Ornaments of Serbian Medieval Frescoes

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Abstract

The ornaments from the Serbian medieval frescoes belong to the religious decorative art with the very restricted set of possible motifs, mostly related to a cross, and thus the basic motifs can fit in a very limited number of symmetry groups. The main criterion for the quality of such ornamental art could be the richness and variety of patterns obtained from a very small number of symmetry groups, proving the creativity of their authors - their ability to create variety with a very restricted number of initial symmetry groups.

1 Introduction

This paper is joined work with dear colleague friend and professor Slavik Jablan who passed away on February 2015.

Ornament (lat. *Ornamentum* – decoration) is the oldest and basic decorative element in visual arts, closely connected to the concepts of repetition and symmetry. Artists and artisans of different epochs, cultures and civilizations used the repetition and combination of motifs for the creation and construction of different decorative patterns on bone, textile, ceramics, paintings, or jewelry... The relatively independent development of geometry and painting resulted in formation of two different languages, which are using different terms for describing symmetrical forms. The dynamic progress of the mathematical theory of symmetry caused that the first more significant incitement for the study of ornamental art came from mathematicians. In the appendix of his monograph about infinite groups, Andreas Speiser [Speiser (1927)] proposed to use ornaments from Ancient world (like Egyptian ornaments) as the best possible illustration of symmetry groups. The approach to the classification and analysis of ornaments based on symmetries was enriched by the contributions of different authors (A. Müller, A.O. Shepard, N.V. Belov, D. Washburn, D. Crowe, B. Grünbaum...). In their works, the descriptive language was replaced by geometric-crystallographic terminology. The approach to the ornamental art from the point of view of the theory of symmetry offers the possibilities for the more profound study of the complete historical development of ornamental art, regularities and laws on which constructions of ornaments are based, as well as an efficient method for the classification, comparative analysis and reconstruction of ornaments. The classification of ornaments according to their symmetries can help us to find answers to many questions: when and where a certain kind of symmetry appears in the ornamental art; which forms prevail; how to classify colored ornaments; how, when, where, and why man created ornaments at all... That kind of classification can also be used as the indicator of connections between different cultures.

2 Serbian Medieval Frescoes

We will discuss ornaments that were represented at the exhibition “Memory Update – Ornaments of Serbian Medieval Frescoes”, The Museum of Applied Art (Belgrade, November 6, 2014 - January 31, 2014) based on the material corresponding to the book by Z. Janc, ”Ornaments in the Serbian and Macedonian frescoes from the XII to the middle of the XV century”, Belgrade, 1961. In the context of this book this material is particularly interesting from several points of view. The first of them is the difference between the mathematical approach to the symmetry of ornaments, where the mathematicians usually working with the patterns from different books or other sources and try to show the representative examples of the particular symmetry groups. The ornaments from the Serbian medieval frescoes belong to the religious ornamental art with the very restricted set of possible motifs, mostly related to a cross, so such basic motifs can fit in a very limited number of symmetry groups, based on the rectangular, rhombic, or square grid. In such a case, as the main criterion for the quality of such ornamental art could be the richness and variety of patterns obtained from a very small number of symmetry groups, proving the creativity of their authors – their ability to create variety with the very restricted number of initial symmetry groups.

Many of the ornaments shown in this exhibition are not geometrically precise and look more as the sketches of geometrical patterns, than as their exact realizations, inviting a viewer to recognize their symmetry and regularity and disregard details. As it was mentioned by Zagorka Janc [Janc (1961)], ”all ornaments in our frescoes are painted very freely, almost imprecisely, usually with strong illusionistic tendencies”. According to Vladimir Dvorniković [Dvorniković (1939)], ”after the first lost battles against the Turks, in the painting is a clearly visible new, rude, but strong natural stroke”, and that ”after the Turkish occupation, popular fresco-painters, stone-cutters and engravers appear, which transformed that old church art into a semi-popular art and craft...” The lack of precision can be explained as the intent of the fresco-painter to give a free interpretation of the patterns copied from textile (where the patterns are absolutely precise and regular), and use them as a decorative part of frescoes, or parts of the space surrounding them. Such ornaments can be treated as approximately symmetric. Through our visual perception, we recognize them as symmetrical. In general, we perceive every approximately symmetrical object as symmetrical, by observing the whole (object) and avoiding the details.

The original meaning of ornaments was primarily symbolical, and then decorative, so it is possible to talk about the language of ornaments. The visual form of the ornaments was harmonized with their (symbolic) meaning. Information about ”visual forces” (static and dynamic impression that some ornament produces, the existence of the ”left” and ”right” form, etc.) are contained in the symmetry group of an ornament, so the choice of a certain symmetry group and its frequency of occurrence depends from its visual/symbolical meaning. Even the title of the exhibition ”Memory update” is the invitation to search for forgotten knowledge and meanings hidden in the Serbian fresco-ornaments.

2.1 Rossetts

Rosettes can be divided into two infinite classes: the class of cyclic symmetry groups C_n, which contain only rotations, and class of dihedral symmetry groups D_n containing rotations and reflections. Since every rotation can be "left" or "right", the rosettes with a cyclic symmetry group can appear in two (enantiomorphic) forms: the "left" and the "right", introducing a possibility to suggest the motion, so cyclic groups produce the visual impression of dynamics and rotation (turn). On the other hand, thanks to the mirror reflections, dihedral groups have only one possible form. Typical geometrical figures with the dihedral symmetry group D_n are regular polygons. Usually, they are placed in such a way that one edge, the basis, coincides with the horizontal line, and the other with the vertical. Because of that, dihedral symmetry groups possess a specific balance between the dynamic visual component, caused by the rotations, and the static component produced by the reflections.

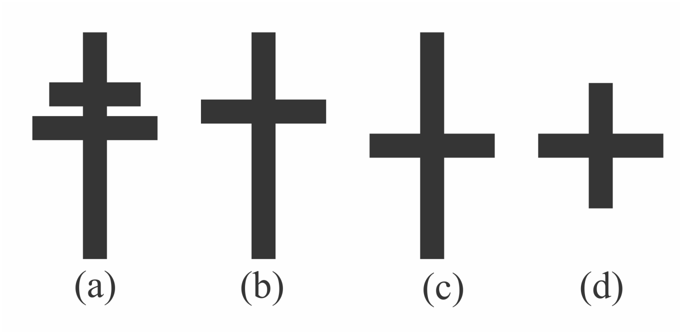

Figure 1: Different forms of a cross.

The superposition of the identical rosettes (Petkovica, Fig. 2a; Petkovica, panel Fig. 2b;) can also result in a symmetrization: by composing two rosettes with the symmetry D_4, we obtain an octagram with the symmetry D_8.

2.2 Friezes

The next classes of the plane patterns are the linear patterns - *friezes*: figures with an invariant direction – the axis of translation. In the friezes, together with translations, reflections and glide reflections, only rotations of order 2 – half-turns appear as symmetries, preserving invariant the axis of a frieze. Exactly seven combinations of the mentioned symmetries exist. This means that every frieze belongs to one of the seven possible schematic patterns, i.e., symmetry groups.

Every symmetry group of friezes can be denoted by the symbol, which consists of the elementary symbols: **1** – trivial rotation of order 1, **g** – glide reflection, **2** – rotation of order 2 (half-turn), and **m** – mirror reflection. As the result we obtain the notation for seven symmetry groups of friezes: **11**, **1g**, **12**, **m1**, **1m**, **mg**, and **mm**. In this notation, the first symbol (**1** or **m**) represents symmetry (trivial rotation of the order 1 or mirror reflection **m**), perpendicular to the translation axis, and the second the element of symmetry parallel to the

Figure 2: Table 1.

translation axis (rotation of the order 1 or 2, reflection, or glide reflection).

Friezes are usually horizontal. If the axis is polar (none of the symmetry transformations from the symmetry group of a frieze changes the direction of the axis), it is possible to suggest an oriented motion. If some symmetry group has no indirect (sense reversing) transformations, the corresponding patterns appear in two forms: the "left" and the "right", so there is the enantiomorphism. In the case of friezes, this means that only friezes 11 and 12 have the "left" and the "right" form, since they have no indirect transformations: mirror reflections, or glide reflections. By using vertical oriented friezes, it is possible to suggest an upward motion. In the case of the "real" and the "mathematical" friezes, we have the same problem as in the case of rosettes: the "mathematical" friezes are infinite symmetrical linear patterns. The "real" friezes are finite, usually placed along an axis coinciding with one of the fundamental natural directions - vertical or horizontal line, which have different visual-symbolical meaning. Oriented friezes with the slanted axis are very rare.

In Serbian fresco painting it is possible to find all seven types of friezes. They are represented as the decorative borders of priest's garments, and decorations of pillars, arcs, doors, windows... Important classes of friezes are those, derived by a simple multiplication of a rosette. Despite of the fact that these rosettes

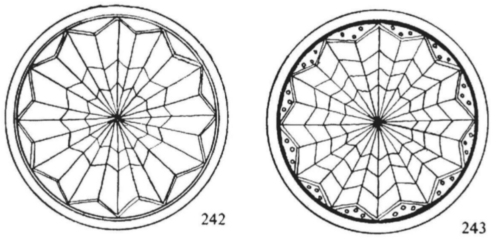

Figure 3: Table XXXIX, 242 and 243 from [Janc (1961)].

can be D_3, C_4, D_4,... the corresponding friezes cannot have rotations of the order greater than 2. For example, by a translational repetition of the rosettes C_4 we obtain friezes **12**, by a translational repetition of the rosettes D_4 we obtain friezes **mm**, *etc.*

2.3 Ornaments

The most important classes of the plane schemes are plane ornaments – infinite plane patterns without invariant points or lines, which have two translations in different directions. Those two translations make so-called translational subgroup of symmetry groups of ornaments. There are exactly 17 different symmetry groups of ornaments, meaning that all plane ornaments can be constructed (in the sense of symmetry) in exactly 17 different ways, and divided (in the sense of symmetry classification) in 17 classes. Symmetry groups of plane ornaments can contain all kinds of symmetries. There is a special restriction for rotations: permitted order of rotations in plane ornaments is 1, 2, 3, 4, and 6. This restriction, called the point of crystallographic restrictions, means that if in an ornament, as local symmetry, appears rotation of another order, e.g., 5, it cannot be the global symmetry of the ornament.

Each of the 17 plane symmetry groups of ornaments we have denoted by the corresponding symbol. In the concise crystallographic symbols of the symmetry groups of ornaments, the first coordinate is the translational part of the symmetry group: parallelogramic lattice **p**, or rhombic lattice **c**; the second symbol represents a reflection **m** perpendicular to the first translation axis, or rotation, and the third symbol represents reflection **m**, or glide reflection **g**. Such notation is chosen to completely describe each symmetry group in the simplest possible way.

In the Serbian medieval Fresco art , we can find the examples of almost all 17 symmetry groups of ornaments. Some of that symmetry groups are parts of the superposition (compound) ornaments, i.e., superposition of symmetry groups, or subgroups in the antisymmetry groups. However, we have not succeeded to find the examples of groups **p6**, **pgg**, and **p31m**.

The problem of recognition of ornaments is very closely related to the question: how to construct symmetrical patterns? There are two approaches to solve this problem: we can start from a local symmetry, and obtain global symmetry, or directly use global symmetry and then, if necessary, reduce it to some lower level (degree) of symmetry (e.g., by using subgroups of the given symmetry group). The first approach can be called *symmetrization*, and the other *desymmetrization*.

In the first case we start from some asymmetric figure, surrounded by its symmetrically arranged copies and continue this algorithm. This is the simplest way to construct ornaments: the symmetrization. The other possibility is to start from the global symmetry. For example, a square grid we will not construct by drawing it square-by-square: we will draw a set of parallel, mutually perpendicular horizontal and vertical equidistant lines and obtain the square grid. By placing some asymmetrical motif in every of the squares (but still respecting regularity), we obtain the subgroup of the preceding symmetry group of the square grid. At the beginning, we have started from the symmetry group of the square grid, denoted by p4m, and in the end we have finished with the symmetry group containing only translations in two directions, denoted by p1. If we use a symmetrical figure, some rosette, e.g., a double-headed eagle with the symmetry group D_1 instead of an asymmetrical figure, as the result we obtain the ornament **pm**, *etc.* This is the method, used very often in our ornamental art in many frescoes with the rhombic lattice, with the symmetry group **cmm**.

In order to construct some antisymmetric pattern, we start from an uncolored ornament and its symmetry group. Then we choose some its subgroup (a pattern placed two times in the initial pattern), and color elements of the each of these two sets by different colors (usually, black and white). In other words, in some black-white ornament we ignore colors, recognize the symmetry group of the basic (uncolored) pattern, then select the figures of the same color (black or white), and recognize the symmetry group of such one-colored pattern.

This approach can be extended to colored symmetry groups, where instead of only two colors, we use more colors. Same as before, first we consider the symmetry group of the uncolored pattern. After that, we recognize the following two subgroups: the subgroup consisting from figures of the same color, and the symmetry group of the completely colored pattern. The first symmetry group and these two subgroups, written in this order, completely describe the colored symmetry group.

Except the antisymmetry and colored symmetry, the other possibility for the desymmatrization is the superposition of ornaments. The result is the intersection of superimposed symmetry groups, i.e., the set of symmetries belonging to the both symmetry groups.

Besides the number of the different symmetry groups that are present in some ornamental art, diversity of ornaments based on the same or similar themes serves as the criterion of its richness. Every symmetry group of ornaments offers an infinite number of possibilities for creating various designs. In the ornamental art of fresco-painting presented in this exhibition, most frequent are ornaments with maximal symmetry groups generated by reflections, which does not offer so much freedom. One of the reasons for this restriction is the religious function of presented ornaments, demanding the permanent use of symbols like a cross, trefoil, lily, double-headed eagle... Therefore, the square lattice p4m is used very often, as the basis for paraphrasing different motifs on the theme of the cross – rosette D_4. Because of its constructional simplicity, the square grid is the most frequently used lattice in the entire ornamental art (Fig. 4).

Also, they use the rhombic grid **cmm**, with the longer diagonal often placed vertically. The rhombic grid is usually derived from the rectangular grid by constructing diagonals, and combined with the mirror-symmetrical, or asymmet-

Figure 4: Ornaments in a square grid.

rical rosettes placed along the vertical, longer diagonal, suggesting the upward tendency, ascending (Fig. 5).

Figure 5: Ornaments in a rhombic grid.

3 Conclusion

Ornaments from the Serbian medieval frescoes are impressive testimony how it is possible to create variability and richness, by respecting relatively strong given rules coming from religious-symbolical function of ornaments. The other important characteristic of this ornamental art is that its compositions (superposition) are remarkable mixtures of different ornaments, perfectly balanced in the sense of the form and colors. Although it is based on the strict rules and on the textile, the Serbian medieval ornamental art characterizes a high degree of freedom: almost none of the ornaments are literal copies of the originals. In most of them we can recognize the lack of precision and imperfections, which are mainly the result of neglecting details, and not some kind of errors. The "variations on a given theme" remind us of the "well-behaved forms" (term used by R. Arnheim to describe the characteristics of an abstract painting) and they are realized with a minimum of tools, as systems of points, or geometrical figures. Therefore, many of these ornaments look "modern": they are completely harmonized with the visual sensibility of a contemporary viewer, and represent an integral "visual field" full of strong visual energy. This is one of the reasons why, after rational discussion about presented ornaments and the search for forgotten meanings, we need to enjoy in their artistic quality, impressive simplicity, and visual power. This exhibition is an invitation to learn from them, to refresh memory, and to try to use them as an inspiration for the future art creation.

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