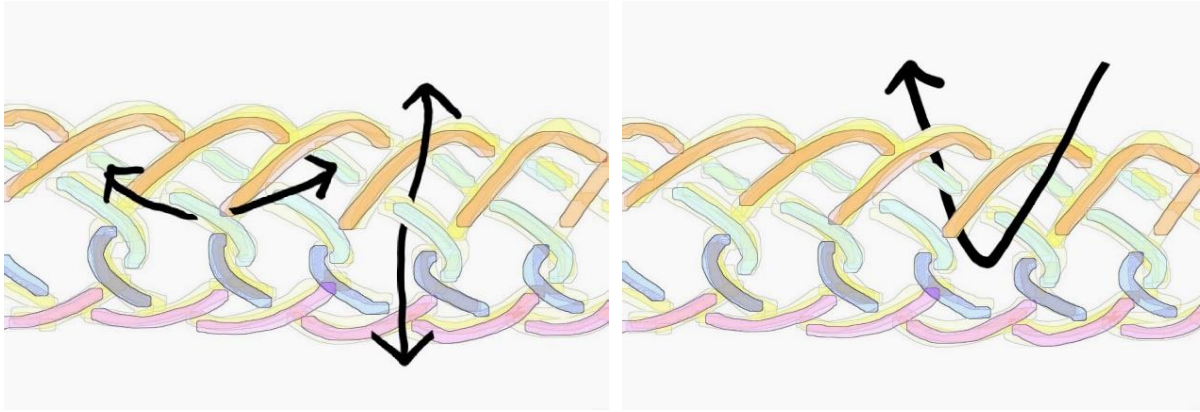- _ = skip one loop (Figure 8)

FIGURE 5 AND 6. Towards/away and upwards/downwards through the middle loop (Figure 5). From front to back under three loops, f3 (Figure 6). Illustrations by the author.
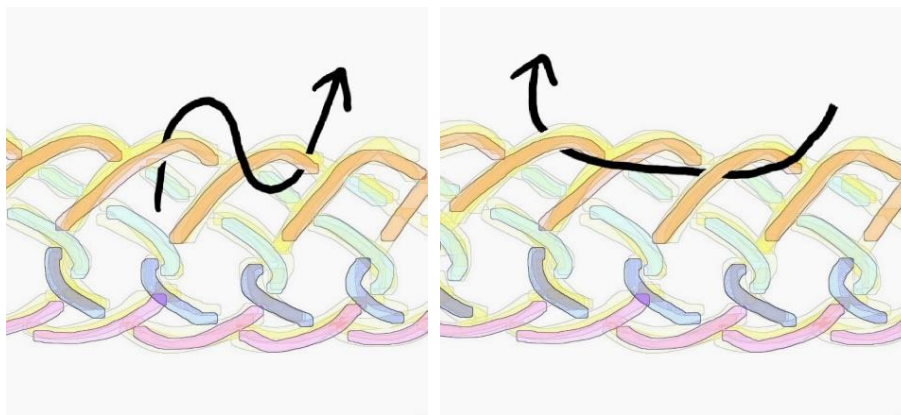

FIGURE 7 AND 8. Combining two top loops going upwards by making a wavelike motion with the needle. Away from the working row if you are right-handed, Ta u~u (Figure 7). Making a connection skipping one top loop towards the working row if you are right-handed, Tt_Tt (Figure 8). Illustrations by the author.

The towards and away will differ depending on if you are right- or left-handed. For a right-handed person, the working row will be on the left, and for a left-handed person, it will be on the right.

Most loops in a nålbound fabric are diagonal, slanting towards or away from the working row. That means that there are two possible ways to describe the direction of the needle that will bring about the same result. In this notation, towards/away and upwards/downwards are used consistently within the connection type group even if there are other ways to describe a specific direction of the needle that would make the same connection.

The number of loops
The number indicates the number of loops of the same type picked up horizontally when going towards or away from the working row. When piercing through the fabric, the number indicates the number of loops above the place where the needle pierces through the fabric. When only one loop of a specific type is used in a combination, the number is not specified.

In front of or behind the working row
If the connection goes through more than one loop of the previous row horizontally, it can be made starting/finishing either in front of or behind the working row (Figure 9).
- (f) = in front of the working row
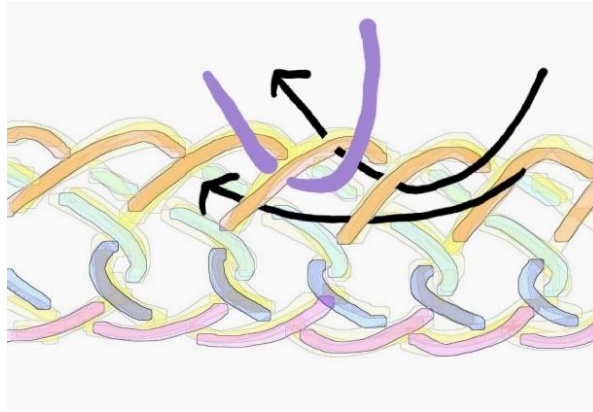- (b) = behind the working row

FIGURE 9. The difference between in front of (lower arrow) and behind (upper arrow) the working row (purple loop). Illustration by the author.

CATEGORISING CONNECTIONS

The different types of connections are categorised into six main groups that can be made on either the technical front or the technical back of the previous row. The swatches in the mapping are all made connecting to the technical front. The categories are as follows:

- Horizontal connections
- Horizontal connections changing directions
- X-connections
- Vertical connections
- Vertical connections changing direction
- Diagonal connections

Horizontal connections

Horizontal connections are made in one or more loops of the same type horizontally, either towards or away from the working row (Table 1 and Figures 10 and 11). Table 1 shows the combinations using one or two loops and the notations used to describe them. Swatches have been made using up to five loops. Horizontal connections can also be made skipping one loop, as shown in Figure 8.

Since 'f' and 'b' describe how many loops there are above where the needles pierce through the fabric, they can, when using the Lund stitch, be used as alternatives for notations using up to three loops on the top row (Table 1).
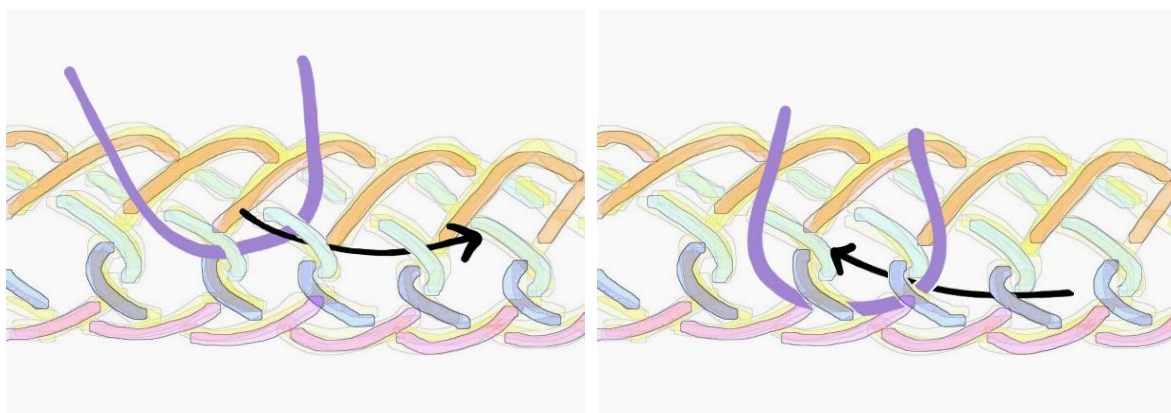

FIGURE 10 AND 11. Two examples of vertical connections. Ma2 (f), going through two middle loops in front of and away from the working row (Figure 10). MBt2 (b), going through two middle-bottom loops towards and behind the working row (Figure 11). Illustrations by the author.

TABLE 1. Horizontal connections. The table shows connections made horizontally with one or two loops.

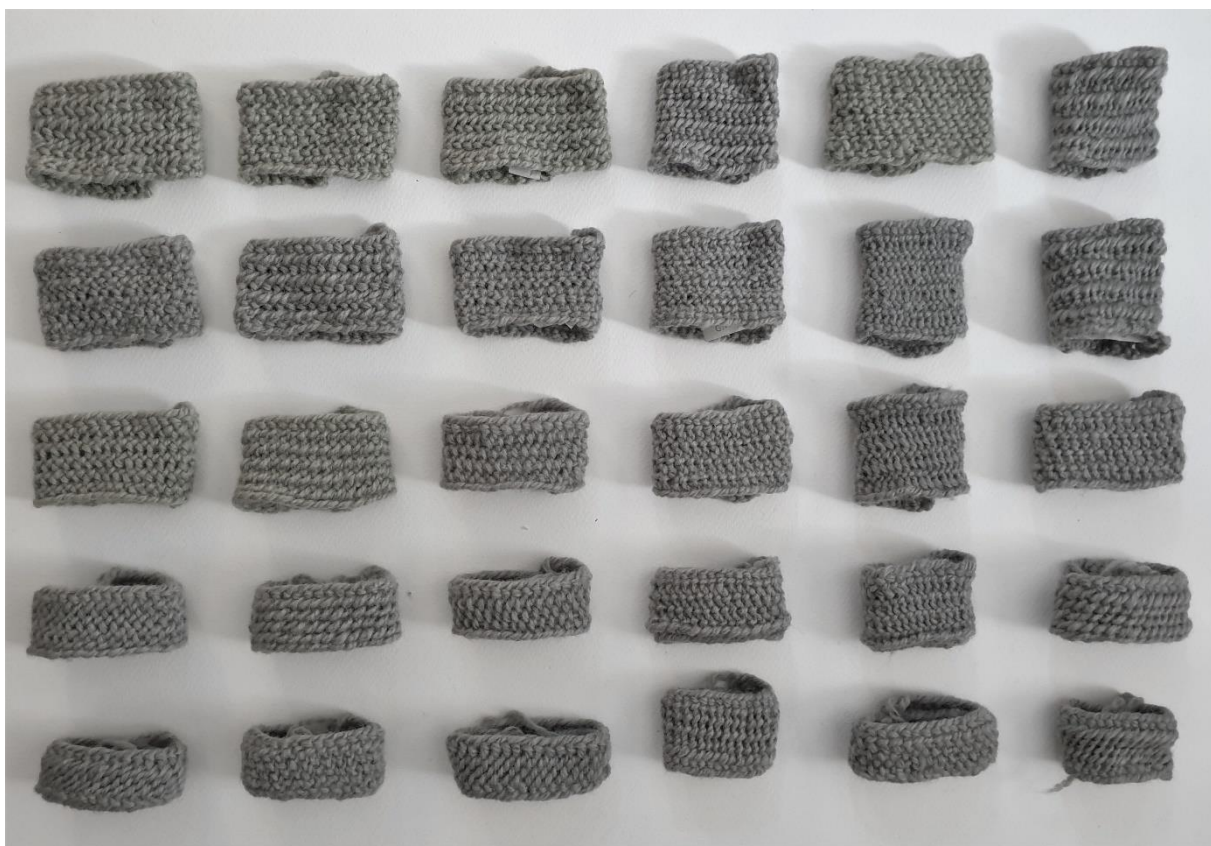| Loop of the previous row	t1	a1	t2 (b)	t2 (f)	a2 (b)	a2 (f)
T	Tt1 or f1	Ta1 or b1	Tt2 (b) or f2	Tt2 (f)	Ta2 (b) or b2	Ta2 (f)
T/	T/t1	T/a1	T/t2 (b)	T/t2 (f)	T/a2 (b)	T/a2 (f)
M	Mt1	Ma1	Mt2 (b)	Mt2 (f)	Ma2 (b)	Ma2 (f)
MB	MBt1	MBa1	MBt2 (b)	MBt2 (f)	MBa2 (b)	MBa2 (f)
B	Bt1	Ba1	Bt2 (b)	Bt2 (f)	Ba2 (b)	Ba2 (f)

FIGURE 12. Swatches made corresponding to the connections shown in Table 1. Photo by the author.

Horizontal connections changing direction

Horizontal connections with the needle changing directions are made by going through two loops of the same type changing directions either upwards/downwards or downwards/upwards (Table 2 and Figures 13, 14 and 15) or combining two loops of the same type upwards or downwards in the opposite direction compared with the horizontal connection. The needle is then making a wavelike motion (Table 3 and Figures 16, 17 and 18). The connections can either be made behind or in front of the working row.
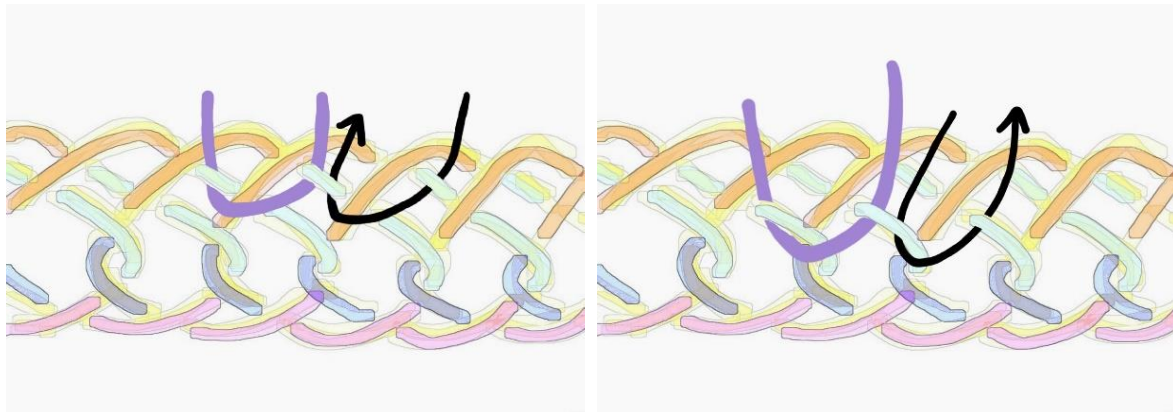
FIGURE 13 AND 14. Two examples of horizontal connections made downwards and then upwards: T/t d+u (f), going downwards and then upwards through the loops beneath the top towards and in front of the working row (Figure 13). Ma d+u (f), going downwards and then upwards through two middle loops away from and in front of the working row (Figure 14). Illustrations by the author.

TABLE 2. Examples of horizontal connections changing directions either upwards/downwards or downwards/upwards.

Loop of the previous row	t u+d (b)	t u+d (f)	t d+u (b)	t d+u (f)	a u+d (f)	a d+u (f)
T	Tt u+d (b) or f+b (b)	Tt u+d (f) or f+b (f)	Tt d+u (b) or b+f (b)	Tt d+u (f) or b+f (f)	Ta u+d (f)	Ta d+u (f)
T/	T/t u+d (b)	T/t u+d (f)	T/t d+u (b)	T/t d+u (f)	T/a u+d (f)	T/a u+d (f)
M	Mt u+d (b)	Mt u+d (f)	Mt d+u (b)	Mt d+u (f)	Ma u+d (f)	Ma u+d (f)
MB	MBt u+d (b)	MBt u+d (f)	MBt d+u (b)	MBt d+u (f)	MBa u+d (f)	Mba u+d (f)

FIGURE 15. Swatches showing the upwards/downwards or downwards/upwards connections corresponding to Table 2. Photo by the author.
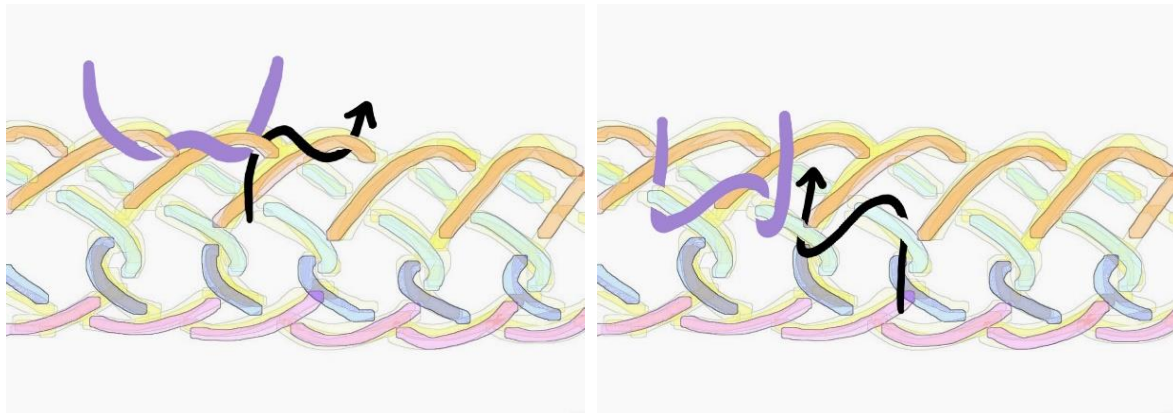
FIGURE 16 AND 17. Two examples of horizontal connections made upwards ~ upwards. Ta u~u (f), going through two top loops upwards in front of and away from the working row (Figure 16). Mt u~u (b), going through two middle loops upwards, towards and behind the working row (Figure 17). Illustrations by the author.

TABLE 3. Combining two loops of the same type going downwards~downwards or upwards~upwards.

Loop of the previous row	t d~d (b)	t d~d (f)	t u~u (b)	t u~u (f)	a d~d (b)	a d~d (f)	a u~u (f)
T	Tt d~d (b)	Tt d~d (f)	-	-		-	Ta u~u (f)
T/	-	-	T/t u~u (b)	T/t u~u (f)		Ta d~d (f)	-
M	-	-	Mt u~u (b)	Mt u~u (f)	Ma d~d (b)	Ma d~d (f)	-
MB	-	-	MBt u~u(b)	MB u~u (f)		-	-

FIGURE 18. The swatches made corresponding to the connections shown in Table 3. Photo by the author.

X-connections

X-connections are made by going under two crossing loops of the fabric, T/X and BX, or under the place there two loops meet and change direction, MX (Table 4 and Figures 19, 20 and 21). The BX and MX connections can be made in all four directions, whereas the T/X only can be done in two ways. The upwards and downwards directions will instead make the same connections as the vertical Mu+T/u and T/d+Md. The top X is not included, as it makes connections corresponding to the horizontal connection of the top row changing directions upwards/downwards.
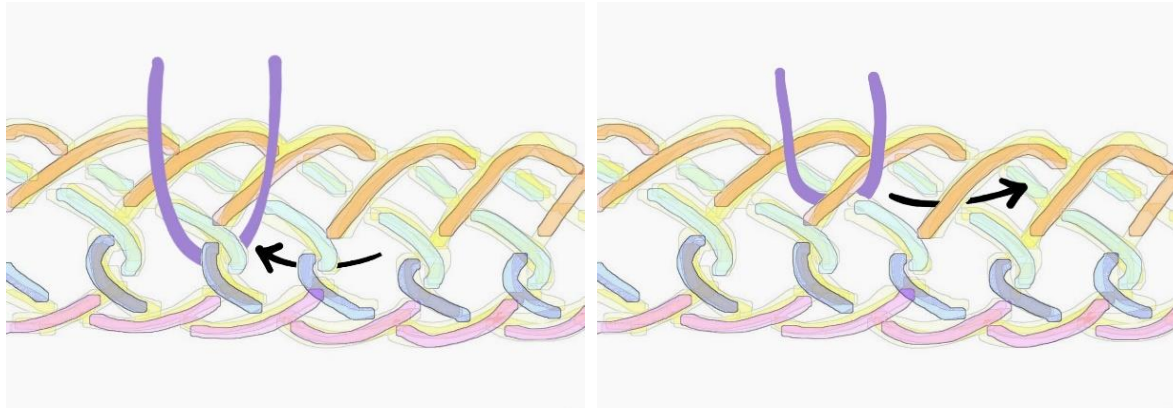

FIGURE 19 AND 20. Two examples of X-connections. MXt, going under the middle X towards the working row (Figure 19). TX/a, going under the X beneath the top row away from the working row (Figure 20). Illustrations by the author.

TABLE 4. X-connections.

X-crossings of the previous row	t (towards)	a (away)	u (upwards)	d (downwards)
T/X	T/Xt	T/Xa	-	-
MX	MXt	MXa	MXu	MXd
BX	BXt	BXa	BXu	BXd

FIGURE 21. Swatches of X-connections corresponding to Table 4. Photo by the author.

Vertical connections

The vertical connections are made going through two or three loops of the previous row vertically, either upwards or downwards (Table 5, Figures 22, 24 and 25). As with the X-connections, the connections corresponding to horizontal connections are not shown in the table. Swatches of eight possible vertical three-loop connections are made (Table 6 and Figures 23 and 26).
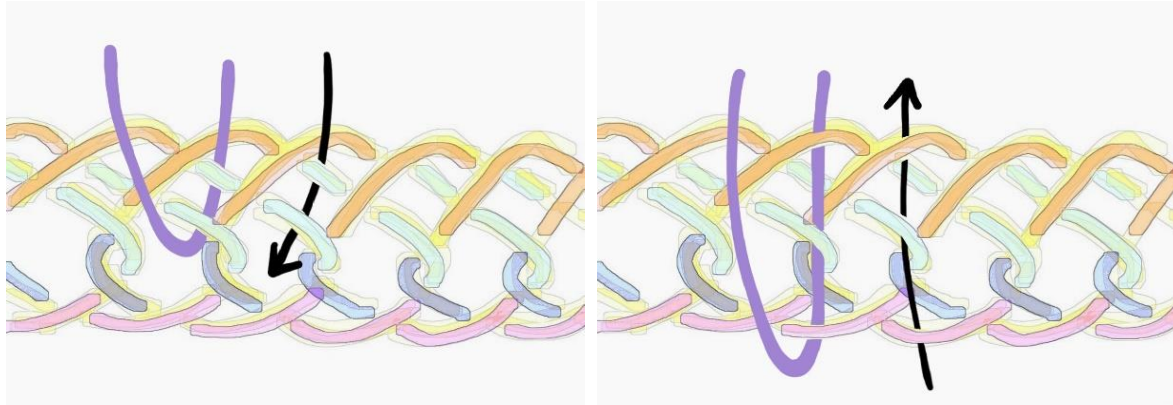

FIGURE 22 AND 23. Examples of two vertical connections. T/d+Md, going under the loop beneath the top row and the middle loop downwards (Figure 22). Bu+Mu+Tu, going through the bottom, middle and top loop upwards (Figure 23). Illustrations by the author.

TABLE 5. Two-loop vertical connections made either downwards (upper right part of the table) or upwards (lower left part of the table).

Loop of the previous row	T	T/	M	MB	B
T	-	-	Td+Md	Td+MBd	Td+Bd
T/	-	-	T/d+Md	T/d+MBd	T/+Bd
M	Mu+Tu	Mu+T/u	-	Md+MBd	Md+Bd
MB	MBu+Tu	MBu+T/u	MBu+Mu	-	-
B	Bu+Tu	Bu+T/u	Bu+Mu	-	-

FIGURE 24 AND 25. Swatches made showing the two-loop vertical versions going upwards (Figure 24), corresponding to the lower left part of Table 5, and downwards (Figure 25), corresponding to the upper right part of Table 5. Photos by the author.

TABLE 6. Three-loop vertical connections made either downwards or upwards.

Direction of the connection	Combinations of T, M and MB	Combinations of T/, M and MB	Combinations of T/, M and B	Combinations of T, M and B
u (upwards)	Td+Md+MBd	T/d+Md+MBd	T/d+Md+Bd	Td+Md+Bd
d (downwards)	MBu+Mu+Tu	MBu +Mu+T/u	Bu+Mu+T/u	Bu+Mu+Tu

FIGURE 26. Swatches corresponding to Table 6. Photo by the author.

Vertical connections changing direction

This category includes various connections where one or more loops of the previous row are picked up first going downwards through one type of loop and then upwards through another type of loop, or the other way around. As there are a great number of possibilities in this category, only a few swatches have been made to demonstrate how these types of connections can be done, such as downwards/upwards (Figures 27, 28 and 29) and upwards/downwards (Figure 30).
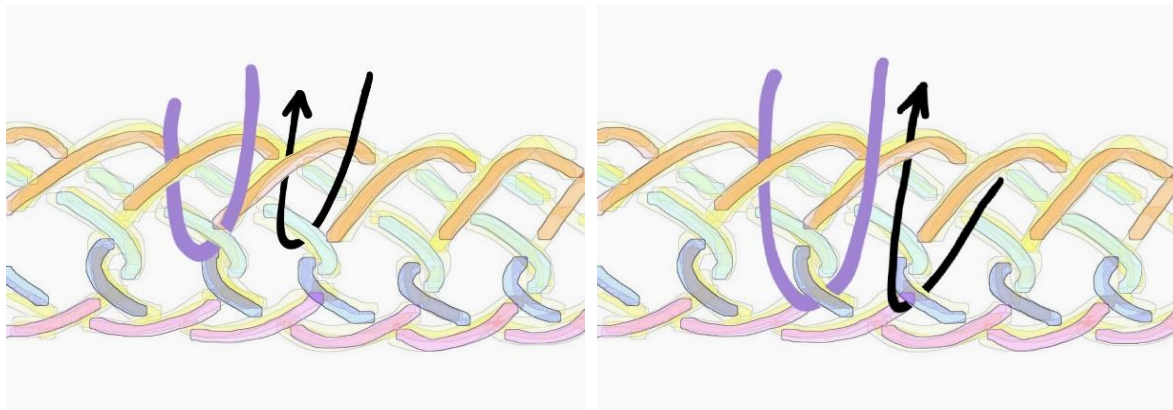

FIGURE 27 AND 28. Drawings showing the connection Md+Tu going under the middle loop downwards and the top loop upwards (Figure 27) and the connection MBd+Tu going through the middle bottom loop downwards and the top loop upwards (Figure 28). Illustrations by the author.
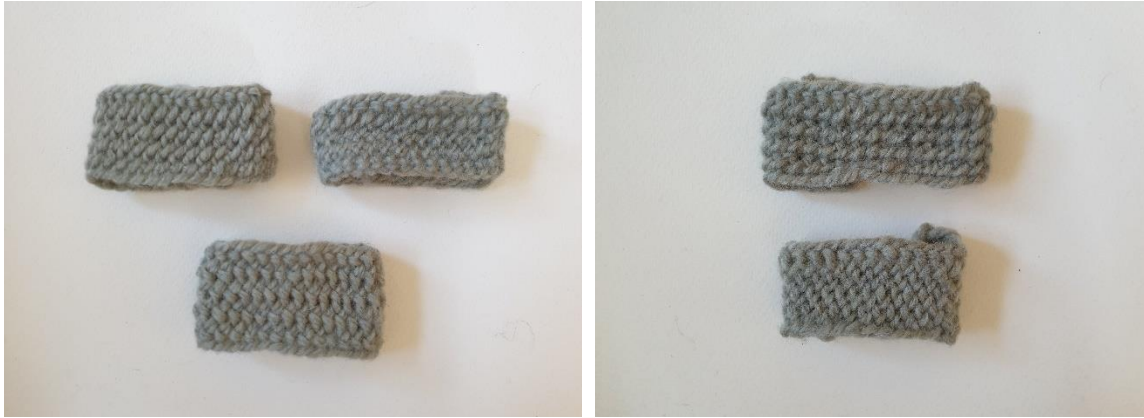
FIGURE 29 AND 30. Swatches showing a combination of different type of loops. Downwards/upwards, MBd+Tu, Bd+Tu and Md+Tu (Figure 29). Upwards/downwards Mu+T/d and Mu+MBd (Figure 30). Photos by the author.

Diagonal connections

Diagonal connections are made by going through two or more loops of the previous row diagonally either slanting towards or away from the working row. As there are numerous possibilities, only a few swatches have been made as examples of what can be made. To be able to describe the diagonally made connections, a combination of, for example, picking the first loop upwards and the second away (Figures 31 and 33, upper right and bottom) or towards (Figures 32 and 33, upper left) the working row can be made. There can also be combinations with two or more of the same type of loop (Figure 34).
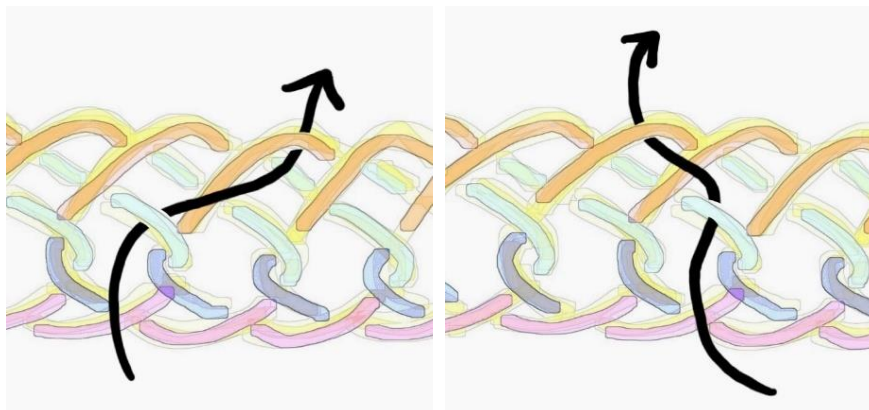

FIGURE 31 AND 32. Examples of a connection made diagonally. Mu+Ta, middle loop upwards and top loop away from the working row (Figure 31). Mu+Tt, middle loop upwards and top loop towards the working row (Figure 32). Illustrations by the author.
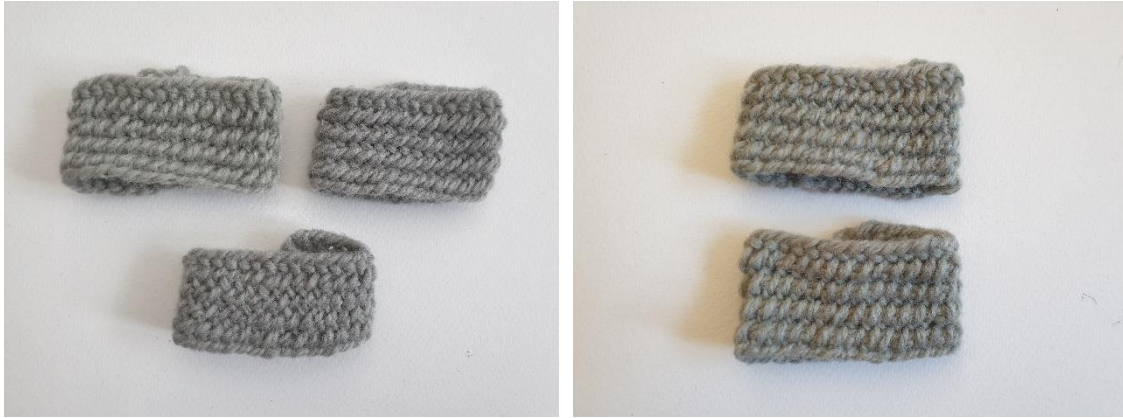
FIGURE 33 AND 34. Swatches showing diagonal connections: Mu+Tt, Mu+T/a and Mu+Ta (Figure 33). MBu1+Tt2 (b) and MBu1+Tt3 (b) (Figure 34).

CONCLUSION

By making swatches and mapping the connections using a common and relatively simple compound stitch, such as the Lund stitch, as a base, it becomes clear that there are aspects of nålbinding that are not yet fully researched and described. The connection is an essential part of the stitch, and changing the connection changes the texture of the fabric, as shown in the paper.

Since the 150 swatches were made connecting only to the technical front of the previous row, the estimated number of possible connections is somewhere around 300 when only using the Lund stitch as the base. As the base part of a stitch varies both in the number of loops and their slanting, the notation will need to be adapted to the stitch used. The number of possible connections will therefore be even larger using more complex stitch types.

Being able to describe different connections makes it possible to make, document, compare and describe existing stitches using Hansen's notation for the base of the stitch and a connection notation for the connection. The connection notation also makes it possible to create new nålbound textures using other stitches as a base for the stitch. Hopefully, this will take the craft of nålbinding in new directions.

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