Enhancement of Design Aesthetics for Jackets Fabrics Executed to Dobby Looms by Applying Self-similarity property in the fractal theory

Prof. Hassan Suleiman Ali Rahma
Professor of Design, Spinning, Weaving, and Knitting Dept, Faculty of Applied Arts, Helwan University
Prof. Tarek Ahmed Ibrahim Khalil
Professor of Design, Spinning, Weaving, and Knitting Dept, Faculty of Applied Arts, Helwan University
Engineer. Mohamed Mohamed Naguib Shebl Ahmed
Demonstrator, Spinning, Weaving, and Knitting Dept, Faculty of Applied Arts, Helwan University
mm2561990@gmail.com

Abstract:

Fabrics produced on fabric looms with Dobby devices play a major role in meeting the needs of consumers of woven fabrics, especially in the field of clothing fabrics. With the great technological development in these lines and their connection to computers, this gave the designer the opportunity to increase his creative and innovative ability to produce designs with values Functional and aesthetic within the limits of the number of limited textile differences in those looms.

Jacket fabrics are very important for consumers to use frequently in the winter as they provide the required warmth, and given its importance and advantages, it deserves technical and Technology consideration, Whereas the design of that kind of fabrics carried on dobby looms almost typical is represented in plain, striped, and plaid designs. There are rarely simple engravings, Hence the importance of developing this type of fabric and providing a new vision by adapting some of the relevant scientific theories and applying them to the production of innovative designs with a new aesthetic and artistic vision.

Keywords:
Fractal Geometry, Self- similarity, Sierpinski Carpet, Fractal in Nature.

Statement Problem

The Jacket fabrics is produced by dobby looms with typical designs, such as in plain, striped, and plaid designs, and there is rarely any engraving in such designs, Due to the importance of the use of these fabrics, they deserve to study in terms of technical and technological development should therefore be developed and provide a new vision for these designs,and These products are developed through the association of the self-similarity in the fractal theory with the characteristics of the dobby fabrics .

Significance:

1- Presenting a new vision for winter jacket fabric designs.
2- Promote the use of scientific foundations and theories to obtain new and diverse designs.
3- Take advantage of the recent developments of dobby looms to develop dobby fabric designs.
4- Enrich the local market with advanced products.

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Objectives :

1 - Development of winter jacket fabrics executed on dobby looms
2 - Emphasis on the adaptation of theories and scientific foundations and use in the dobby fabric design.
3 - Developing the local product to face the competition of the foreign product.

Research hypotheses:

1 - The theory of fractal in the design of dobby fabrics contribute to design solutions and aesthetic values of many and varied.
2. The type of material used effectively influences the aesthetic and functional properties of the fabrics.
3 - The difference of used yarn counts to affect the design and functional characteristics of fabrics produced.
4 - The cover factor of both warp and weft affect the technical and technological properties of fabrics.

Research Methodology:

The research follows the analytical experimental method.

A- Theoretical Framework:

Fractal Theory:

Benoit Mandelbrot was the one who established this new geometry and thus allowed to produce more precise models of natural objects and processes. In the 1970s, he introduced the concept of fractal. This concept has exerted a strong influence on the forthcoming development of all areas of knowledge [(1).] Says BenoitMandelbrot, The existence of complexity and fragmentation in nature challenges us to study these patterns or natural forms, which Euclid has left aside because it is in his view without form, As athletes have scoffed at the challenge, They have created mathematical theories that have nothing to do with any form we can see or feel, For this reason, Mandelbrough describes geometry as being rigid because of his inability to describe natural forms[(4)], This proved by asking how much along the coast of Britain?

His answer was that its length is uncertain but depends on the length of the ruler or yardstick used. It is evident that its length is at least equal to the distance measured along a straight line between its beginning and its end. However, the typical coastline is irregular and undoubtedly winding. It is much longer than the straight line between its endpoints [(6)]. In response to this challenge, Benoit Mandelbrot has developed a new nature geometry that can be used in a number of different fields [(4)], Which described many irregular and complex forms in nature around us such as mountains, coasts and many other natural phenomena called fractal geometry [(3).]

Definition of fractal geometry:

I coined fractal from the Latin adjective fractus. The corresponding Latin verb frangere means "to bretlk:" to create irregular fragments. It is therefore sensible- and how appropriate for our needs! -that, in addition to "fragmented" (as in fraction or refraction), Jractus should also mean "irregular," both meanings being preserved in fragment [(2-4)]

Characteristics of fractal theory [2]:

1- Self-similarity property

Each geometrical form of fractal shapes can be divided into parts, each part being a microcosm of the overall size of the shape.

2- Fractal dimension property

The Hausdorff dimension of the set is strictly greater than its Topological dimension.

3- Iteration property

Examples of fractal forms in nature:

- **Coral reefs and is characterized by self-similarity.** [7]

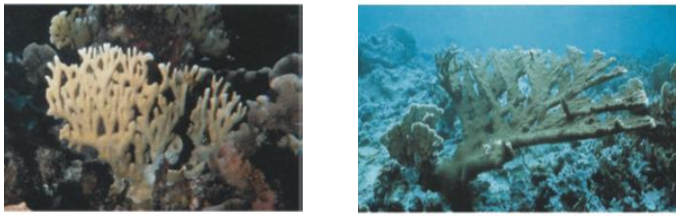


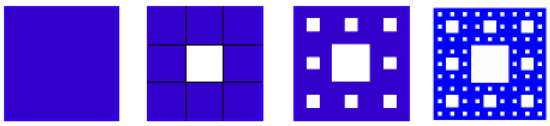
Figure1: Coral reefs

Examples of fractal shapes in geometry:

- **Sierpinski Carpet**

It is named after the Polish mathematician Waclaw Sierpinski and is characterized by self-similarity.

- The construction of the Serpinski Carpet begins with a square drawing
- The square is then divided into 9 identical boxes and the square in the center is deleted
- Then divide each square into 9 squares and delete the center and so on to infinity, noting the stability of the central square [1-5], As shown in Fig 2.



4 3 2 1

Figure 2: Sierpinski carpet [8]

B- Applied technical product

Introduction:

Due to the great competition between the woven products, the producers are always looking for new and sophisticated design ideas to meet the wishes of their customers, It is noted that the design of the jackets fabric on the dobby looms is almost typical represented in plain, striped, and plaid designs, And rarely have some engravings and therefore show the importance in the development of this type of fabrics and provide a new design vision, , So the research presents a set of new design ideas in the field of jacket fabric designs inspired by the self-similarity in the theory of fractal and adapted to obtain designs suitable for implementation on dobby looms.

Samples were carried out according to the following operational specifications:

Specification of warp

- The number and type of used warp threads are 24/2 s cotton
- The density of warp threads in a single unit of measurment 22 threads /cm

Specification of weft

- The number and type of used weft threads are 12/1 s cotton
- The density of weft threads in a single unit of measurment 22 threads /cm

Specification of loom

- Type of machine: Vamatex Leonardo Silver – HS (High Drive) 2007
- Type of dobby: STAUBLI – Type:2670B/2 – 16 Harness.

Data of Finished Fabric

- width of fabric: 142 – 145 cm
- Weight per square meter: 242 gm\m^2
- The weight of the longitudinal meter: 350 gm\m^2
- Type of Finishing: special

Executed search design

A group of decorative designs characterized by self-similarity have been created within 12 different On the base of straight draft.

Design 1

Figure 3 illustrates the stages of design work from 1-3. Phase 4 shows photograph of the executed design using one color in the warp and two colors in the weft in a chromatic arrangement (1 Weft color A: 1 Weft color B)

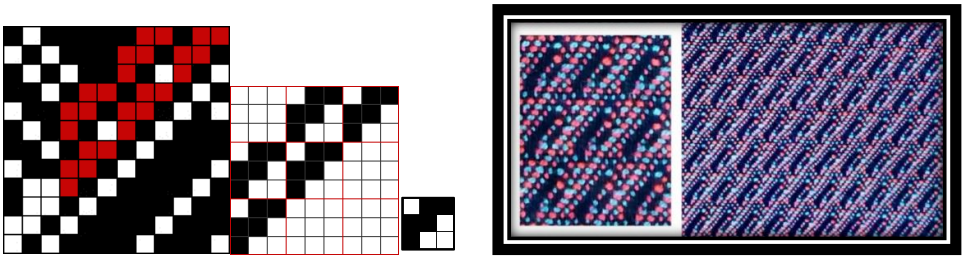


Figure 3: Design 1

Design 2

Figure 4 illustrates the stages of design work from 1-3. Phase 4 shows photograph of the executed design using one color in the warp and one color the weft.

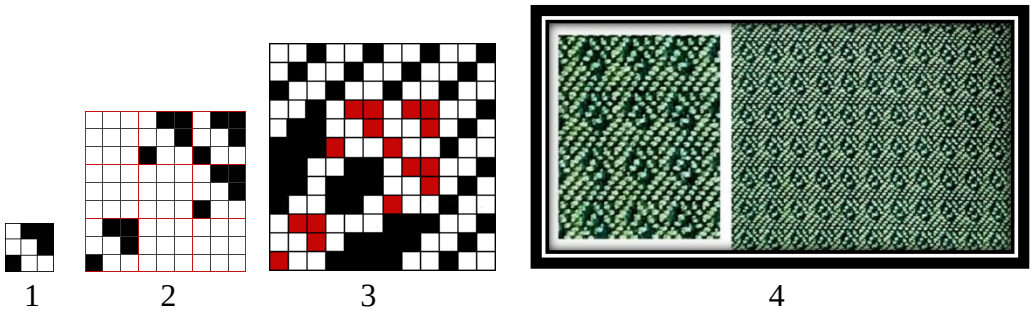


Figure 4: Design 2

Design 3

Figure 5 illustrates the stages of design work from 1-3. Phase 4 shows photograph of the executed design using one color in the warp and three colors in the weft in a chromatic arrangement (1 Weft color A: 1 Weft color B: 1 Weft color C)

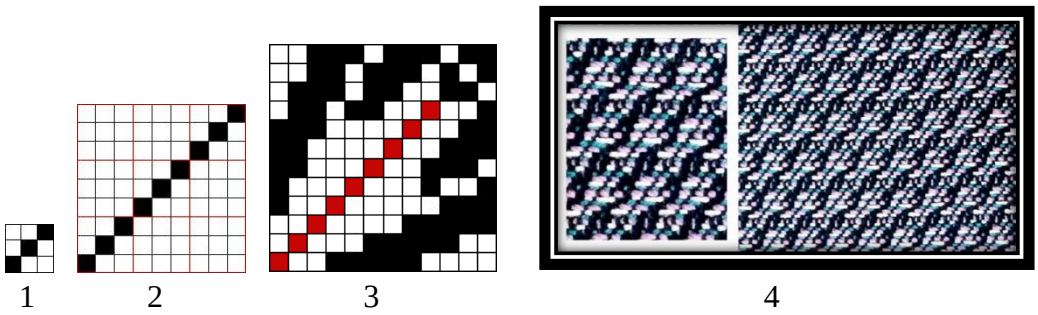


Figure 5: Design 3

Design 4

Figure 6 illustrates the stages of design work from 1-3. Phase 4 shows photograph of the executed design using one color in the warp and one color the weft.

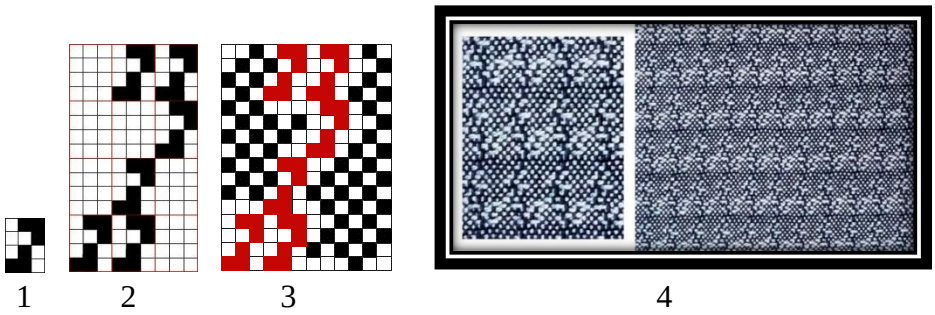


Figure 6: Design 4

C- Research Results:

1 - Obtaining innovative decorative designs bearing a new aesthetic and artistic vision for the fabrics of the jackets executed on dobby looms.

2 - Obtain new design solutions by applying some characteristics of fractal theory within the limits of a small number of textile differences.

3 - Achieve the main research objective is the development of jacket fabric designs

D- Research recommendations

1 - interest in the work of different color experiments of the designs in question.

2 - Interest in the study of scientific theories and use them to provide a new vision in the design of woven fabrics.

3 - To benefit from the results of applied research to develop textile products to contribute to the development of local product to face the competition of foreign product.

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