

# Digital Representation of Color Stitches in Craft Software

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**Abstract.** This paper studies problems related to the development of craft software. It proposes an approach to developing an application for digital representation of color stitches in cross stitch pattern and crochet software. A database containing information about the most popular embroidery floss brands in Bulgaria has been built. The software module can be used independently for digital representation of a needlework thread catalog and floss conversion or to be embedded for digital representation of color stitches in cross stitch and crochet software. The software is oriented to people manufacturing national Bulgarian costumes and clothing with national Bulgarian embroidery.

**Keywords:** Crochet Software, Cross Stitch Pattern Software, Craft Software, CAD Systems, Domestic Handicrafts, Digitalization, Computer-aided Design.

## 1 Introduction

Over the past centuries, traditional textile domestic handicrafts such as weaving, knitting, crochet and embroidery have become widely spread activities in many countries. Performing these traditional female activities aims to produce cloths and different kinds of homespun textiles. Some of these domestic handicrafts have been preserved until today, although they have transformed into hobby or leisure activities. Regardless of the modern approach to these activities, people dealing with them have a feeling of continuity, expressed in searching for old patterns and samples and their replicating (National movement "Workshop- traditional crafts circle").

Traditional Bulgarian folk costumes are richly decorated with embroidery and crochet lace. Apart from being part of the artistic decoration of clothing, they also have a protective function. Typically, they are placed near to the open parts of the human body - cuffs, necklines, end of shirt. Their purpose is to protect human beings against malicious forces, magic, as well as to ensure health and prosperity (Veleva P., 2018). In this way, each embroidery pattern has a certain symbolism passed down through the centuries, and therefore the preservation of old patterns is related to the preservation of the intangible cultural heritage.

In recent years, there has been a growing interest in Bulgarian folk costumes in this

country. Many companies offer on the market production of both Bulgarian folk costumes and clothing, decorated with typical national embroidery (Vezba), (Elnashar AE., 2017). It determines the increased demand for old patterns of embroidery and crochet laces. Many people use Internet to share free patterns of Bulgarian embroidery and exchange different ideas related to textile handicrafts (B.), (Alita Design), (Istoriavshevici). That is why, it is important that there should be some pattern design software that supports these activities.

Worldwide, people engaged in textile domestic handicrafts such as knitting, embroidery and crochet use software to create, store and distribute patterns of their manufactured textiles. Examples of such applications are *knitting software* (Ursa Software), *crochet software* (Send Castle Design.), (Stitch Work Software, 2015), *cross stitch software* (Pattern Maker for cross stitch ). All these application are known also as *craft software* (Ursa Software), (Stitch Fiddle). Usually, textile craft sites support actual information on such software (Lord Libidan). Craft software, on the one hand, aids the work of people dealing with textile crafts and, on the other can be used for preservation of age-old patterns of embroidery, knitting, crochet. Thus, modern technologies are used to preserve textile crafts as part of the cultural heritage.

Generally, craft software applications are equipped with image editors for graphic representation of knitting, crochet or cross stitch patterns by sets of color or graphic symbol stitches. Since realistic pattern representation is essential, a requirement for such a type of software is to maintain the color ranges of embroidering and crochet threads available on the market. This paper focuses on the representation of color stitches in craft software and proposes an approach for developing a software module supporting information for different embroidery and crochet thread brands.

## **2 Problems with Digital Representation of Color Stitches in Cross Stitch Software**

As has already been mentioned, cross stitch software necessitates that the floss colors available on the market should be taken into consideration. All thread brands have catalog numbers, which correspond to different types of color stitches. As the most famous threads brand DMC (DMC) has establish itself as a benchmark used in all printed and electronic editions of cross stitch patterns. Due to this fact, all cross stitch applications support DMC threads. Another famous threads brand is Anchor (Coats), supported by many craft programs, too. Usually, at the beginning of a design process in a cross stitch application, the user is required to determine which brand type will be used. Some applications can convert the number from DMC to Anchor and vice versa. Some handicraft sites also suggest some floss conversion functionality (Cyberstitchers ).

The digital presentation of the color scheme for the embroidery pattern makes it so that each color stitch is related to the catalog number of the thread. In existing software solutions, the presentation of color stitches has some negative aspects, which can be summarized as follows:

- Sometimes the difference between a digital color picker and a real floss color is too tangible and the user cannot receive a realistic view of the pattern.

- The cross stitch applications do not support the entire floss catalog. It is probably due to the lack of up-to-date information about the new threads launched on the market.
- Usually, the cross stitch software sorts the color stitches according to the numbers, in ascending order, Stitch Fiddle for example (Stitch Fiddle, n.d.), unlike the company catalogs, where the threads are arranged in color ranges. The color ranges arrangement facilitates the user to compare resembling colors and to find the proper one.
- When there is a consistency between the different brand catalogs, it is assumed that the colors of the threads are the same. According to company policy, actually, there is no full match between the thread colors produced by the different companies. This fact is not taken into account by the existing software and therefore, sometimes the pattern does not give the true view of the product.

Except embroidery floss, companies like DMC and Anchor produce crochet threads as well. In comparison with embroidery floss, the color range of crochet threads is limited. The existing crochet software does not support information about any crochet thread brands.

This paper is intended to introduce an approach to digital representation of color stitches in cross stitch and crochet software. The objective is to develop a software module holding information for most frequently used floss and crochet thread brands in Bulgaria. The ultimate aim is to create functionality that overcomes the shortcomings of the existing software solutions. The proposed software module can be used independently for digital representation of floss and crochet thread catalogs or to be embedded in cross stitch and crochet software for digital representation of color stitches.

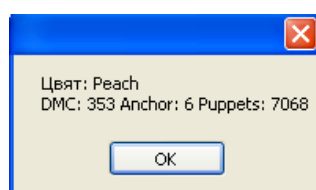
### 3 Software Module for Digital Representation of Color Stitches in Cross Stitch and Crochet Software

The paper proposes an approach to developing some software for digital representation of color stitches in handicraft software. There has been built a database that stores information about the most popular embroidery floss brands in Bulgaria including the base (parent) table, named **brandsTable** with the numbers of the most famous floss brands in Bulgaria – DMC, Anchor and Puppets. The structure of **brandsTable** is shown in Table 1.

**Table 1.** Columns of Table **brandsTable**.

Name	Type	Description
id	<b>Int32</b>	ID number
Name	<b>String</b>	Color name
DMC	<b>Int32</b>	DMC color number
Anchor	<b>Int32</b>	Anchor color number
Puppets	<b>Int32</b>	Puppets color number

Each table record shows the conversion between the color catalog numbers of different thread brands. For example, Anchor color 13 corresponds to DMC colors 349 and 817; DMC color 666 corresponds to Anchor colors 46 and 9046. The colors are very close to each other. Due to the fact that two or more colors of one brand are doublets of one color of the other brand, the fields' contents are not unique i.e. the contents of **DMC**, **Anchor** and **Puppets** columns may be repeated. Some floss colors are unique for the particular brand and they have no similarity with the floss colors of the other brands. So, the **DMC**, **Anchor** and **Puppets** columns may be null-able. The field **id** is added to identify each table row. The example of **brandTable** row content is shown in fig. 1.



**Fig. 1.** The example of brandsTable record.

The database supports three child tables containing information on DMC, Anchor and Puppets thread catalogs. These tables have the structure given in Table 2. The id field contains the color number and it is used as a primary key. The table row gives the RGB color picker of each floss color by the fields Red, Green, Blue. Although the brandTable table matches the colors of different brands of threads, their color schemes differ from each other. For this reason, different color schemes are stored for the threads of each brand.

**Table 2.** Columns of **DMC**, **Anchor**, **Puppets** Tables.

Name	Type	Description
id	<b>Int32</b>	Color ID number
Products	<b>Int32</b>	Products in the color
Column	<b>Int32</b>	DMC color number
Row	<b>Int32</b>	Anchor color number
Red	<b>Byte</b>	Red color
Green	<b>Byte</b>	Green color
Blue	<b>Byte</b>	Blue color

The **Row** and **Column** fields contain the color space information provided in the catalog by the manufacturer. In practice, the values of these fields determine the digital representation of the thread catalog, which corresponds to the real one. The color position is fixed by means of color ranges, thus facilitating the user to choose a proper color. The **Row** and **Column** fields serve to identify the location of the color number in the actual catalog and in practice, this makes the preparation of the purchase order easy.

Fig 2 illustrates the screen form that visualizes the Anchor floss catalog. The RGB values are taken from catalog pictures using color picker detection software. Since the location of the color number in the actual catalog is easy to navigate through the contents in the Column and Row fields the preparation of a purchase order is much simpler.

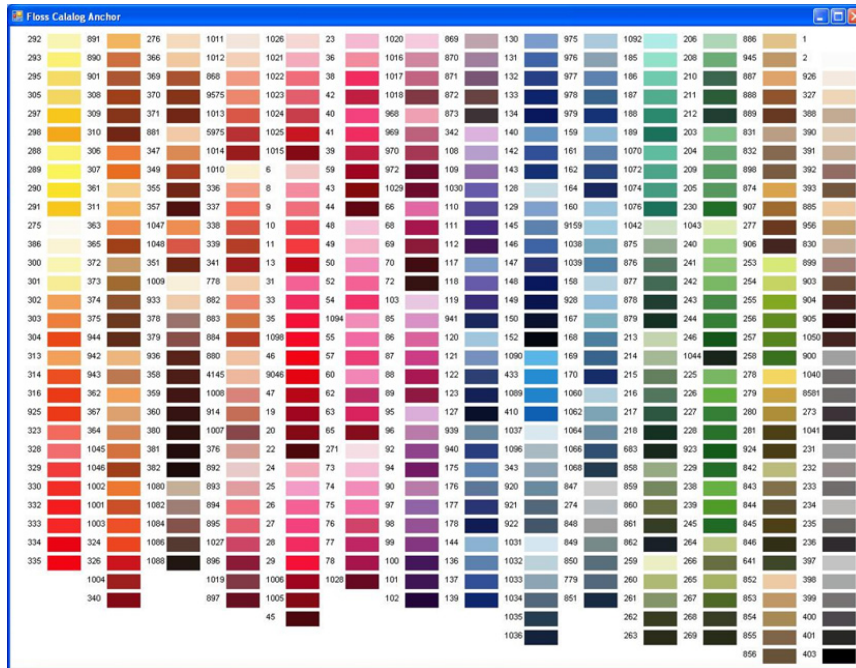


Fig. 2. Digital representation of Anchor floss catalog.

Except embroidery floss, DMC and Coats produce also crochet threads. For example, DMC offers crochet threads (cotton pearl balls in different sizes), tapestry wool and more. The **Products** field is provided for information about what products the company offers in the appropriate color. Accordingly, the value of this field is used when generating the catalogs of the various items - skeins; cotton pearl balls size 10, size20, size30; skein tapestry wool. The Products field has different meanings for the tables, depending on what products the company offers.

#### 4 Conclusions

Traditionally practiced domestic textile handicrafts like embroidery, knitting, tapestry and crochet are part of the cultural heritage. On the one hand, they pay respect to the skills passed on from generation to generation, and on the other – they keep alive the patterns containing symbolism through the ages. To help enthusiasts who engage in these handicrafts, there are developed software applications for designing embroidery,

knitting, and crochet patterns. This paper proposes an approach to developing a software module for digital representation of color stitches in cross stitch pattern and crochet software. For the implementation of which are used C# and ADO.NET. The application supports the most frequently used embroidery and crochet thread brands in Bulgaria. A database representing DMC, Anchor and Puppets catalogs has been created. The software module can be used independently for digital thread catalog representation and floss conversion or to be embedded for representation of color stitches in cross stitch and crochet software.

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