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THE USE OF CORELDRAW PROGRAM FOR THE REPRESENTATION OF WEFT KNITTED STRUCTURES

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Abstract: *The representation weft knitted fabrics covers a wide range of methods, which may vary from country to country or may be similar, being used identical or slightly modified. In Romania, currently, for the weft knitted fabrics are used four methods of representing the knitted structures, namely: structural or analytical representation, representation using knitting notations, symbolic representation of the section of stitch courses and representation of drawing design. Generalization of knitted fabrics design using CAD systems determined the development of software design, including 2D representation that can be used for any type of machine. 2D representation of stitches solves the modeling problems and is possible to be executed using different computer graphics programs (CorelDRAW, AUTOCAD, etc). With the help of the graphic editor CORELDRAW it is possible to make the graphical representation of the structure of any kind of weft knitted fabric regardless of its complexity, strating from the simplest ones such as knits with basic weaves (single jersey, rib fabric, links, links and links patterns) to the most complex structures such as knitted fabrics with different evolutionary changes of normal stitches (tuck loop knits, missed stitches knits, racked stitches knits, etc.) or those with combined designs (knitted jacquard, intarsia knits etc.).*
This paper presents the possibility of using the CorelDRAW application for representing knitted structures.

Key words: *CAD systems, CorelDRAW, knitting, structure, weft knitted fabrics*

1. INTRODUCTION

The representation of weft knitted fabrics covers a wide range of methods, which may vary from country to country or may be similar, being used identical or slightly modified. The graphical representation of the knitted fabric structure consists in transferring on drawing the yarn position and the form of component elements (normal stitches, elements with modified evolution, additional yarns) from yarns of the same color or different colors of yarns. From a graphical representation, besides the evolution of yarn (yarns) may further result: drawing and drawing rate, some technological indications and the effect created by the structure on the knitted fabric.

For the graphical representation of knitted fabrics are used differnet methods that, worldwide, have different areas of usage.

In Romania, currently, for the weft knitted fabrics are used the following methods:structural representation, (analytical); representation using knitting notations; symbolic representation of the section of stitch courses; representation of drawing design.[1]

All electronic knitting machines use programming stations based on code-machine system. The generalization of knitted design using CAD systems has determined the development of design softwares, including 2D representation that can be used for any type of machine. 2D representation of stitches solves the problems of modeling and it is possible to achieve using computer graphics programs (CorelDraw, AutoCAD, etc), but mostly specialized software.

CorelDRAW is a graphics software package that provides automatic drawing facilities and also objects processing and the use of special effects facilities. [2], [3], [4] Next we will show how this program can be used to achieve a graphical representation of weft knitted structures by the 4 methods.

2. REPRESENTATION OF WEFT KNITTED FABRICS WITH CORELDRAW GRAPHIC EDITOR

2.1. Structural representation of weft knitted fabrics

The structural (analytical) representation accurately reproduces the yarn (yarns) geometry within the knitted fabric, its position within the ratio. This method allows the representation of the knitted fabric structure in two layouts: theoretical and real. In the case of theoretical layout, the shanks of the loop and the connecting segments are considered line segments and the needle and sinker loops are half circles.

In the case of real structural representation, both the positions of the yarn and also of the stitches are presented, suggesting their placement in denuded condition. Compared to the theoretical method, in free representation there occur changes of the stitches position, difficult to represent exactly in the drawing and the yarn is no longer represented by a line as in the case of of theoretical representation.

The analytical representation of the knitted structure is a time-consuming method, but it is the one presenting the most complete information regarding the fabric structure.

With CorelDRAW graphics editor the structural representation of a weft knit begins with drawing of a stitch, multiplying it according to size report and then processing the ratio to obtain the desired characteristics. [4]

We will start with drawing the stitch model. Thus, click the button ***Elipse*** and select command ***Arc***  to draw the needle loops. Then press **Ctrl+D** on the keyboard to create a duplicate of stitches. Then draw straight lines with the help of the tool ***Bezier Tool***  , lines that represent the shanks of the loops. Using ***Ctrl+D*** we can create a duplicate of the arc of the circle and choose from menu ***Arrange*** → we choose ***Transformations*** → ***Rotate*** for obtaining sinker loops. We rotate the arc to 180 degrees and we positioned it at the end of the line.

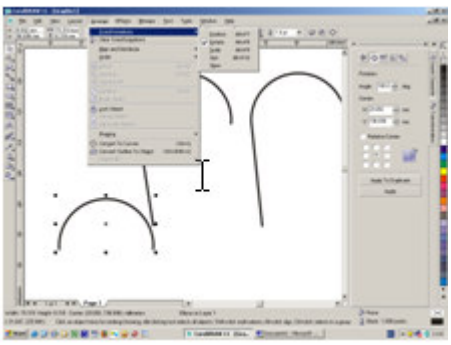

Fig. 1: *Drawing the needle loops*

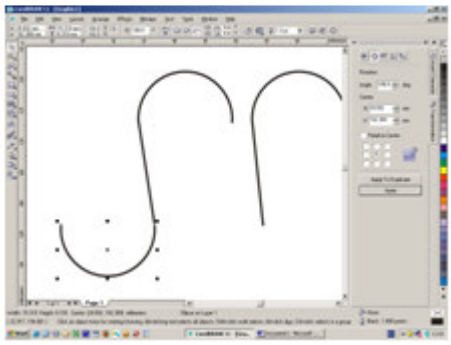

Fig. 2: *Drawing the sinker loops*

We will continue this procedures until all stitches are obtained in a row. Then we select the stitches and group them using ***Group*** from ***Arrange*** menu or by pressing ***Ctrl G***. The figure thus obtained is multiplied vertically, depending on the number of rows in the report.

Fig.3: *Multiplying the stitches vertically, according to the number of rows from the report*

Highlighting the yarns overlapping is achieved by interrupting the shanks or the needle and sinker loops according to the form of the drawn stitch. To do this, we select the line or the loop we want to interrupt. Click the right button on the mouse and choose option ***Break Apart***. We select the points where we want to interrupt the shanks or the needle and sinker loops and we delete the segment

with the help of ***Delete*** command. The result consists in interrupting the segments between the two selected points. We will continue this action all over the report.

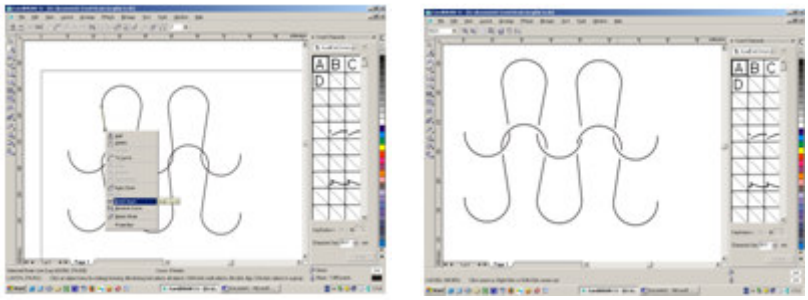

Fig. 4: *The interruption of the shanks or the needle and sinker loops according to the aspect of the drawn stitch*

In the following tables som example of irregular jacquard are given.

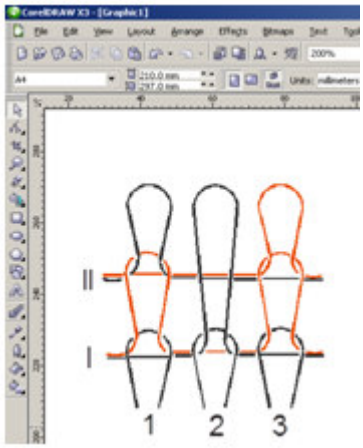

Fig. 5*: Irregular jacquard*

2.2. Representation using knitting notations of a weft knit

The representation using knitting notations consists in representing certain signs of the knitted structure, for each component element proposing one symbol.

Different variants for the representation of the component elements can be used. In Romania the method most widely used uses the following conventional signs [5]:

x = front stitch;
o = rear stitch
\- = float stitch
∧ = loop

The representation using knitting notations with the help of the graphic editor CORELDRAW implies covering the following phases:

a. ***Setting up the framing net (fig. 6)***

Next in the options toolbox choose ***Polygon Tool*** and click ***Graph Paper Tool***. Then determine the number of rows and columns according to the report dimensions.

b. ***Drawing the normal stitches with rear stitch (fig. 7)***

Click the button ***Elipse*** then position the cursor where you want the stitch to appear. In order to represent a normal stitch made on the back needle bed (symbolised by a circle) hold the ***Crtl.*** key.

c. Drawing the normal stitches with front stitch (fig. 8)

Click the button ***Free Hand Tool*** , select ***Bezier Tool*** and draw two lines so that you get a normal stitch made on the front needle bed.

d.Drawing a loop (fig. 9)

Click the button ***Free Hand Tool*** . Select ***Bezier Tool*** . You have to click where you want to make the first knot. Then click where you wnat to make the second knot so that you get the representation of a loop.

e. Drawing a float (fig. 10)

Click the button *Free Hand Tool* , select ***Bezier Tool*** and draw a horizontal line – the graphic symbol of a float.

f. Counting the number of rows and the columns (fig. 11)

After filling in all the squares from the net with conventional signs associated with the desired report, we strat counting the number of rows and columns by clicking the ***Text Tool*** button on the toolbar.

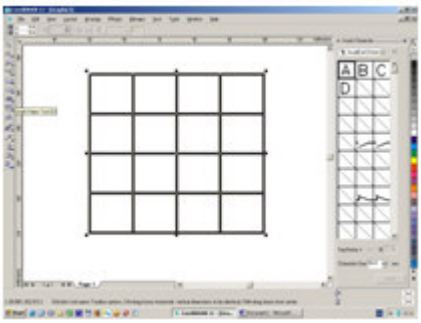

Fig. 6: *Seting up the framing net*

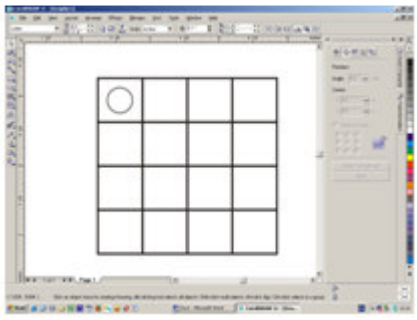

Fig. 7: *Drawing the normal stitches with rear stitch*

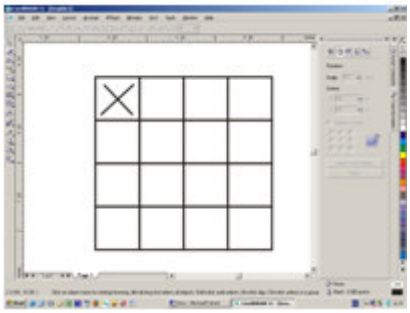

Fig. 8: *Drawing the normal stitches with front stitch*

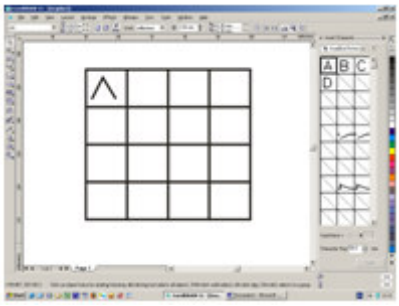

Fig. 9: *Drawing a loop*

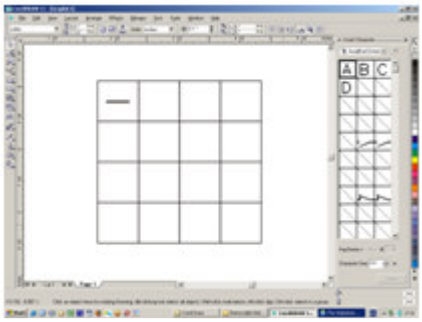

Fig. 10: *Drawing a float*

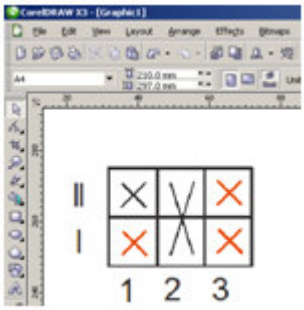

Fig. 11: *Counting the number of rows and columns for irregular jacquard*

2.3. Symbolic representation of the section of stitch courses for a weft knit

The symbolic representation of row stitches consists in translating on paper of the position of yarns compared to the needles, in the respective row of stitches.

The needles are represented by points and are placed according to thier position on the needle bed.

The method has the advantage of giving information on the knitting process (number of needle beds, relative needle position, the way the needles work). [6]

Symbolic representation of the section of stitches rows with the help of the graphic editor CorelDRAW is done as follows:

For ***drawing the stitch with front stitch***, from the options toolbox we choose ***Polygon Tool*** and then click ***Graph Paper Tool***. Then we establish thenumber of rows and columns of the report. Next we click ***Free Hand Tool***, we select ***Bezier Tool*** and we draw 2 lines that will represent the sinker semiloops of the stitch. We click ***Elipse***. By holding down the ***Ctrl*** key we draw a circle to represent the body of the stitch. Then we draw the point that represents the needle which forms the respective stitch.

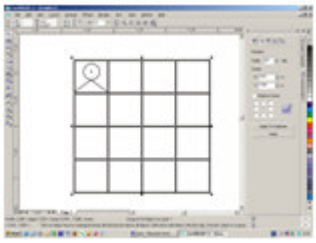

Fig. 12: *Drawing with front stitch*

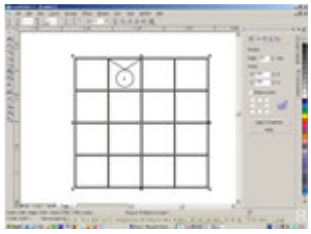

Fig. 13: *Drawing with rear stitch*

For ***drawing a loop with front stitch*** represented by an arc, we click ***Elipse*** button and select ***Arc***. We draw 2 straight lines with the help of ***Bezier Tool***. Then we draw the point that represents the arc forming the respective loop.

For ***drawing a loop with rear stitch*** we select the loop obtained with front stitch. From menu ***Arrange*** choose ***Group*** command. Then press ***Ctrl+D*** keys to create a duplicate. From menu ***Arrange*** select → ***Transformations*** → ***Rotate***. We rotate the figure to 180 degrees and we get ***loop with rear stitch***.

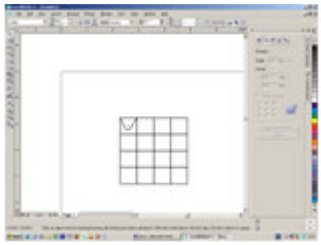

Fig. 14: *Drawing a loop with front stitch*

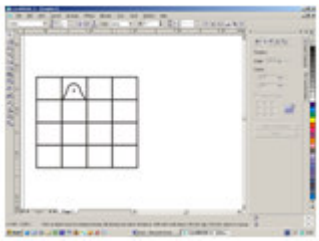

Fig. 15: *Drawing a loop with rear stitch*

With the help of ***Ctrl+D*** command on the keyboard we draw the main structure by positioning each element in the dedired position. Then we select the network and delete it with the help of ***Delete*** command from ***Edit*** menu. By using the method described we will make all the rows corresponding to the report. After representing the report the rows and columns will be numbered through the section of the stitches rows by clicking ***Text Tool*** button.

In the following figure is given an example of representing the section of stitches rows for irregular jacquard.

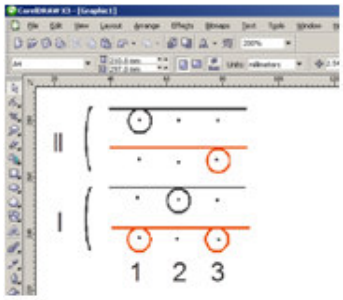

Fig. 16: *Representation of a section of stitches rows for irregular jacquard*

In the case of knitted fabrics with large drawings, made on machines with two fonts, it is recommended to use in addition to the representation of the knitted structure through one of the methods presented previously and the representation of the drawing aspect on the front side of the knitted fabric. For this we use a mesh with the size of the report on which stitches of diffenere colours are shown, according to the drawing. We use the stitch symbol for front stitch "x" or we highlight in the respective colour the square reserved for one stitch. [5]

With the help of the graphic editor CorelDRAW the representation of the deisgn involves goining through some stages whose sequence is presented below.

From toolbox choose ***Polygon Tool*** and click the ***Graph Paper Tool***. Then determine the number of rows and columns. Using the ***Pick Tool*** selected the network. Click on the ***Fill Color*** and select the first color. For the representation of stitches of other color follow the next steps: where there are stitches of other colour, click the ***Graph Paper Tool*** and draw a cell over the previously drawn one. Changing the color of the cell is made by clicking the ***Fill Color*** button.

In the following figure is presented the layout of the drawing for irregular jacquard.

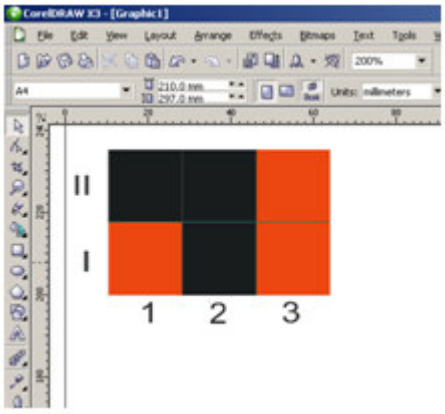

Fig. 17: *Representation of layout design for irregular jacquard.*

3. CONCLUSIONS

With the help of the graphic editor CORELDRAW we can make the graphical representation of the structure of any kind of weft knitted fabric regardless of its complexity, strating from the simplest ones such as knits with basic weaves (single jersey, rib fabric, links, links and links patterns) to the most complex structures such as knitted fabrics with different evolutionary changes of normal stitches (tuck loop knits, missed stitches knits, racked stitches knits, etc.) or those with combined designs (knitted jacquard, intarsia knits etc.).

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