

# Creation an Information Model of the Bulgarian National Embroidery for Presentation and in Knowledge Bases

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**Abstract** – Embroidery, as a decoration of the folk costume, is an integral part of the overall composition of the garment. It is a source of information for contemporary researchers about the aesthetic and moral norms of our ancestors, about their ancient gods, beliefs and traditions that have lost their popularity these days. Over time, the embroideries have lost the meaning of a sacral element, and many of them have been modified, geometricized and stylized, but in their infinite variety they represent an extremely valuable historical heritage. Regardless their uniqueness and diversity, national embroideries carry some compulsory elements that can be summarized and required when creating knowledge bases with information about them. A formalized model of semantic information, carried by the Bulgarian national embroidery, is presented, with a detailed description of its specifics. Along with the commonly accepted standardized forms, the characters encoded as a positive, negative or hidden element are also stored. The characteristics thus selected, make it possible to build a knowledge base such as a semantic network based on the subjective semantics of the elements. The aim is to provide an opportunity to search and display comprehensive information about an individual artefact, to study it in the context of such monuments and to create a collection for further socialization.

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## 1. Introduction

In addition to protecting the human body from climate, the national attire of different countries also performs a number of other functions: decorative, aesthetic, religious, socially determining and more. In many cultures, including ancient Persia, India, China, Japan, Byzantium, and medieval and Baroque Europe, the numerous embroidered garments, religious and household items have been a sign of wealth and status. Traditional folk techniques have been passed down from generation to generation in different cultures, despite their wide variety.

The folk costume decoration is an integral part of the garment and the overall composition of the costume. The clothes, as well as their embroidery decoration, acted as an identity document through the elements which corresponded to an area the person who wore it was from, from what kind, whether he or she was married, his financial status, etc. [1] They are a source of information for contemporary researchers on aesthetic and moral norms, ancient gods, beliefs, and traditions that have lost their popularity these days.

It is believed that the origin of the stitches on the clothes comes from the ancient custom of people to tattoo them. There are idol sculptures from the early prehistoric periods that represent bare painted bodies, and in later eras, sculptures with definite clothing marks were found on which similar decoration was present, and they could accordingly be interpreted as embroidery or weaving [2].

The origin of embroidery can be dated to the cro-magnon days or 30,000 BC. During archaeological excavations, fossil remains of heavily hand-sewn and decorated clothing, boots and a hat had been found [3].

Embroidery and most other fiber and handicraft arts are thought to originate in the Orient and the Middle East. Much of the embroidery ornaments appear on the garments of different nations as a result of the influence of other ethnic groups, with which

they are directly in the path of their historical development. For example, very close or almost identical ornaments are found in ancient clothing, carpets, ornaments and household items in Tibet, China, Korea, Mongolia, Central Asia, Volga Bulgaria, the Danube Bulgaria and wherever the Bulgarian people settled [1].

During the passing of the models throughout the generations, every embroiderer has put a great deal of creative interpretation and the ornamental patterns have been transformed into a national identity style. Due to necessity to preserve nationality and identity, the tradition has also undergone changes under the influence of the seamstress's imagination and creative sense. Thus, many of the ornament patterns have lost their original symbolism, and instead had adopted the specifics of the local way of life [5].

Over time, the embroideries have lost the meaning of a sacred element. Many of them are modified, geometricized and stylized, but in their infinite variety they represent a unique legacy of the secret language and symbolism embedded in the ornaments, a peculiar memory of a rich worldview, a unique aesthetic sense, and the sense of rhythm and harmony of our ancestors [1].



Figure 1. Bulgarian folk costume from the Rousse region

Regardless their uniqueness and diversity, embroideries of various cultures carry some compulsory elements that can be summarized, and they are mandatory when creating knowledge bases with information about them [4].

The purpose of this paper is to describe the created formalized model of semantic information, carried by the Bulgarian national embroidery, with a thorough presentation of its subjective sides. Along with the commonly accepted standardized forms, the characters encoded as a positive, negative or hidden element are also stored. The selected characteristics make possible the creation of a knowledge base such as a semantic network is based on the subjective semantics of the elements.

The aim is to provide an opportunity to search and find comprehensive information about an individual artefact, to study it in the context of such objects and to create a collection for further socialization. The catalog is organized in a way that gives a sufficient description of cultural values such as national embroidery, including a great deal of information about the meaning and significance of the chosen artifact within the cultural heritage.

The developed and presented knowledge base will be promoted online and will offer images and authentic models to amateurs and researchers.

## 2. Standards and Research Models for Artifact Description

Today, almost all types of museum activities are analyzed and standardized. World standards for a complete catalog description of artifacts and collections cover the entire museum resource base [6]. Using them ensures uniformity of records, easier distribution, reliability of information and easy access to it. There are many museum standards in the world today for cataloging museum sites. The most popular are six of them, implemented in many museums around the world. These are the Dublin Core Metadata Initiative (DCMI), the standards used in Europa's Digital Library, Europeana Archives and Museum, the standard developed by the International Organization for Standardization - ISO for a computer image base, etc. [6]

Different standards apply to different types of museum objects - for those from archaeological excavations, for ethnographic artifacts, for works of art, for natural-scientific collections, numismatic collections, and more. Each contains a certain number of information fields (metadata) depending on the purpose of the description and the general characteristics of the object. [6]

The Dublin Core Dublin Core Metadata Initiative (DCMI) standard is the result of an international interdisciplinary consensus achieved with the assistance and continued efforts of the Dublin Core Metadata Initiative (DCMI) [7]. It aims to provide the basis for a standardized bibliographic description of information resources on the Internet. Its main essence is a special metadata scheme - a "core" of 15

elements known as the Dublin Core Metadata Element. They can be used to describe web resources (videos, photos, web pages, etc.) as well as physical resources such as books and CDs, as well as objects such as works of art.

The full set of Dublin Core metadata can be found on the Dublin Core Metadata Initiative (DCMI) website. This data includes title, Creator, Subject (keywords, indexes, subject headings), Description (Content, Annotation), Publisher, Contributor, Date, Format (physical or digital manifestation of the resource) - Format, Type, Identifier (ISBN, ISSN, etc.), Source, Language, Relationship, Coverage, Copyright. They are shown in Fig. 2

Dublin Core Metadata can be used for a variety of purposes, from simple resource descriptions, to web applications, etc., but they do not include the minimum of metadata for a full catalog description of artefacts and collections, and they are really just one "kernel". This format is preferred for describing electronic resources in the Web space, and it is mostly used by computer science. The main criticisms of the Dublin Core standard are that it lacks many of the important attributes of cataloging, and that information about them can be provided by authors, webmasters, publishers, and others who have no knowledge of cataloging principles [ 4].

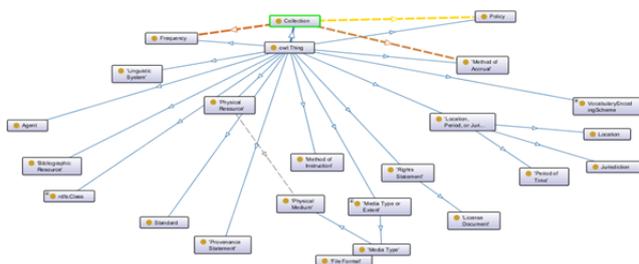


Figure 2. Dublin core schema, visualized by Protégé 5.0 (<https://www.dublincore.org/schemas/rdfs/>), presented on 2012-06-14

### 3. Exposition

In recent years, there has been an increasing interest in using ontologies to represent the semantics of data from different fields of knowledge. Their specific advantages, such as simplicity, clarity, and presentation, favour the formalization of large volumes of factual information. For this reason, semantic digital libraries have been attracting the attention of various scientific and educational institutes for a decade [8], [ 9].

Since the description of cultural and historical heritage elements is an area that offers interesting opportunities for the implementation of ontologies, not only computer professionals but also historians are interested in promoting digital libraries that preserve the subjective semantic characteristics of

individual artefacts. Bases of knowledge about the folklore area cover different areas of cultural life in the past. [14]

Creating a knowledge base with national embroidery has its own peculiar feature, because it requires analysing the information describing the ensembles of ornamentation and decoration, combining fabric, embroidery, appliqués and borders.

The embroidery ornaments embedded in the embroidery are signs and symbols that encode an incredible message. Through them, the masters of the thread personified the cult of the sun and the stars, symbolizing ancient, mighty gods. In addition to pleasing the eye, these ancient drawings were of sacred magical significance, guarded, healed, and hid secrets. In them, the rainbows put their hope in protecting themselves from "evil forces" and "bad eyes", for fertility, health and birthing. The women passed on their love and blessing on the rough clothes of their husbands, brothers and sons, passed on the knowledge from mother to daughter, preserving it for millennia [10].

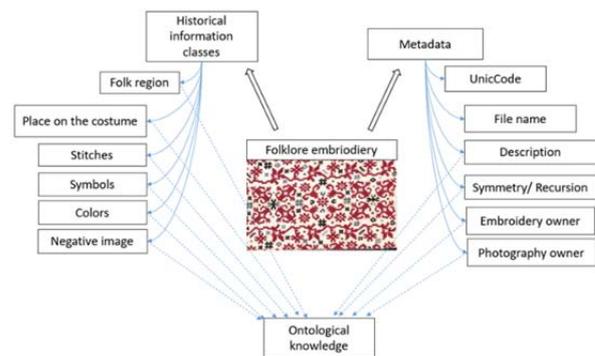


Figure 3. Information model (adapted by [16])

The embroidery patterns are quite symbolic, and often each folklore region has its own unique "embroidery code". The patterns can be geometric, colored or even zoomorphic. They include different embroidery techniques to create an endless variety of designs.

#### 3.1. Historical Information

On the territory of Bulgaria there are embroideries unique regarding the different regions, but all of them have a universality of symbols for prosperity, fertility and health. From ancient times, it was believed that embroideries guard against evil, so women embroidered the clothes of the family to weave magic trademarks into it. The most colourful and ornate garments were the shirts worn closest to the body, in order to stop the influence of all evil forces. Unfortunately, the exact prototypes have been lost over time. The ancient traditions of people being

buried with their finest clothes, as well as the deliberate alteration of symmetry and leaving something unfinished (against lessons) were detrimental to the accurate transmission of the model's prototype.[11].

These facts require the classes describing the knowledge base to be as follows:

- **Folk region** - Bulgaria is divided into several ethnographic areas, each of which has its own peculiarities in terms of song and dance folklore. In general, the folklore regions in Bulgaria are seven. Depending on the costumes, the Bulgarian folklore has formed in more than twenty significant varieties spanning the different regions. For a territory that is the size of Bulgaria, this is too much. For this reason, it is necessary to introduce Class FolkRegion, which will serve to store this information, and help to determine the peculiarities of the stitches in the particular area.

- Although the present study is focused solely on the Bulgarian national embroidery, it is envisaged, through the Class Country Knowledge Base, to store other nations' embroideries as well. This organization predisposes the current theoretical framework for further development, and provides a tool for comparing elements from different ethnic regions, which will facilitate and enrich a number of studies on the migration of nations with factual material. [9]

- **Stitches** - The embroidery is sewn directly onto the canvas through uniform stitches, made out of a number of multicolored, mostly woolen, rarely silk, and more recently cotton threads. Often, the same motif is found in the folk embroidery, made in different variations of stitches, without breaking away from its origin. It depends on the personal taste of the master, who enriches folk art, adding something new and personal to it.

The stitches are very diverse, and their names are given in a generalized and relatively conditional way, because the terminology is not well established in this field. Some stitches are called in one way by the folk masters and in another way by specialists in the sewing industry. The stitches used to make the Bulgarian stitches are flat, embossed and openwork. Of these, the most common and oldest stitch is the cross. This stitch is supposed to have represented the cult of the sun, whose main symbol is the cross. There is a theory that the cross stitch is a magic sign used for safety purposes [5].

As a standard, the description of each stitch as a museum object also describes the sewing stitch (cross stitch, curl stitch, openwork, needle weaving), with which the artefact is embroidered, so Class Stitch is included for the sake of completeness.

- **Place on the costume** - The embroideries were always placed in the ends of the garment. Finally the sleeves, the torso, around the neck and the solar plexus, on the head, down at the end of the frock and at the waist. The reason is that in this way they have a protective function and protect the visible boundaries of the body.

According to its purpose, the seamstress is different for: bosom, collar, skirt or sleeve.

- **Colors** - Ideas for combining individual characters are endless. The traditional Bulgarian colors in the seamstress are red, green, blue and dark red. Yellow is used very rarely. In some parts of Bulgaria the traditional color is black. Of course, in addition to the standard colors, rainbows are used as rich palette to create colorful geometric shapes.

- **Symbols** - In his monograph "Bulgarian Embroidery and Tissue Ornamentation" [12], using the methods of joint examination and analysis, Prof. Koev systematized over 800 titles of embroidery and woven ornaments, divided into 17 sections according to whether they were plant names or animals; whether they are the names of the settlements where the ornament originated, or the names of the dressmakers, motifs, etc. By their essential elements, it divides the ornaments into five sections: animal, plant, symbolic, geometric human figures [12]. The researchers of these signs agree that they have played a multifunctional role, sometimes serving as a protective device, a family sigil, a religious symbol, a production sign, some as letters and more.

There are stylized birds from the animal kingdom - roosters, pigeons, geese, peacocks, dragonflies, etc. Human figures are mostly found in old embroideries, highly stylized, reduced to ornament. The geometric motifs are rhombic, square, and stylized crosses with flowers that resemble roses. Shapes in the rhombic field, stars that are most often octagonal, are found in multiple variations and combinations.

Separate classes have been created for each group according to the types of symbols distinguished by the folklorists, and each individual model is a copy of the class.

### 3.2. Metadata

Metadata is simply data about data. The purpose of their definition is to enable them to be applied to many and various resources, so that the potential users can appreciate their usefulness and purpose. Although there is no doubt that any information, however limited, is still a useful resource and that some categories of metadata are of greater interest than others, it is far less clear on what basis or authority should the definition of a standard set of metadata descriptors be defined [13].

Object metadata controls the types of records that can be created and what actions can be taken with them. Using only site metadata and web services, developers can write code to perform data actions in any environment. This metadata can be altered with customization tools in order to create or edit objects, fields, and object relations.

Well-crafted metadata is very important for managing and storing digital objects. Without metadata, information about the digitization process can only be obtained from the file name, file extension and directory structure. But this data does not provide enough information about the creator, user or manager of the digital object [14].

- **Description** - this field allows the history of the source itself to be stored. E.g. how old is the model or to whom did it belong, if it would be of any interest to consumers.

- **Negative image** - Occasionally, ancient shapes show an ornament not only of the embroidered but also of the non-embroidered constituent of the stitch as an image - which is presented in a 'negative' form, as a white box between two embroidered red figures. These types of compositions are deliberately composed with the unity of the embroidered unbound parts.

In the “elbetitza” from “svilenitza” of the IEPPEM fund No. 473516, the white unbound fields between the red figures (close to the images of the Neolithic Birth Goddess) form four unbound upright female figures with horned heads, arms folded and expanding skirts.



Figure 4. Embroidery motif of the IEPPEM fund No. 473516

Symmetry / Recursion - A specific effect of Bulgarian folklore embroidery is that it contains symmetry and consistent repetition. Instead of primitive pictures of the outside world, geometrical symbols with religious messages have been transmitted for centuries [5].

Baeva [15] introduces in her research a mathematical apparatus for describing recursion and symmetry. Therefore, it is envisaged that metadata can be stored as mathematical indicators for this type of geometric repetition.

- **FileName** - This is data about the individual components that make up the entire digital object, and also describes the relationships between those components.

The following conditions have been taken into account in the creation the knowledge base for the Bulgarian national embroidery: if real embroidery has a material medium, then one image (photo) is not sufficient for its digitalization. For this reason, an Embroidery class is provided that directly corresponds with Class Image.

- **Unicode** - A unique number is provided for the description of each embroidery. This reduces the likelihood of close images from different authors being duplicated. The uniquely generated specific number includes data on the state, folklore region, settlement and serial number [17],[18].

- **Anotation** - In her article, Baeva [15] proposes an approach for annotating part of geometric images in a stitch. If every motive is correctly described, it would be easy to find other similar motives through automated search.

- Embroidery owner / Photography owner - Rights metadata. This is the intellectual property data of the artefact and the digital object. Example: copyright details, terms of use, licenses.

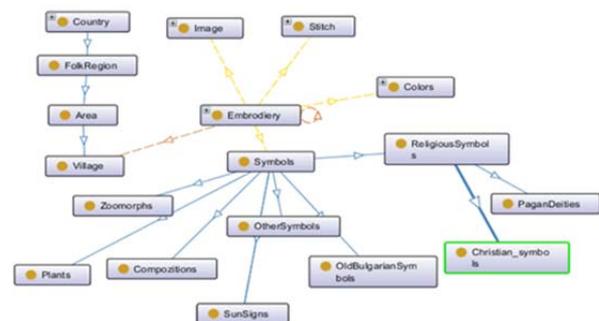


Figure 5. Bulgarian national embroidery ontology, presented by OntoGraph in Protégé

#### 4. Conclusion

Over the past few years, more and more people have been curious about the art of sewing, the techniques of embroidery, and the unraveling of the secret encoded in them.

A well-organized and standardized knowledge base for the national embroidery would be a valuable resource, and it is extremely important to build a comprehensive description of historical specimens within such a resource.

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