

Digital Representation of Crochet Symbols Sets

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Abstract. This paper views problems related to the development of crochet software. It presents an approach for developing a software module representing crochet symbols for describing basic and advanced crochet stitches. The purpose is to develop a functionality that creates advanced crochet stitches made by combinations of basic ones. The module can be embedded in a crochet software to facilitate the process of crochet pattern design. The application is oriented to digital representation of crochet patterns, a part of old traditional costumes and homemade textiles.

Keywords: Crochet Software, Knitting Software, CAD Systems, Home Crafts, Digitalization, Computer-aided Design.

1 Introduction

Over the last centuries traditional home crafts such as weaving, knitting, crochet and embroidery have become widely spread activities in many countries. Performing these traditional female home activities aims to produce cloths and different kind of home textiles. Some of these traditional home crafts have been preserved until today, nevertheless that they have been transforming into a hobby or leisure activities. Regardless of the modern approach to traditional home crafts, people dealing with them have a feeling of succession, expressed in searching for old patterns and samples and their replicating (National movement "Workshop- traditional crafts circle", n.d.), (Brown-Reinsel, 2013).

As a part of cultural heritage, textile crafts are characterized by materiality because by using them we produce objects and goods that are fit for use. On the other hand, the goods are made thanks to the masters' skills. Thus materiality intertwines with intangibility, living heritage with preserved patterns of the past (Krastanova, 2016).

Computer technologies have been used for preserving textile home crafts as a part of cultural heritage. One example of this is the development of a software for computer-aided design of textile patterns and digital representation of samples made in the past. Software applications for computer-aided design can support the enthusiasts of homemade textiles. The so called knitting software (Soft Byte LTD, 2012) and crochet software (Send Castle Design), (Stitch Work Software, 2015) are good examples of such applications where crochet and knitting charts and instructions can be created.

One of the main problems related to the digital representation of crochet charts is the description of crochet symbols. Crochet symbols are semi-graphical characters, each of which corresponds to a crochet stitch. The existing applications are equipped with image editors containing a set of stitches in their own data format which can be modified only by developers. Sharing stitches between different applications is impossible, which leads to platform dependency and inability to modify existing graphic primitives or create new ones describing stitches.

The development of Knitting and Crochet Symbol Fonts is another way of digital representation of knitting and crochet characters. There are some examples such as (FFonts, 2012) (Hernandez, 2009) (Kauricat Knits, n.d.). A significant disadvantage of this approach is the impossibility to add new symbols and modify the existing ones. It is the main problem of the digital representation of crocheted symbols especially because many of them are a combination of some basic symbols. Minor changes in any combination lead to a new symbol creation and thus the number of characters can tremendously increase.

For digital representation of knitting symbols Portable Knitting Format (PKF) has been introduced (Zaharieva-Stoyanova, 2015). It's a XML-based language for knitting symbols and diagrams. A PKF extension has been developed to represent crochet symbols and diagrams (Zaharieva-Stoyanova E., 2017). This paper suggests an approach for developing a software module for crochet symbols' design. The application should be embedded as a part of crochet software oriented to digital representation of crochet patterns - a decoration of the old traditional costumes and homemade textiles.

2 Features of Graphical Representation of Crochet Symbols

Usually the description of crochet patterns includes a graphical representation by a crochet chart and text with instructions for crocheting each row. A crochet chart represents each crochet stitch by a crochet symbol. Crochet symbols are semi-graphical characters, resembling in a stylized form the relevant stitch. The symbols are arranged in crochet rows and the chart follows the crochet's shape, thus the chart graphically represents the lace.

The types of crochet stitches could be divided into basic stitches and advanced ones. The basic stitches can be determined as single stitches because they comprise a single item. The advanced stitches (sometimes called *clusters*) are often combinations of basic stitches, or made by inserting a hook into the work in unusual locations. Basic stitches are relatively few. The most recently used are: *chain stitch*, *slip stitch*, *single crochet stitch*, *half double crochet stitch*, *double crochet stitch*. The stitch types are named according to the US terminology. In English-speaking world basic stitches have different names varying from country to country (Craft Yarn Council, n.d.). Combinations of basic stitches allow us to create advanced stitches of various shapes and effects. There is an attempt to standardize the crochet symbols introduced by Craft Yarn Council

Standard (Craft Yarn Council, n.d.). It presents the most recently used basic and advanced crochet stitches.



Fig. 1. Textile sample tablecloth – from the end of the 19th to the beginning of the 20th century.



Fig. 2. Textile sample for decoration of the lower end of a women's shirt – from the end of the 19th to the beginning of the 20th century.

Making combinations of basic stitches and creation of clusters is a main feature of crochet charts. The most recently used combinations (advanced stitches) are:

- *Picot* – some chain stitches join by slip stitch.
- *Cluster* – some double crochet stitches crocheted together.
- *Shell* – some double crochet stitches hooked into the same locations.
- *Popcorn* – some double crochet stitch hooked into the same locations and crocheted together.

The possibility to create and describe clusters of crochet symbols is very important for digital representation of crochet charts because in most cases the pattern consists of some clusters. They form the so called *rapport* – a repeated part of the crochet chart. Examples of crochets are shown in fig. 1 and fig. 2. These textiles are original samples made in the period from the end of the 19th to the beginning of the 20th century. The pattern represented in fig. 1 is a ribbon for decoration of a tablecloth and consists of some picot and shell stitches. The second pattern (fig.2) is a lace for decoration of the lower end of women's shirts. The predominant stitches are chain stitch series and advanced stitches of “shell” and “picot” types.

In general, crochet software does not feature the functionality of creating advanced crochet symbols. Such a functionality will improve the design process as well. Once created, the crochet symbol can be used multiple times. It is not necessary to create a crochet chart by simultaneous drag-and-drop of basic crochet symbols as it is done in existing crochet software systems. The paper suggests an approach to crochet software development including a functionality for creating crochet symbols.

3 Software Module for Digital Representations and Creation of Crochet Symbols

The approach to digital representations and creation of crochet symbols is the development of a software module including a design of single symbols (basic symbols and their modifications) and a design of advanced symbols.

3.1 Design of single (basic) symbols

As has been already mentioned, a crochet diagram is based on some basic types of stitches: chain stitch, slip stitch, single crochet stitch, half double crochet stitch, and double crochet stitch. These stitch types are described by means of corresponding crochet symbols. The application represents the five crochet symbols with the buttons shown in fig. 3.

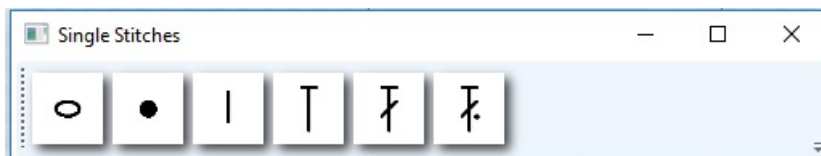


Fig. 3. Basic (single) stitches.

It's possible to modify the fifth stitch type – double crochet stitch to receive a treble, quadruple, quintuple est. crochet stitch. These modifications reflect relevant crochet symbols. To add a modified crochet symbol, a symbol n-double crochet stitch is introduced. The symbol is represented by the last (sixth) button in fig. 3 and it is used for adding a treble, quadruple, quintuple est. crochet stitch. As crochet stitch couldn't be excessively lengthened, the maximum increasing value is 10. The example of adding

new single stitches is given in fig. 4. If the user doesn't need some of the newly created buttons, they can be removed.

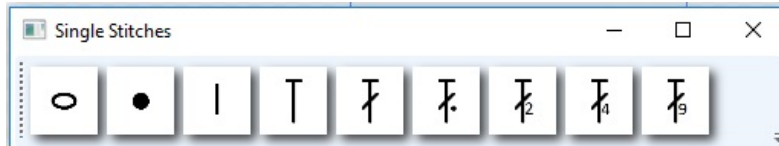


Fig. 4. Adding new basic (single) stitches.

3.2 Design of advanced stitches (clusters)

The design of advanced crochet stitches is based on combining basic crochet stitches. The user determines the type and the number of basic stitches. The application automatically makes the most recently used advanced stitch types such as picot, open picot, shell, open shell, cluster of some stitches crocheted together, and popcorn. These advanced stitches are often used in the crochet pattern of old samples textile decoration.

The user chooses the cluster type, the number of stitches and the basic stitch type (if it is necessary). The number of stitches is limited according to the cluster type.

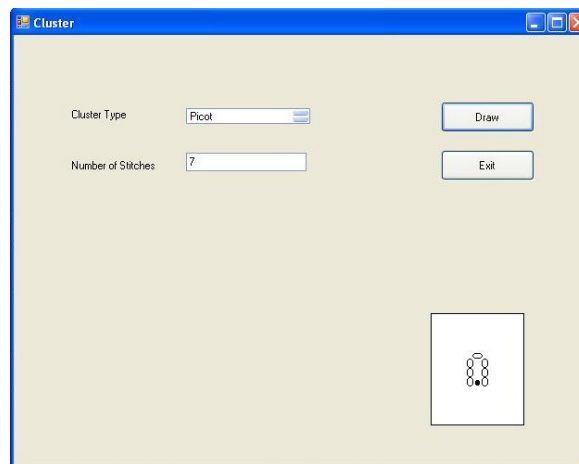


Fig. 5. Example of cluster design.

An example of the definition of 7 chain stitch open picot is given in fig. 5. The generated crochet symbol is automatically visualized.

4 Conclusions

The development of crochet software supports the preservation of this traditional home craft. On the other hand, such a software can be used as a storage medium of the old

crochet patterns – part of cloths and homemade textiles. Due to the non-durability of textile materials, digital representation of old samples of crochets is important for their preservation as a part of the cultural heritage. This paper presents an approach to developing crochet software. The application is geared to the digital representation of crochet patterns made in the past as decorations of traditional costumes and homemade textiles. Digital representation of crochet patterns guarantees their accurate replication.

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