# Project of Crochet Software Development

Elena Zaharieva-Stoyanova[1]

*Abstract* – **The paper treats problems related to crochet software development. Such applications are intended for Computer-aided design of handmade textile. Generally, they help people dealing with traditional home crafts. Moreover, these software applications can be used for storing samples of the old knitting and crochet which are ethnographic exhibits. These software systems can be developed with tools or wizards oriented to ethnographic researches. Detailed overview of graphic representation of crochet charts is done. Examples of such charts are created. According to the technology, the paper suggests an approach for crochet software development.**

*Keywords* – **Crochet software, Knitting software, Computer-aided design, CAD systems.**

## I. INTRODUCTION

Computer science and technologies enter in almost all branches in the modern life. They are applied even in braches where until recently the modern technologies were not in use. Such example is a handmaid textile.

Traditional home crafts as weaving, knitting, embroidery, crochet, etc. have a long history. Because they are related to the manufacture of cloths and household articles, they have practiced for centuries all over the world. Nowadays few people continue the tradition of these home crafts, although they are practiced rather as a hobby, than a necessity [3], [14]. However, it has to be mention that the interest to homemade textile provokes another tendency – putting on the market home made knitwear, embroideries, crochet as souvenirs or as customized boutique products, turning home crafts into a business [1], [2], [8].

The design process in which pre-established model of a product, is required whether for manual or machine-made product. There are many software applications for Computer-aided design of home made textiles. Most of existing hand-craft software is oriented towards embroidery and tapestry [13], [14], [15]. There are also applications for Computer-Aided Design of knitwear, so called **knitting software** [6], [7], [11], [12], [17]. Embroidery design software can be used as knitting software, but imposes restrictions on the type of knitted models. Also, knitting software may be used for crochet designing. Desiring to present their product as a multipurpose, companies state theirs application more than one activity [5], [10]. At all, the idea for multipurpose software for Computer-aided design of home made textile is not good. The main reason is that nevertheless the design process in embroidery, knitting and crochet are resemble each other, each home craft has its own peculiarities and different way of describing the models.

The software applications for Computer-aided design of crochet charts are much less common than those for designing embroidery and knitting. Usually, the companies dealing with knitting software state that products are usable for crochet design [5], [10]. It's valid just only of models, whose patterns can be described in rectangular grid. The most crochet patterns are worked in the round. For this kind of models such software is inapplicable.

The examples of crochet software are Crochet Charts [4] and Filet Crochet Software [9]. First one is oriented to models crocheted in the round; second one is for fillet patterns worked flat. The advantages of Crochet Charts are: the product is tailored to the manufacture of crochet; presents the crochet diagram with crochet instructions, a well-done user interface. The product has some flaws. As the user designs the structure stitch by stitch, so the editing process is complicated. Another disadvantage is that software does not respect the rules of next crochet row coming. This makes the diagram unrealistic. Accordingly, it is possible to create crochet charts, which in practice can not be realized.

This paper represents an approach for crochet software development. The project takes into account both feature of crochet patterns and the way they have been made. The application can be used for designing new models, as well as for preserving and storing samples of old, existing crochet. In this sense, the software can be used for storage of ethnographic exhibits.

## II. FEATURES OF CROCHET PATTERN DESCRIPTIONS

### A. Descriptions of crochet patterns

Crochet patterns are described by crochet charts and/or crochet (work) instructions. Crochet charts include graphic symbols, each of them correspond to a crochet stitch. At all, a crochet chart follows the shape of the real crochet pattern as it's represented in fig. 1. In most cases a legend describing stitches is added to the crochet chart. Figure 2 represents crochet chart with a description of the stitches.

Crochet symbols are type of semi-graphical characters. The most frequently used crochet symbols standardized by Craft Yarn Council are represented in fig. 3 [16]. Usually, a legend describing crochet symbols is added to crochet charts as it is shown in fig. 2.

[1]Elena Zaharieva-Stoyanova is with the Department of Computer Systems and Technologies at Technical University of Gabrovo, 4 H. Dimitar str., Gabrovo 5300, Bulgaria, E-mail: zaharieva@tugab.bg.

Fig. 1. Crochet pattern and its chart



Fig. 2. Crochet chat and legend

To get accurate information of pattern workmanship, the crochet charts adds work instructions. They give details how crochet each row. Practically, sometimes operating instructions are alternative manner to describe a crochet pattern. It should be mentioned though that does not always work instructions completely replace the crochet pattern. People dealing crochet often prefer to hold a crochet chart as pattern description. A crochet chart follows the shape of the pattern, so it represents how the crochet patter looks like. Looking the chart the master can find errors leading to inability to make the model. Using charts skips also the language barrier. If the user does not speak language of written operating instructions but he is aware with crochet symbols and charts, it is sufficient to understand how realize the pattern. Work instructions in turn complement the chart and bring any necessary background information. For example, in precise work instructions no need for the user to count the chart how many crochet symbols are in a row. Overall, the full description of a crochet pattern should include both the charts and work instructions. These instructions also include materials used and the hook's gauge.

*B. Graphic representation of crochet charts*

Development of computer aided design software always takes into account the peculiarities both the description of the models and technology of their implementation. In this case, it is necessary to take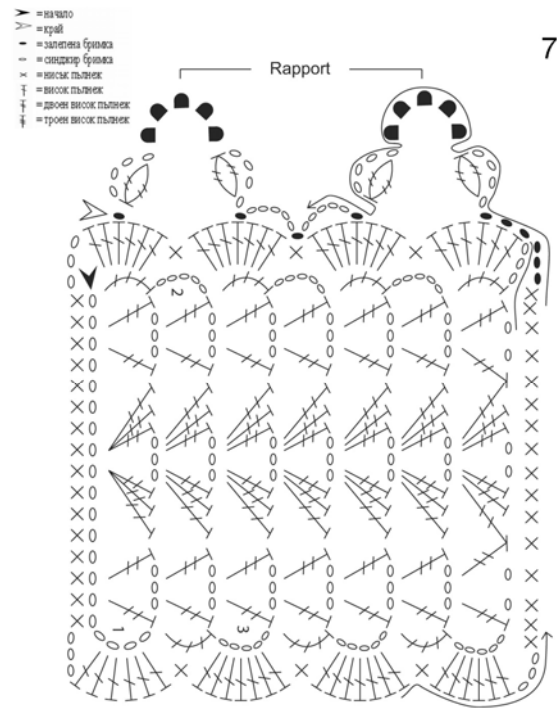 into account both the characteristics of the graphical representation of the charts and the way that makes the product.

As it has been already mentioned, the graphic description of crochet patterns using diagrams or charts represents their handmade. Unlike knitting patterns where diagrams are described in rectangular grid, crochet charts could be represented in various shapes. Just a few models can be represented in rectangular grid as each item corresponds to a stitch. In general, crochet symbols are put on the screen in more open order. Moreover, following the pattern shape each symbol could be rotated from 0 to 360 degrees. These features greatly make the Computer-aided design of the crochet charts more difficult than Computer-aided design of knitting patterns.

Crochet can be worked either **flat** or **in the round**. The model in fig 1 is an example of crochet worked in the round and the model in fig. 2 is an example of flat worked crochet. The second type crochet charts are resembled to the knitting charts – the stitches described by symbols are put on rectangular grid. Unlike knitting charts, because there is no precise layout of crochet stitches, the rotation of crochet symbols is possible (see fig 2). For patterns worked in the round, stitches are places in the circle and crochet symbols follow this layout (see fig. 1). It's possible to modify the circular shape of the pattern to an oval, triangle, hexagon or any other polygon. Crochet symbols are positioned to follow the shape of the pattern.

Both of the kind of patterns (worked in flat or in the round) begins with a **chain** - a number of stitches named **chain**. Practically, the first chain stitches form the base of the crochet. Also, each row begins with one, two or more chain stitches. For patterns worked in the round, the chain stitches are closed with a slip stitch, thus the base is formed as a circle. For patterns worked in flat, the chain base does not close and the crochet continues as knitting forming odd and even rows. There are patterns worked in the round in which the base does not close in a circle. This kind of patterns acquires an oval
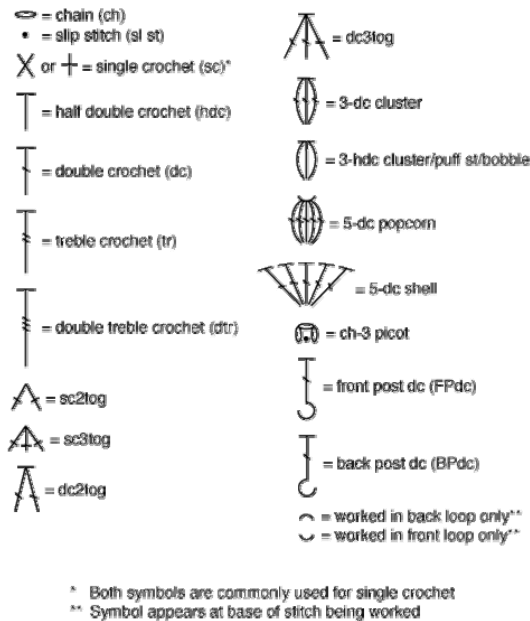


Fig. 3. Crochet symbols

shape.

They are common patterns that comprise a plurality of repeating segments. This technology is named "patchwork" or Irish crochet. Developing crochet software, it must be provided for editing this type charts - the location of the segments and the links between them.

## III. APPROACH TO CROCHET SOFTWARE DEVELOPMENT

In existing solutions [4], [9], crochet software development follows the approach to knitting software development – the charts are edited symbol by symbol as each symbol corresponds to a stitch. The paper suggests another approach – to represent a crochet pattern with their chart and work instructions together. The chart and its operating instructions must be interconnected, so change the chart to reflect to work instructions and vice versa – edit the working instructions to change the chart.

Initially, it's necessary to determine the working method – crochet in flat or work in the round. The way of crochet significantly affects how will be represented graphically subsequently chart. In the first way may be used a rectangular raster grid - like knitting software development. An example of such crochet char is given in fig. 4. However, it should



Fig. 4. Graphic representation of crochet chat worked in flat

provide that, unlike knitting symbols in crochet charts very often violated the right rectangular order of crochet symbols. In terms of graphics representation, this means that should be allowed each of the symbols in order to be rotated around its own starting point.

In the second way, crochet symbols are arranged in the round in the chart – the shape is a circle or an ellipse. This type of the charts suggests using a polar coordinate system for their graphical representation. An example of such a chart is presented in fig. 5. Provision should be made that possible circular or oval shape can be transformed into a triangular, square, hexagonal or other polygonal shape. It is also possible circular shape be modified in more complex shape, a star, for example, as the chart in fig.2. It's convenient, according to the type of figure, the user alone to determine the number of axes in the polar grid. Due to the specifics of crochet in this type of chart should be allowed rotation symbols around their starting points.

At all, the description of crochet chart includes its shape and the number its rows. The crochet chart comprises a plurality of rows, each of which contains a certain number of crochet symbols. Respectively can be defined the following drawing objects:

$$CHART \rightarrow ROW \rightarrow SYMBOL$$

These three really existing objects determine classes needed for a chart description.

There are two approaches to creating a crochet pattern:
- To create a pattern by editing symbol by symbol, to shape lines that form the entire chart.

- Initially create the overall shape of the chart, separate it as rows and set the characters in each line.
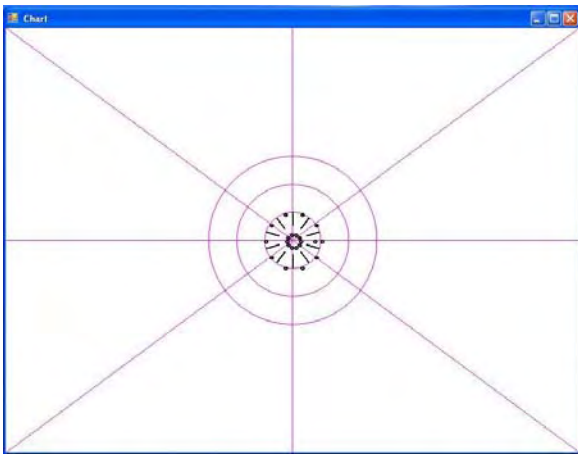


Fig. 5. Graphic representation of crochet chat worked in the round

Both approaches are recommended for well-developed software. It's necessary to declare classes corresponding to the objects chart, row and symbol. Classes must have methods for graphic transformations: translation, rotation, scaling. The chart is defined by its shape – circle, ellipse or polygon. The rows follow the chart shape but each row can be somewhat of changing its size. Each row consists of crochet symbols. Each symbol has type, size, and location.

To avoid possible technical errors in the graphic construction should be laid:

- An initial row includes a set of chain stitches
- Start point for each row marked with a number and required number of chain stitches and slims, if it necessary.

Regardless of the type of chart depending on the working mode, each of crochet symbols can be rotated. It is necessary to provide for a graphical transformation rotation of each symbol.

## IV. CONCLUSION

Despite the fact that in the modern world, unlike in the past, people are not required to make handmade products, there are some people who deal with this either as a hobby or as a small business. Moreover, traditional crafts and home occupations are also part of the cultural heritage; in practice people who deal with them keep traditions alive. Modern information technology can be successfully used for presentation and preservation of cultural heritage. Development of knitting and crochet software helps the people dealing with these home crafts. Moreover, these software applications can be used for storing samples of the old knitting and crochet which are ethnographic exhibits. These software systems can be developed with tools or wizards oriented to ethnographic researches.

In comparison with knitting and embroidery software, there are fewer crochet software applications. The reason is the larger difficulties in graphics system development due to the essence of the crochet technology. This paper treats the problems related to crochet software development. Detailed overview of graphic representation of crochet charts is done. Examples of such charts are created. According to the technology, the paper suggests an approach for crochet software development.

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