



FIBONACCI TILINGS IN FASHION DESIGN

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Abstract: *The Fibonacci sequence is a symbol of beauty and harmony and by this reason geometrical objects in its proportions are used in the design. There are some versions of Fibonacci series tiling, which are constructed with equilateral geometrical figures – squares or triangles, as the sides' lengths are equal to the numbers of the Fibonacci series, or the lengths of the sides of the squares or equilateral triangles are each to other in proportions, which are equal to Fibonacci sequence. The paper presents design of ladies' dresses with the both ways of constructing of Fibonacci tilings with squares, the variants in a spiral pattern and the variant with squares which are put side by side, and the version of Fibonacci tiling with triangles in form of double spiral named Fibonacci rose. Nine models of ladies' dresses are shown. As a result of the use of Fibonacci tilings for designing of aesthetic, beautiful and harmonic clothing, it can be concluded that in fashion design Fibonacci squares and Fibonacci rose can be used in different ways of color combinations, proportions toward the clothing sizes, and as a frame of creations of design elements. The different position, proportions and color combinations of use of Fibonacci squares and Fibonacci rose in fashion design according to the body type and size can cover some bodily defects and enhance the beautiful forms.*

Key words: *Fibonacci squares, Fibonacci rose, fashion design, lady's dress.*

1. INTRODUCTION

The Fibonacci sequence is a symbol of beauty and harmony and by this reason geometrical objects in its proportions are used in the design. [1]

The Fibonacci numbers are the sequence of numbers $\{F_n\}_{n=1}^{\infty}$ defined by the linear recurrence equation

$$F_n = F_{n-1} + F_{n-2} \quad (1)$$

with $F_1 = F_2 = 1$. As a result of the definition (1), it is conventional to define $F_0 = 0$. The Fibonacci numbers for $n = 1, 2, \dots$ are 1, 1, 2, 3, 5, 8, 13, 21, ... [2]

There are some versions of Fibonacci series tiling, which are constructed with equilateral geometrical figures – squares or triangles, as the sides' lengths are equal to the numbers of the Fibonacci series, or the lengths of the sides of the squares or equilateral triangles are each to other in proportions, which are equal to Fibonacci sequence.

With the Fibonacci Series, there are two ways of constructing the series with interlocking squares. In the version, presented in Figure 1, we constantly circle the block to find the next addition site, and end up with a spiral pattern. In the version, which is shown in Figure 2, we put two squares side by side, add another square to the longest side, and repeat, darting from left to right as we decide where to put the next square. [3]

The version which uses equilateral triangles to form a double-spiral is shown in Figure 3. This tiling version is named Fibonacci rose. [3]

The paper presents fashion design of ladies' dresses with the both ways of constructing of Fibonacci series tilings with squares and the version of Fibonacci tiling with triangles named Fibonacci rose.

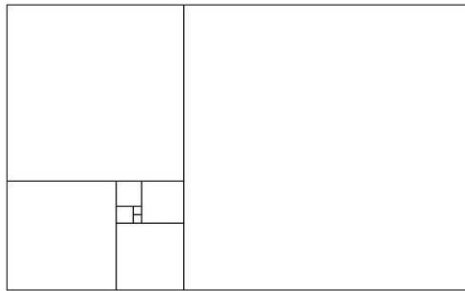


Fig. 1: *Fibonacci series tiling with squares forming a spiral pattern*

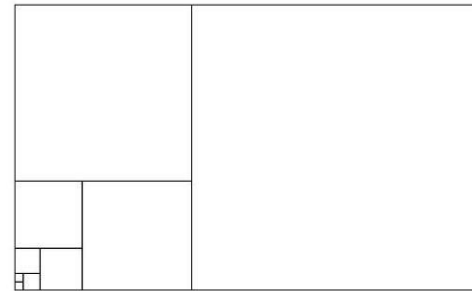


Fig. 2: *Fibonacci series tiling with squares which are put side by side*

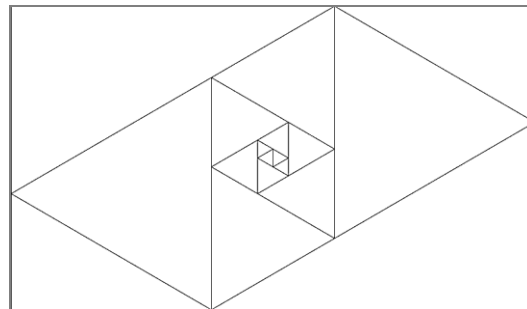


Fig. 3: *Fibonacci tiling with equilateral triangles
Fibonacci rose*

2. FASHIN DESIGN WITH FIBONACCI SQUARES AND ROSE

Figure 4 presents a lady's dress with Fibonacci series tiling with squares in a spiral pattern, which is shown in figure 1. The first square of the tiling is situated in center of the waist area. Analysis of the color decisions shows that the best color combination is that with four colors in fourth directions. [4] Every fourth square is in one and the same color. The 1st, 5th, 9th, ... squares are in the first color, the 2nd, 6th, 10th, ... squares are in the second color, the 3rd, 7th, 11th, ... squares are in the third color, and the 4th, 8th, 12th, ... squares are in in the fourth color. In this way the squares, which form a set in one and the same direction, are colored in one and the same color.

Figure 5 shows a lady's dress with Fibonacci series tilling with squares which are put side by side, presented in figure 2. In the dresses the tiling is situated in the upper part as the first and the second squares are in vertical direction by the shoulder. In the model, Fibonacci series tiling is in bi-colored combinations in which two squares, colored in one and the same color are covered by two squares, which are in another color [4] as the 1st, 4th, 5th, 8th, 9th, ... squares are colored in one and the same color, and 2nd, 3rd, 6th, 7th, 10th, 11th, ... squares are colored in another color. [4]



Figure 6 presents a lady's dress with "quad-spiral" version of Fibonacci tiled squares, which are put side by side. [3] The center of the quad-spiral is situated in the center of the waist. In the fourth Fibonacci tilings of the spiral are used another bi-color combination in which the odd numbers squares are in one color and the even numbers squares are in another color. [4]

The Fibonacci tilings with squares can be used as frames of entered geometric elements and the models of ladies' dresses in Figures 7, 8, and 9 are examples of the use of the entered element in the spiral Fibonacci square tiling in design.

The Fibonacci tiling in Figure 1, in which the squares form a spiral pattern, is the base of the creation of Fibonacci spiral. [5] Figure 7 presents a lady's dress with Fibonacci spiral in which many spirals design shapes similar to butterflies.

Figure 8 shows a lady's dress with some spiral pattern Fibonacci squares tilings with entered diagonals in every square, which form spiral shapes too.

The designs of both models in Figures 7 and 8 use both the spiral Fibonacci squares tiling and the entered elements – Fibonacci spiral in Figure 7 and spiral shape, formed by entered diagonals in Figure 8. In the both models the entered elements and the frames of Fibonacci tilings are arranged in vertical directions in the whole lengths of the dresses. The entered elements divided Fibonacci square tiling in two areas which are colored in different colors.

The entered geometric elements can be used in the fashion design without the frame of the tiling and Figure 9 presents a model of a lady's dress with a spiral from circles which are a result of entering in a spiral Fibonacci square tiling. The spiral starts in the center of the waist area and the model of the dress use bi-colored model – one color for the circles and another for the background.

Figure 10 presents a model of a lady's dress with Fibonacci rose. The start of Fibonacci rose is situated in the center of the waist. The model is in bi-colored model as the triangles in the both directions are colored in different colors. [6] Another way of coloring is when the both spirals shapes, formed by Fibonacci rose triangles are colored in different colors. [3]

Like Fibonacci square tiling Fibonacci rose can be used as frame of entered geometric elements and the models of ladies' dresses in Figures 11 and 12 are examples of the use of the entered element in the triangles. [6]

A double spiral formed with curved lines can be created around the double spiral shaped by triangles in Fibonacci rose. Figure 11 shows a model of lady's dress with double curved spiral in the frame of Fibonacci rose. The center of the rose is located in the center of the waist and the both areas between the both curved spirals are colored in two different colors. [6]

Circles can be entered in the triangles of Fibonacci rose and in result the circles form a double spiral. Figure 12 presents the use of double spiral of circles without the frame of Fibonacci rose in the design of a lady's dress. The start of the spiral is situated in the center of the waist area. The both circles' spirals are colored in two different colors and the background in third one.

3. CONCLUSIONS

As a result of the use of Fibonacci tilings for designing of aesthetic, beautiful and harmonic clothing, it can be concluded that in fashion design Fibonacci squares and Fibonacci rose can be used in different ways of color combinations, proportions toward the clothing sizes, and as a frame of creations of design elements.

Fibonacci tilings can be used in fashion design as application, fabrics' design, pieces of the main clothing parts, etc.

The different position, proportions and color combinations of use of Fibonacci squares and Fibonacci rose in fashion design according to the body type and size can cover some bodily defects and enhance the beautiful forms.

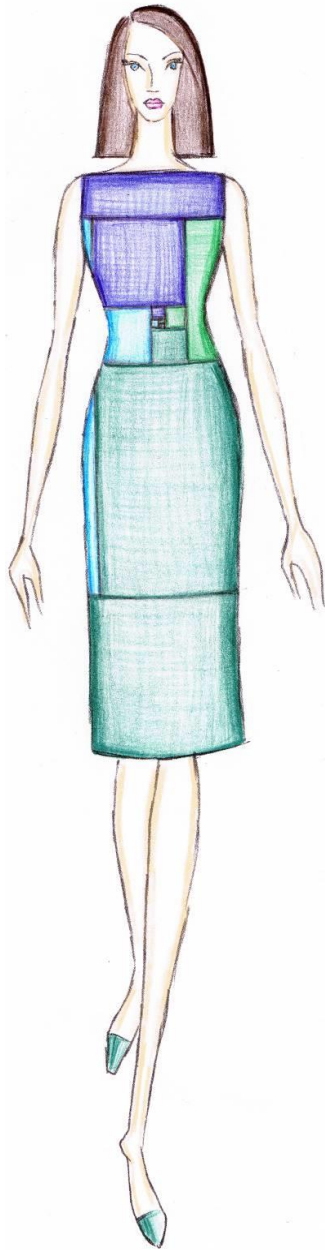


Fig. 4: Design of a lady's dress with Fibonacci series tiling with squares forming a spiral pattern

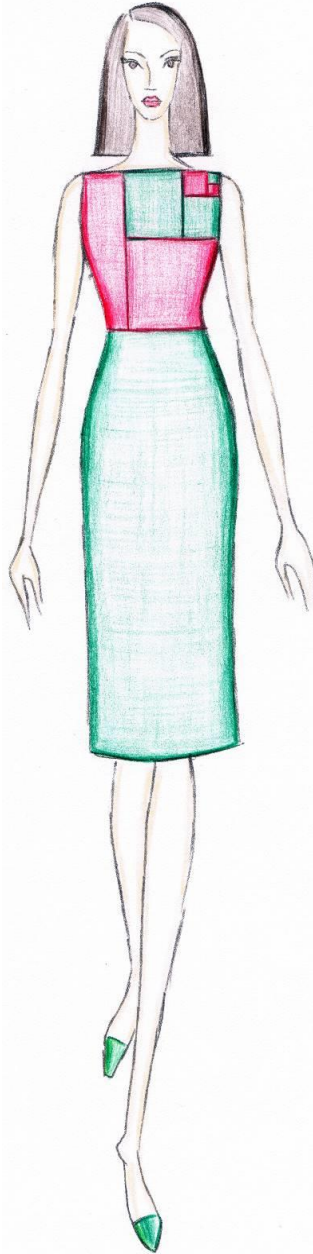


Fig. 5: Design of a lady's dress with Fibonacci series tiling with squares which are put side by side

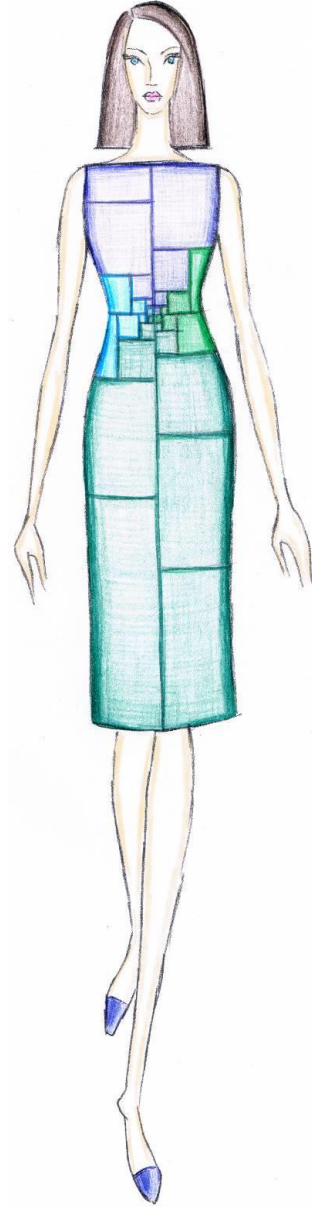


Fig. 6: Design of lady's dress with a quad-spiral version of Fibonacci tiled squares which are put side by side

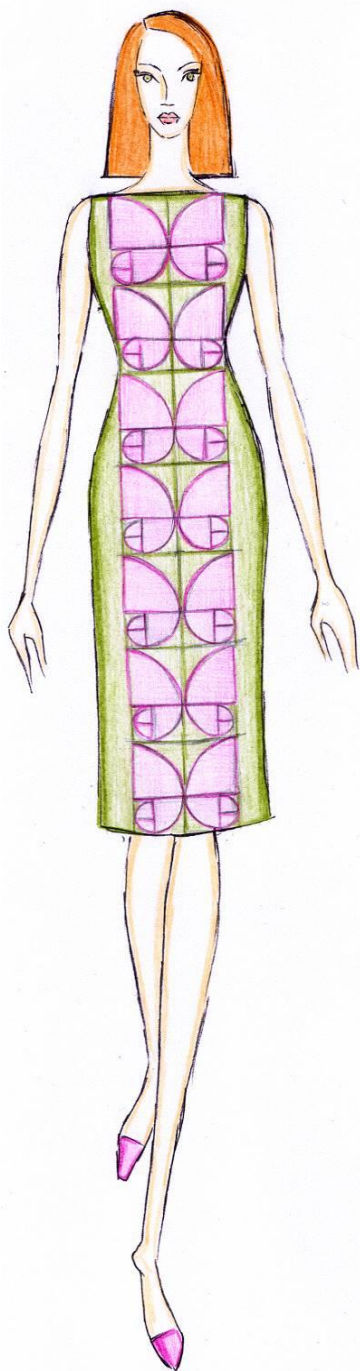


Fig. 7: Design of a lady's dress with Fibonacci spiral in the frame of Fibonacci series tiling with squares forming a spiral pattern

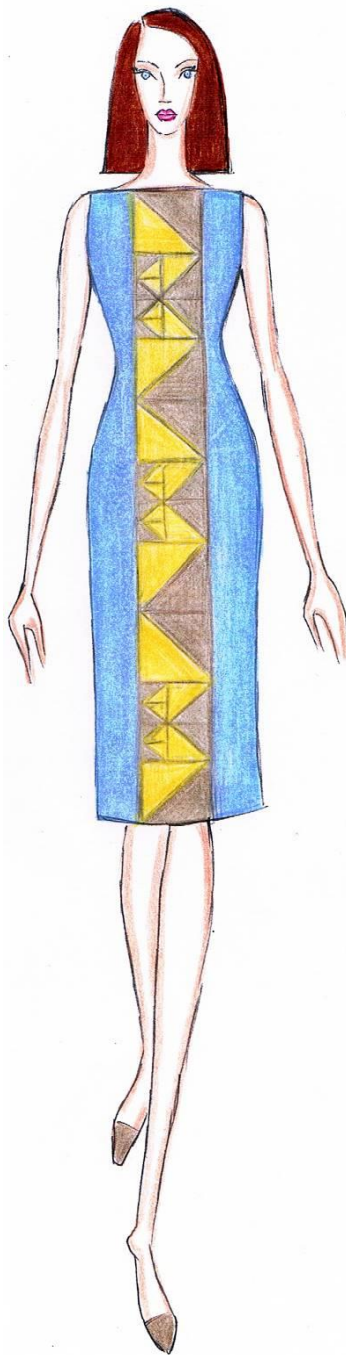


Fig. 8: Design of a lady's dress with a spiral shape from diagonals entered in the frame of Fibonacci series tiling with squares forming a spiral pattern

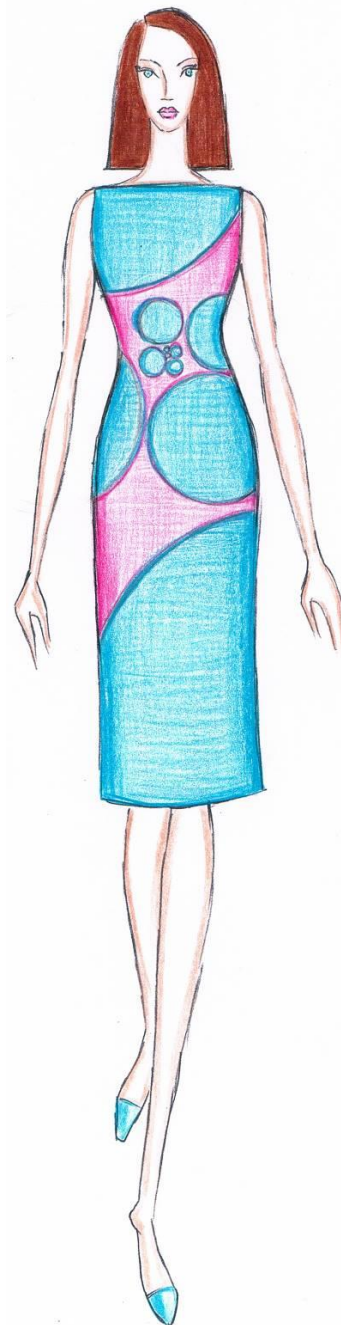


Fig. 9: Design of a lady's dress with a spiral of circle, result of entering in the frame of Fibonacci series tiling with squares forming a spiral pattern

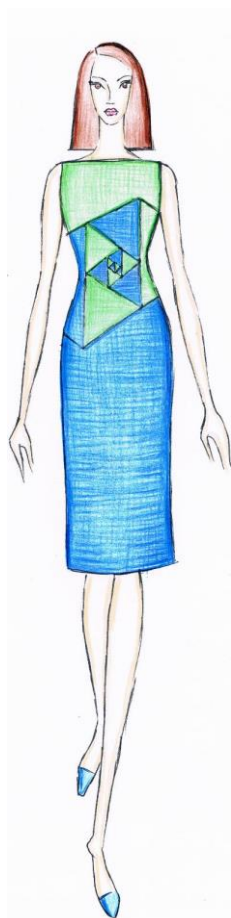


Fig. 10: Design of a lady's dress with Fibonacci rose

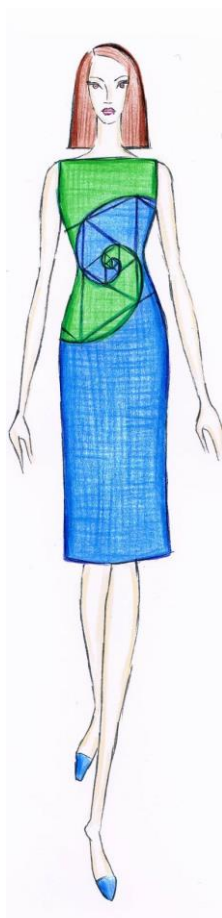


Fig. 11: Design of a lady's dress with Fibonacci rose and a double curved spiral around triangles of Fibonacci rose

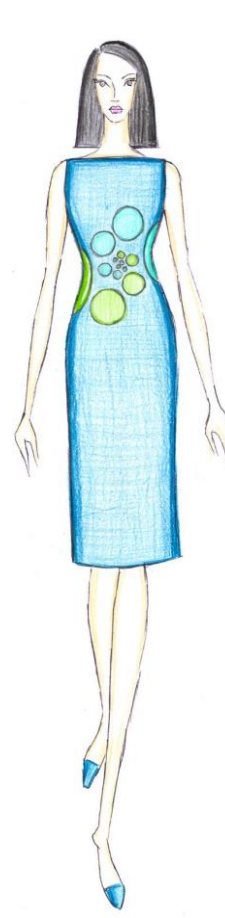


Fig. 12: Design of a lady's dress with double circles' spiral, result of entering in the frame of Fibonacci rose

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