

Creating Contemporary Parametric Fashion Designs Inspired by Islamic Motifs Using 3D Printing

Prof. Ghada Abdullah EL-Kholy

Professor, Apparel Design and Technology Department, Faculty of Applied Arts -
Helwan University

Ghada_elkholy@hotmail.com

Assist. Prof. Dr. Wedian Talaat Madian

Assistant Professor, Apparel Design and Technology Department, Faculty of Applied
Arts - Helwan University

Wedian_Madian@a-arts.helwan.edu.eg

Assist. Lect. Mohammed Hamid Youssef Khafagi

Assistant Lecturer, Fashion Department, Higher Institute of Applied Arts - 6th of
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mojakhafagi@gmail.com

Abstract:

In scope of changes in all aspects of human factors affecting fashion which require finding innovative design solutions interact and fit with technological variables. This paper focuses on developing parametric contemporary fashion designs inspired by Islamic motifs aiming to contribute in the fashion industry by utilizing the manipulation of parametric design concept with 3D printing technique to benefit from modern technology. The research proves the applicability of mixing the parametric design with 3D printing to suit the functional aspect of women's daywear fashion targeting the age group (30-40). Another result is to reach a designed solution to be applied on Islamic motifs to produce a contemporary wearable fashion using parametric design and 3D printing. During the research three contemporary fashion lines were created inspired by three different Islamic motifs. Three outfits were tailored at the MOJA Design Studio in Egypt. Islamic motifs were printed using 3D printing techniques which were printed at the Kyoto Design Lab, Kyoto Institute of Technology (KIT), Japan using Rhinoceros/Grasshopper program.

Keywords:

Parametric Fashion, 3D Printing, Islamic Motifs

المخلص:

في نطاق التغييرات في جميع جوانب العوامل البشرية التي تؤثر على الموضة والتي تتطلب إيجاد حلول تصميم مبتكرة تتفاعل وتتناسب مع المتغيرات التكنولوجية. تركز هذه الورقة على تطوير تصميمات الأزياء المعاصرة البارامترية المستوحاة من الزخارف الإسلامية التي تهدف إلى المساهمة في صناعة الأزياء من خلال الاستفادة من التلاعب بمفهوم التصميم المعياري باستخدام تقنية الطباعة ثلاثية الأبعاد للاستفادة من التكنولوجيا الحديثة. أثبت البحث قابلية تطبيق المزج بين التصميم البارامترى والطباعة ثلاثية الأبعاد لتلائم الجانب الوظيفي لأزياء النساء اليومية التي تستهدف الفئة العمرية (٣٠-٤٠). والنتيجة الأخرى هي الوصول إلى حل مصمم ليتم تطبيقه على الزخارف الإسلامية لإنتاج أزياء معاصرة يمكن ارتداؤها باستخدام التصميم المعياري والطباعة ثلاثية الأبعاد. خلال البحث، تم إنشاء ثلاثة خطوط أزياء معاصرة مستوحاة

من ثلاثة زخارف إسلامية مختلفة. تم تصميم ثلاث أزياء في **MOJA Design Studio** في مصر. تم طباعة الزخارف الإسلامية باستخدام تقنيات الطباعة ثلاثية الأبعاد التي تم طباعتها في مختبر كيوتو للتصميم، معهد كيوتو للتكنولوجيا (KIT)، اليابان باستخدام برنامج **Rhinoceros / Grasshopper**.

الكلمات المفتاحية:

أزياء بارامترية ، طباعة ثلاثية الأبعاد ، زخارف إسلامية

1. Introduction:

As an art passed on engineering design, Islamic art is a familiar medium of old centuries art. Mathematical technologies and the use of modern computing have allowed designers to expand and revamp endless renewable designs. one of these methods is 3d printing based on "the Parametric design" and its various applications on fashion. In fashion, the 3d printing technology has been applied widely from an experimental approach. Yet on the other hand such techniques have not been reflected widely on international fashion runways and classified as a fashion trend.

Parametric design is a process of computational thinking that illustrates the relationship between the purpose of design and the response to variables. This is a design style in which the relationship between design elements is used to manipulate them and to achieve a design with variable and multiple structures.

The researchers found that there is a problem in using both the Parametric design concept and 3D printing style only in the avant-garde styles which ensure a new conceptual framework, the formulation of new goals, methods and values, and adds a new direction to research work but it has not been used as a daywear style in the fashion industry.

This paper aims to support the fashion industry by a modern solution to be applied in the fashion field using the modern technology. This innovative solution is using the concept of parametric design through the Islamic motifs to create contemporary wearable fashion designs for women using 3D printing technique.

2. Review of literature

2. 1. Three-dimensional Printing (3D Printing)

It is a form of manufacturing technologies in addition to a three- dimensional objects being formed by placing successive thin layers of materials above each other (Kenton,2020).

2. 2. Parametric design

It is a process or a technique based on computational thinking by inserting one or more "boundary equations" to find program areas for the designed objects (Engle, 2020).

2.3. Fractals and Parametric Design:

Parametric design does not deal directly with the form itself, but rather it studies the mathematical logic behind each form. (Lorenz, W.E., 2002.), (Stavric, M. & Marina, O., 2011) From the non-living galaxy to the genetic material of life, DNA, fingerprints, snails, petals, etc. it's been observed that patterns in nature are visible regularities that can be found in insects and animals having different patterns of spots and streaks (Macnab, M., 2011). For example, zebra

has distinct lines, while leopards, cows and beetles are full of spots, and butterflies mix stains and streaks and all these patterns are common in nature. Picture (1)



Picture (1) Examples of fractals in nature

Source: <http://www.rhynelandscape.com/2013/06/24/20-patterns-in-nature-part-four>

Benoit Mandelbrot was the first to recognize how intricately ordered are actually the seemingly chaotic patterns and shapes that form the world around us. He discovered the comparatively simple math equation which create the infinite complexity of these wonderful patterns, in a manner never seen before. That is why Mandelbrot's discovery unified science and art. (Mandelbrot, B., 2013)

Fractals are very common in nature which has infinite similarities. Such examples are coasts, lightning, mountains, the nervous system of the body, blood vessels, etc. Mathematics tries all the time to discover and explain various abstract styles and rules. The optical models of nature afford explanations in logarithmic algorithms, fractals, topology, and other mathematics, which is essentially establishing a mathematical design for a boundary. (Li, X. and Su, J.N., 2018)

2. 4. Parametric fashion:

It is a costume designed by parametric equations or parametric patterns.

The influence of nature on parametric design and how we can read the fractals in nature could be noticed in many areas of applied arts. In fashion, there are many experiments that have used parametric design as a methodology to create designs. For example, the Dutch designer, Iris Van Herpen uses always skeletal effects, expressing the impression of the human body and environment. The inner fractal structures have been translated into unique skeleton dress that expresses the biological system. Picture (2) (Anneka, 2018).



Picture (2): Iris Van Herpen | Skeleton Dress

Source: <https://www.dezeen.com/2013/04/22/iris-van-herpen>

The collection "Ludi Nature" (play nature) SS2018 by Van Herpen, shows her designs with a prodigious replicator of nature using heat-bonded parametric patterns on invisible tulle. The parametric designed dresses were created by expert researchers to convert 2D patterns into 3D data. (Verner, A., 2018) Picture (3)



Picture (3): Iris van Herpen SS 2018 couture collection, shows parametric pattern from nature fractals

Source: <https://www.vogue.com/fashion-shows/spring-2018-couture/iris-van-herpen>

Pauline Van Dongen sees that fashion needs revolutions. That's why she used a 3D print to find out what is accessible through this technique and to examine how it can lead to more focused outfits on the body and respond to how the person moves. Van Dongen's first 3D printed experience was a sleeve, but she wanted it to be more than just a cover, so she tried to give it more dimensions by making it thicker when stretching (Grush, L., 2015). Picture (4).



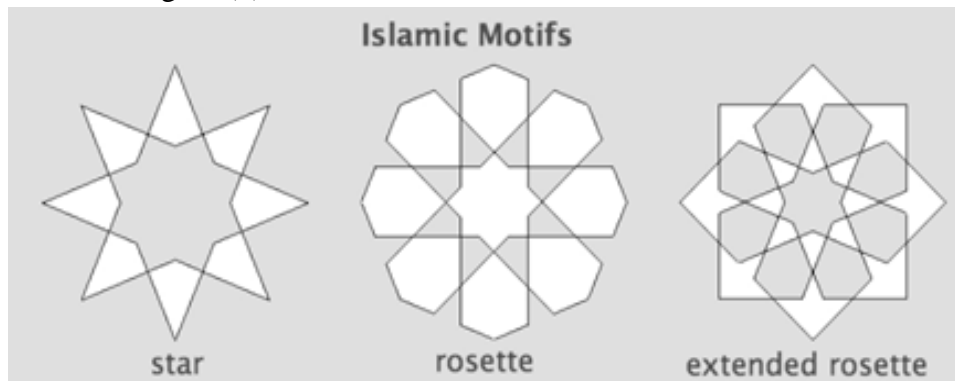
Picture 4: Body Activated Sleeve equipped with sensors to map people's motions

Source: <https://www.popsci.com/sxsw-2015-3d-printed-fashion-activated-body/>

2. 5. Contemporary Islamic art motifs

Many designers of modern Islamic patterns employ historically developed methods based on sub grids of Polygons variously called "touch polygons". The Stars were also used as placeholders for motifs. Using the star polygon that is formed by joining each corner in each direction.

The point of departure was to find out that a star could be a "placeholder" for any of the three most famous Islamic star motifs, known as stars, rosettes, and extended rosettes (Webster, P., 2013)- as shown in Figure (1).



Figure(1):the three most famous historical Islamic star motifs

Source: Webster, P., 2013. Fractal Islamic geometric patterns based on arrangements of $\{n/2\}$ stars

3. Methods and analysis

To apply the parametric equations to the geometric units of the Islamic stars, we have to get acquainted with the parametric software that helps us to apply this quickly and easily.

Nowadays the advances parametric software and engineering technologies have led to combining them with the design process to evaluate project goals (Meng, Y., et al., 2012) The most common of these systems are Autodesk 3D Max, Autodesk Revit, and the 3D Grasshopper which is used in this research to design a structure for Islamic motif, to reach a variety of motif design solutions by manipulating the values assigned to them.

3. 1. Steps of designing process of 3D Islamic motifs using Rhinoceros/Grasshopper software

Step 1: Using the main structure lines of the element consists of two main lines A and B that are mirrored around the C-axis. Figure (2)

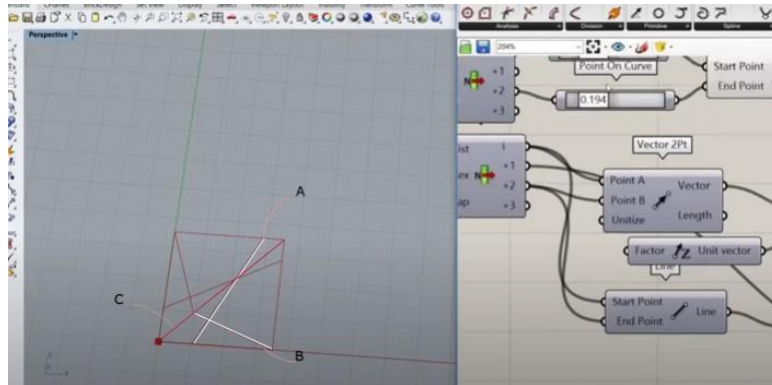


Figure (2): Step 1

Step 2: using Rhinoceros/Grasshopper software repeat a quarter of the Islamic rosettes four times to form a full extended rosette. Figure (3)

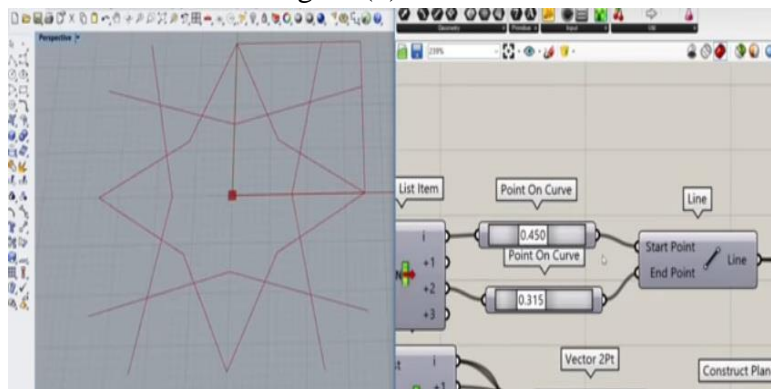


Figure (3): Step 2

Step 3: Creating various design solutions for the shape of the Islamic rosettes by manipulating values of the sliders number. Figures (4-5)

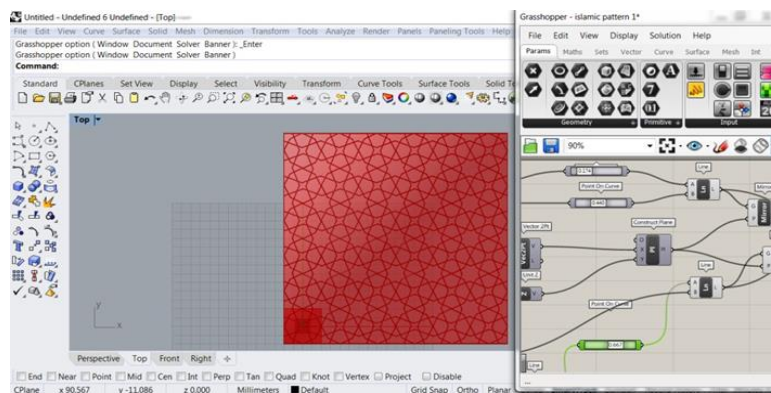


Figure (4) Step 3

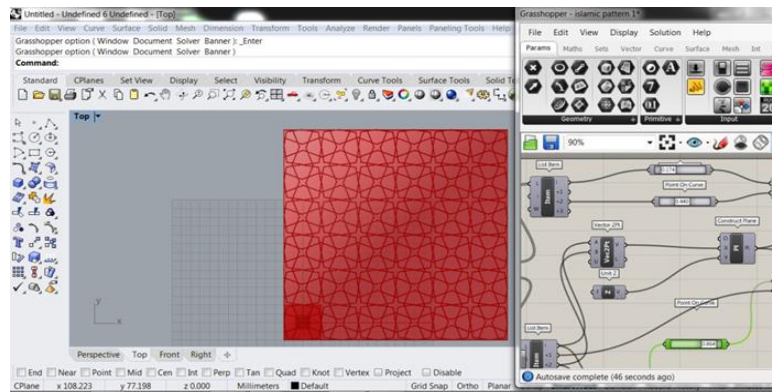


Figure (5): Step 3

Step 4: Rhinoceros/Grasshopper software has been used to create the 3D printing of the fashion collection which was applied in this research. There are three styles were followed in the design of the designed motifs.

The first motif is rosette, and the composition of motifs was based on Islamic rosette star with inner central cell with 8 vertices points, and has the variation in thickness of outer cell (hexagon form). Figure (6)

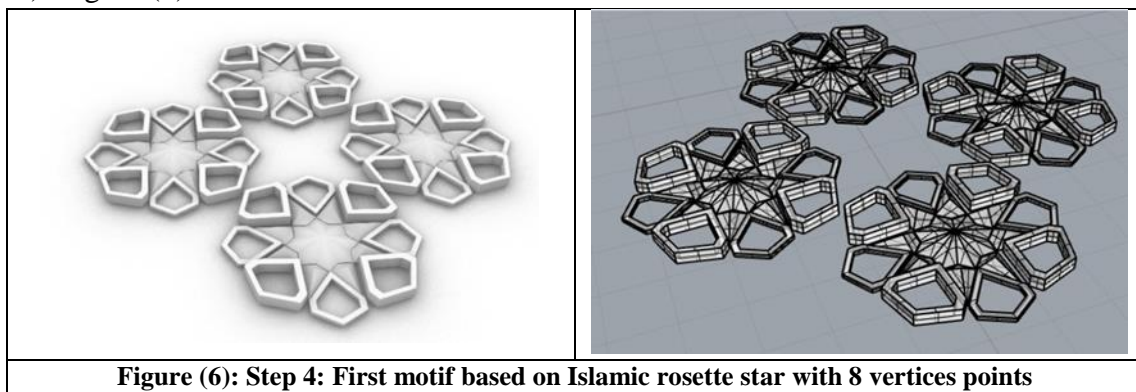


Figure (6): Step 4: First motif based on Islamic rosette star with 8 vertices points

The second style adopts multiple levels in constructing the 3D Islamic motif. The main 4 stars composing the motif as inner cell central star with 10 vertices points which composes the rectangle decorative motif. Figure (7)

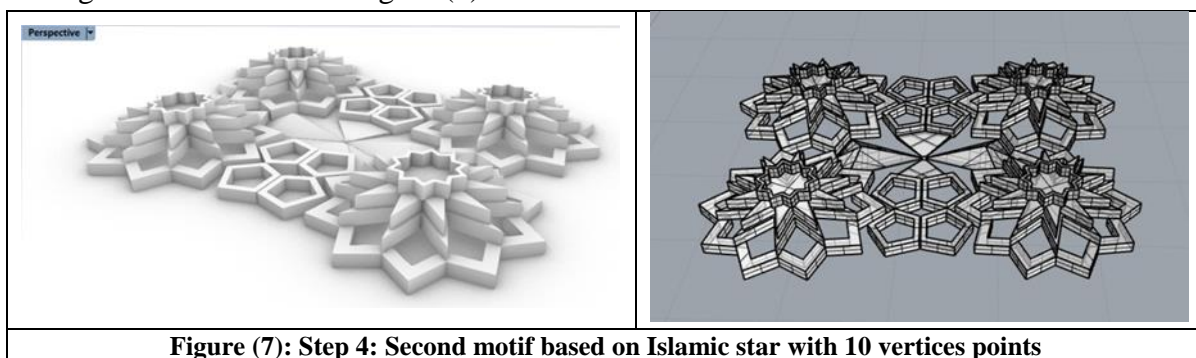


Figure (7): Step 4: Second motif based on Islamic star with 10 vertices points

As for the third motif composition, its design is based on Islamic extended rosette a central star with 6 vertices points, and we realize that the surrounded 6 stars with 12 vertices points used motifs as placeholders for motifs. And a star polygon that is shaped in each direction by connecting each corner. Figure (8)

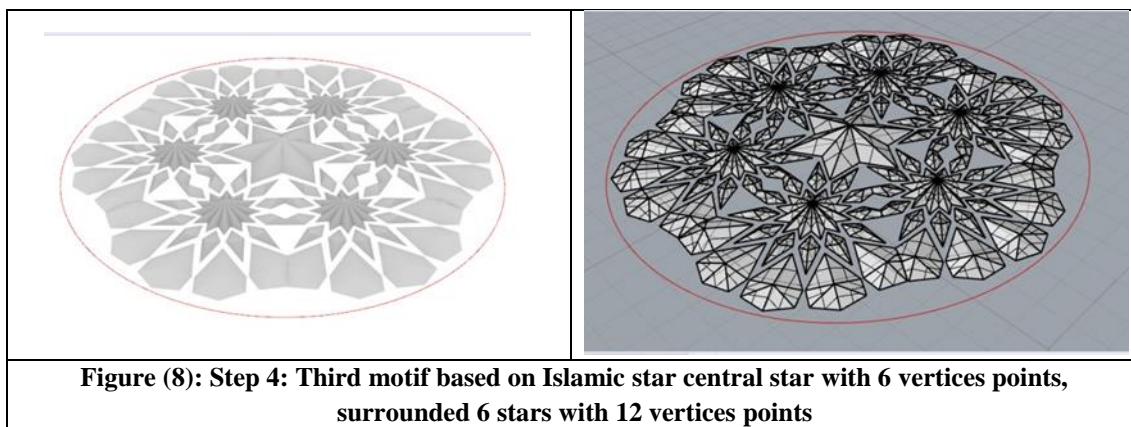


Figure (8): Step 4: Third motif based on Islamic star central star with 6 vertices points, surrounded 6 stars with 12 vertices points

3. 2. Contemporary Parametric Fashion Designs:

The fashion collection is intended to align with the Spring / Summer 2021. Designs were adopted of the Women's Trend S/S 21 according to WGSN's "Transform". The trends focus on the feeling of angry, contemplative, and reactive transform in fashion design through a world of crisis, but it also embraces light on the angst, resulting in modernist trend which feed on both seafaring and city dwelling themes .

Through the dark outlook of this trend, we will also see a juxtaposition of lighter and softer influences, focused on light weight sheers and ethereal metallic for a commercial, minimalist take on occasion wear lines. Also, from the action point of this trend the embrace architectural influences as humans are the primary cause of damage to our planet, that is why humans are also responsible for the solutions, look at how contemporary architecture can inspire contemporary tailoring. (WGSN, 2018) figure(9)



Figure (9): WGSN Women's Style Trend Concepts S/S 21: Transform
 Source: Ross Anna, Future Trends > S/S 21, / 08.20.19, <https://www.wgsn.com/>

The chosen direction from the forecasting trend concept was the "clear ambition" to empower this lightweight story by the search for clear waters figure(10). Clear waters inspire this lightweight story, centered around layered sheers, by changing the opacity, layering different weights to conceal and reveal the torso in white shades.



Figure (10): WGSN – Clear Ambition

Source: Ross Anna, Future Trends > S/S 21, / 08.20.19, <https://www.wgsn.com/>

The collection in the research is inspired by Islamic art geometric motifs passed on Islamic stars in Islamic architecture using fractals and parametric design concept. The white color and its shades were chosen to be the dominant color in the collection. Matte satin fabric was used in most parts of the outfits' pieces, and skin tone tulle. The tulle was used as the basis for 3D printing technique to reach a parametric fashion design as shown in the mood board –Figure (11). The targeted women group is 30 to 40 years old. The 3D printed parts in the garment were printed at the Kyoto Design Lab, Kyoto Institute of Technology (KIT), Japan. The cutting and sewing processes of the garment pieces was executed at the MOJA Design Studio in Egypt.

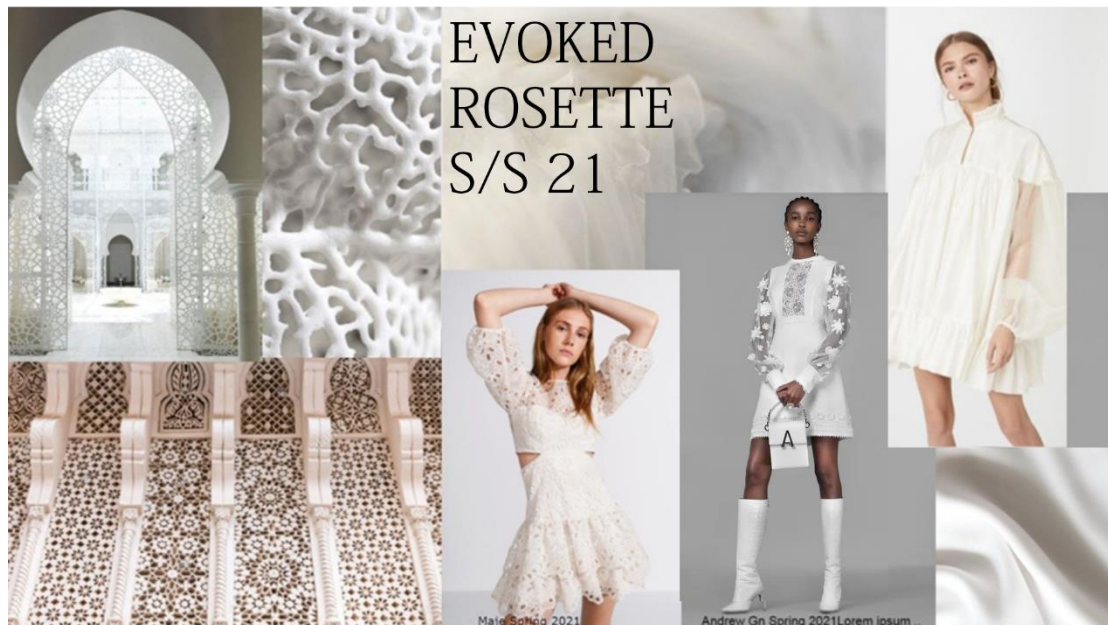


Figure (11): Mood board

The designs of the fashion collection were divided into three design lines which are as follows:

3. 2. 1. First design line relied on the repetition of a decorative Islamic motif no. 1

This line is based on flared-waisted silhouette which is represented through the tight-fitting look of the upper part of the body and starting from the waist line the design is widen. The bottom part of the outfit is either fitted pants with different lengths or without a second piece of garment. The 3D printed areas are concentrated in the upper garment to ensure the enrichment of parametric design concept. Figure (12)

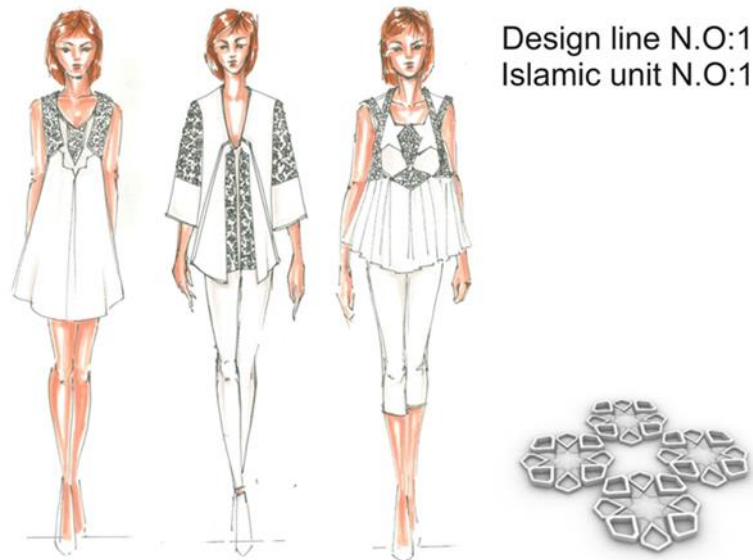


Figure (12): design line 1 ,relying on repetitions Islamic motif no.1

3. 2. 2. Second design line, it relied on iterating decorative Islamic motif no. 2.

This line is based on I silhouette which is represented through the straight tight-fitting look of the outfit. This line relied on designs that are characterized by the formal style. Each outfit in the line consists of three pieces, a jacket, an upper piece is worn underneath, and a bottom piece is either trousers or a short pencil skirt. -The 3D printed areas are mostly concentrated around the shoulder area of the jackets. figure (13).

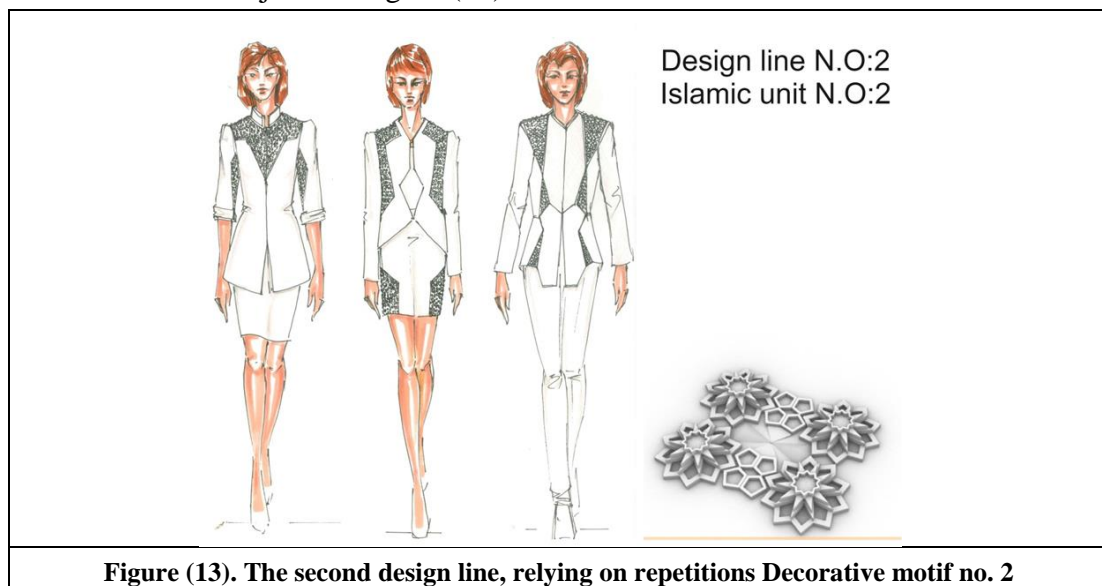
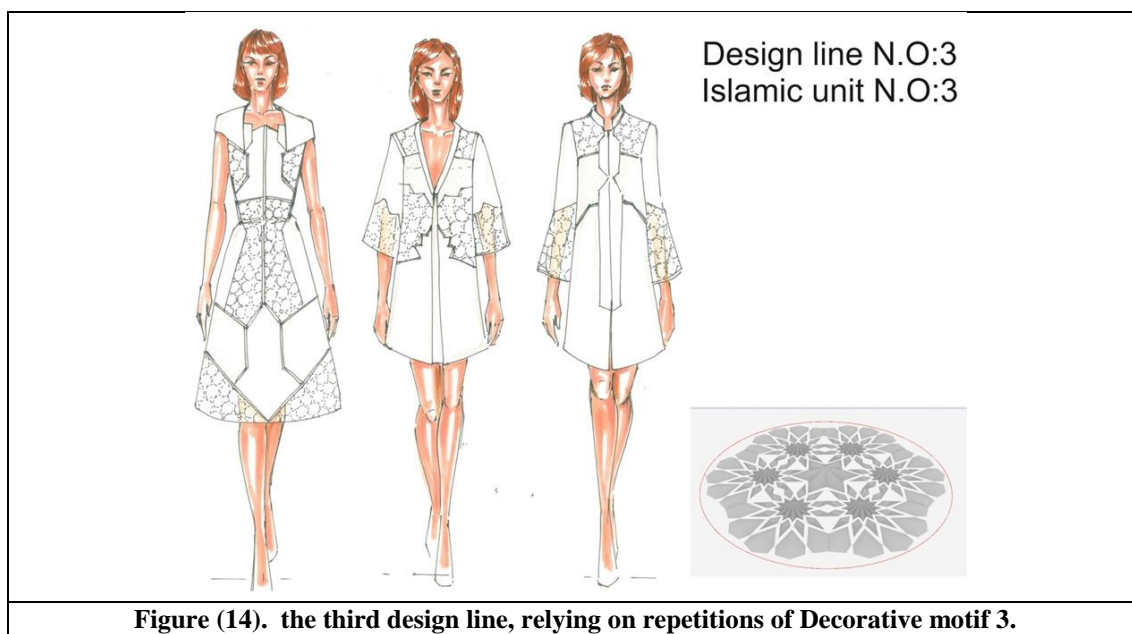


Figure (13). The second design line, relying on repetitions Decorative motif no. 2

3. 2. 3. Third design line, repetitions of the decorative Islamic motif no. 3

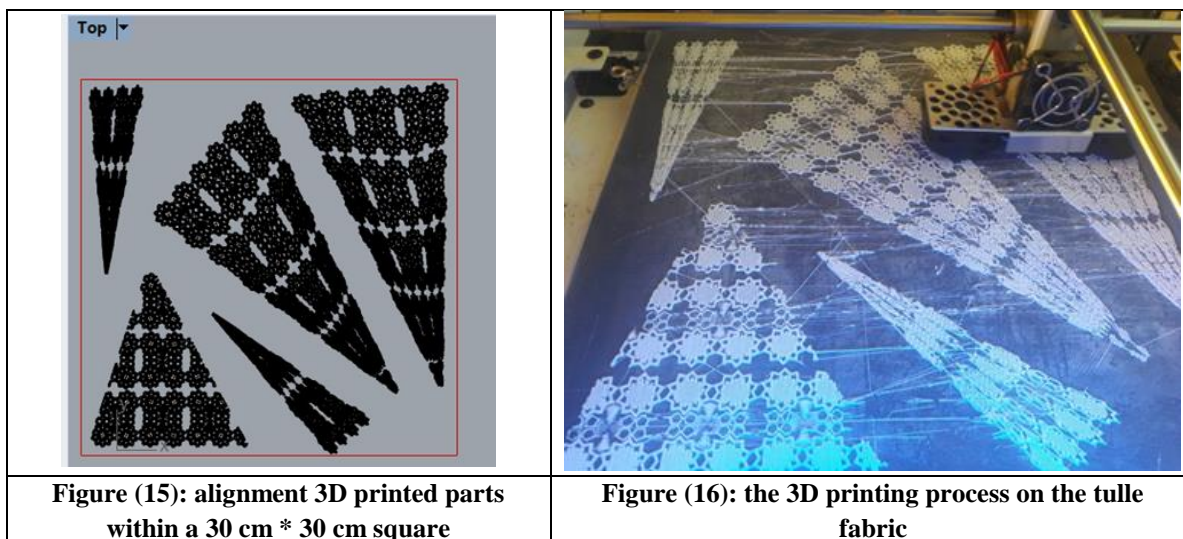
This line is based on A silhouette which is represented through the tight-fitting look of the upper part of the body and wide hems in a straight look. This line consists of dresses and cardigans with under-shirts. 3D printing is constructed in different areas all over the outfits to give strong impression of parametric design inspired by Islamic motifs. (Figure 14).



3. 3. Applying the chosen designs:

A design was chosen from every fashion line in the collection to be executed, and the following steps were followed in implementation:

- 1- The garments pattern for each design was scanned on a computer and opened on Rhinoceros/Grasshopper 3d software.
- 2 - The 3D printing areas were determined, to ensure that their dimensions match the real dimensions of the woman's body.
- 3- Printed areas have been copied within a 30 cm * 30 cm square on the Rhinoceros/Grasshopper 3D program, as this is the size of the base used for the printing of the project. Figure (15)
- 4- The file to be printed has been transferred to the program (simplify3D) for setting the printer, and it has been adjusted to match the TPU Ninja flex white filament used for printing.
- 5- A layer of tulle is stretched on the base platform of the printer; the 3D motifs were printed on these tulle fabrics. Figure (16)
- 6- After the printing process was finished, the printed fabric is carefully lifted and removed the print excesses.
- 7- Each piece is cut according to where it should be placed, with appropriate sewing ease allowance left in the tulle.
- 8- The printed pieces were sewn in the places designated for them in the piece of garment.
- 9- final sewing and finishing were done



3. 3. 1. First outfit (Design no. 1)

The first outfit (design no.1), which is inspired by the geometric lines of the Islamic art, to create a flared-waisted short satin dress with tight-fitting in chest and waist area. Chest and shoulders areas come with tulle fabric decorated by 3D printing of the first Islamic rosette star with inner central cell with 8 vertices points, and has the variation in thickness of outer cell following the parametric repetition pattern. figure (17)



3. 3. 2. Second outfit design (Design no. 5)

As for the second outfit design, which relied on geometric lines inspired by Islamic art, to create a contemporary formal style white satin suit in a straight tight-fitting. The suite consists of three pieces, a jacket, an upper piece is worn underneath, and trousers. Shoulder area and other areas along the jacket in the front and the back come with tulle fabric decorated by 3D printing for the second Islamic unit in multiple levels in constructing the 3D Islamic motif. The main 4 stars composing the motif as inner cell central star with 10 vertices points with a parametric repetition pattern based on the gradation in the unit size According to the part to which the motifs are applied. Figure (18)



Figure (18): Second outfit design (Design no. 5)

3. 3. 3. Third outfit design (Design no. 7)

As for the third outfit design, which is based on geometric lines inspired by Islamic art, to create a white cardigan with tight-fitting look of the upper part of the body and wide hem combined with an under-shirt. Shoulders and sleeves areas come with parts of tulle cloth decorated by 3D printing of Islamic extended rosette with a central star of 6 vertices points, and surrounded 6 stars with 12 vertices points as placeholders for motifs in a parametric pattern in the building of the motif. Figure (19)



Figure (19): Third outfit design (Design no. 7)

3. 4. Statistics and Analysis

This part compares three framing methodologies of design research from: (a) Design line -N.O 1 \ Islamic motif N.O 1, (b) Design line -N.O 2 \ Islamic motif N.O 2, and (c) Design line -N.O 3 \ Islamic motif N.O. 3. The three framing methodologies are: (i) Motif design, (ii) outfit design, and (iii) design usability. The first methodology supports two elements of paisley textile design (color and size of motif) were manipulated to investigate their effects on people's perception. The second methodology supports fashion trends, increased the uniqueness, compatible with the Islamic art inspiration, achieved the balance between originality and contemporary, suitable for women in the age group (30-40) and the 3D printing technology. The third methodology extracts knowledge from concrete employing 3D printing in the outfit suitable for the spring/ summer season, materials, and combining fashionable look and practicality. In general, the three research methodological approaches are characterized by a growing level of contextualization, and by an increasing level of knowledge synthesis. They together offer a genuine methodological platform for doing design research.

Data Analysis Descriptive statistics, reliabilities, and correlations using SPSS 25 were computed for each variable to obtain the results and to identify the relationships.

3. 4. 1. Descriptive Statistics and Analysis

A total of 43 respondents participated in the survey. Table 1 provides a demographic profile of respondents, the majority of participants (% 51.2) Academic, (% 16.3) Design industry, (%27.9) Other, (%4.7) Stylist Questionnaire.

In order to use a semantic differential scale, three factors determined to be suitable for textile pattern evaluation were selected; these were Motif design factor, outfit design factor, and design usability.

Table (1) Demographic profile of respondents

Profession	Frequency (n 43)	Percentage %
Academic	22	51.2
Design industry	7	16.3
Other	12	27.9
Stylist	2	4.7
Total	43	100.0

3. 4. 2. Validity and Reliability of the questionnaire

The validity and reliability of the research instrument is very necessary. There are many factors which influenced the experimental study. To make the research instrument a valid and reliable one, the questionnaire was approved from the two different strategies, critical thinking and rote memorization teaching.

3. 4. 3. Results of the correlation analysis

Correlation analyses between variables were conducted using Pearson correlations. A simple correlation was computed within each question with sum of all questions, the significance level for the correlation statistics in this study was set at $p < .01$.

The correlation analysis gives the results about the variables and consider if they tend to indicate variety or not. The results of the present research variables can be shown in (Table no. 2) where there is significant correlation ($p < 0.001$) between each question and sum of all questions. The correlation analysis gives the results about the variables and consider if they tend to indicate variety or not. The results of the present research variables can be shown in Table (2) where there is significant correlation ($p < 0.001$) between each item in motif design questions and overall Preferences

Table (2) Correlation analysis between each item in Motif design questions, and total number of items

Motif design	Pearson Correlation	Sig.
The motif used reflect the spirit of Islamic art.	.860**	0.000
The size of the motif used in the design appropriate.	.911**	0.000
The color of the used motif matching the design.	.943**	0.000
The distribution of motif in the design appropriate.	.948**	0.000
The motif add aesthetic values for women's wear of age group (30 -40).	.899**	0.000
The motif adds value to the texture of material used.	.934**	0.000
The motif composition appropriateness for women's clothing.	.927**	0.000

The results of the present research variables can be shown in Table (3) where there is significant correlation ($p < 0.001$) between each item in outfit design and overall preferences

Table (3): Correlation analysis between each item in outfit design questions, and total number of items

outfit design	Pearson Correlation	Sig.
The outfit compatible with SS 2021 fashion trends.	.885**	0.000
The look of the outfit is unique.	.927**	0.000
The use of 3D printing technology increased the uniqueness of the outfit.	.913**	0.000
The outfit design lines are compatible with the Islamic art inspiration.	.899**	0.000
The design achieved the balance between originality and contemporary.	.952**	0.000
Combining 3D printing with fabrics add uniqueness to the outfit	.955**	0.000
The design is suitable for women in the age group (30-40).	.920**	0.000
The 3D printing technology is suitable for the outfit design.	.938**	0.000

The results of the present research variables can be shown in Table (4) where there is significant correlation ($p < 0.001$) between each item in design usability questions and overall preferences

Table (4): Correlation analysis between each item in design Usability questions, and total number of items

design Usability questions	Pearson Correlation	Sig.
Employing 3D printing in the outfit suitable for the pring/ summer season.	.848**	0.000
The placement of 3D printing motif in the outfit ergatively impacts its movement.	.563**	0.000
The design achieved the functional values.	.946**	0.000
The outfit achieves the function needs for women in the age group (30-40).	.930**	0.000
The materials used in the design are suitable for day-wear.	.864**	0.000
The design succeeded in combining fashionable look and practicality.	.936**	0.000
The 3D printing technology didn't negatively impact the function of the outfit.	.850**	0.000

The results of the present research variables can be shown in Table (5) where there is significant correlation ($p < 0.001$) between each factor and overall preferences

Table (5): Correlation analysis between each factor and total of all

design questions	Pearson Correlation	Sig.
Motif design questions	.988**	0.000
outfit design questions	.989**	0.000
design usability questions	.979**	0.000

3. 4. 4. Reliability

The present study uses Cronbach's alpha because it is a popular method for measuring internal consistency (Jung & Goldenson, 2008). In the early stages of research on an assessment instrument, reliabilities of 0.7 or higher are considered sufficient for narrow constructs (Van DeVen & Ferry, 1980). As a result, the reliability of the constructs was measured at an aggregate level; the Cronbach alpha test was used on IBM SPSS 25 for Windows and the test result had a good internal consistency with the alpha coefficients of 0.986 for design questions.

The first acknowledged analysis of SPSS was based on the reliability analysis. The computation of Cronbach's alpha on the reliability of a test is considered to be a sound alternative to SPSS (Hatcher, 1994). In Remembering- Cronbach's alpha value method, regarding the reliability of the given response has been confirmed at 0.959. For Motif design the reliability analysis of these questions, the Cronbach's alpha value has been confirmed at 0.974. For outfit design Cranach's alpha value has been confirmed at outfit design. For design Usability alpha value has been confirmed at 0.928 for all three factors alpha value has been confirmed at 0.986 The method of measurement used has been endorsed, meaning that the scale used in this research is reliable since all values indicate a reliability co-efficient of above 0.70, which is really acceptable level of reliability. (Santos, J.R.A., 1999)

Table (6) The reliability

Variables	Number of items	Reliability Indicator
Motif design questions	7	0.970
Outfit design questions	8	0.975
Design usability questions	7	0.928
Overall Preferences	22	0.986

3. 4. 4. 1. Part 1: Demographic data - Participation

Figure 20 shows that the majority of participants (% 51.2) Academic.

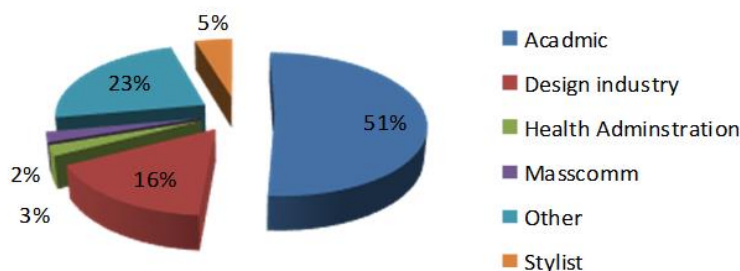


Figure (20): Demographic data

3. 4. 4. 2. Part 2: Background Information:

Demographics of the Participants Descriptive Statistics “Data analysis”. Data were collected, automated and then analyzed using SPSS software through descriptive statistics (the mean standard deviation and One-Sample Statistics). Significance is assessed at 5 % level of significance with p value was set at 0.05 less than this is considered as statistically significant difference.

The mean is the sum of observation on the number of the observation. The standard deviation is the square root of the variance and is expressed in the unit of the original measures. The variance is a measure of variability around the mean within a data set. (Table 7)

Table (7) measure of variability around the mean within a data set

		N	Mean	Std. Deviation	Minimum	Maximum	F	sig
Motif design questions	Design line-no1\ motif no1	43	28.05	8.136	7	35	.468	.627
	Design line-no2\ motif no 2	43	27.70	8.692	7	35		
	Design line-no3\ motif no 3	43	29.33	7.797	7	35		
	Total	129	28.36	8.182	7	35		
outfit design questions	Design line-no1\ motif no 1	43	32.37	9.222	10	40	.161	.851
	Design line-no2\ motif no 2	43	31.95	10.463	8	40		
	Design line-no3\ motif no 3	42	33.14	9.639	8	40		
	Total	128	32.48	9.725	8	40		

		N	Mean	Std. Deviation	Minimum	Maximum	F	sig
design Usability questions	Design line-no1\ motif no 1	43	26.65	7.828	8	35	.256	.774
	Design line-no2\ motif no 2	43	26.00	8.527	7	35		
	Design line-no3\ motif no 3	43	27.26	8.024	7	35		
	Total	129	26.64	8.084	7	35		
Design line	Design line-no1\ motif no 1	43	87.07	24.817	25	110	.349	.706
	Design line-no2\ motif no 2	43	85.65	27.312	22	110		
	Design line-no3\ motif no 3	39	90.23	23.301	40	110		
	Total	125	87.57	25.124	22	110		

A one-way analysis of variance (ANOVA) was calculated on participants' ratings of Motif design for the three designs (Design line -N.O 1- Design line -N.O 2 Design line -N.O 3). The analysis was not significant, $F= 0.468$, $p = 0.627$. Participants found that there is no difference between the Motif designs within three design in Motif (Design line -N.O 1- Design line -N.O 2 Design line -N.O 3).

The analysis was not significant in outfit design, $F= 0.161$, $p = 0.851$. Participants found that there is no difference between the outfit designs within three design (Design line -N.O 1- Design line -N.O 2 Design line -N.O 3).

The analysis was not significant in outfit design, $F= 0.256$, $p = 0.774$. Participants found that there is no difference between the designs Usability within three design (Design line -N.O 1- Design line -N.O 2 Design line -N.O 3)

The analysis was not significant in sum of all question, $F= 0.349$, $p = 0.706$. Participants found that there is no difference between the sums of all question within three design (Design line -N.O 1- Design line -N.O 2 Design line -N.O 3)

Conclusion:

This research highlights some concerns regarding the effective use of getting inspired of Islamic motifs using modern technology represented in mixing parametric design and its various applications with 3D printing techniques in the daily wear fashion. However, what the research presented here proves that mixing the parametric concept of design with 3D printing to create contemporary wearable fashion adds an aesthetic value to the outfits in terms of shape, texture and other visual and functional factors. Thus, it is recommended to direct researchers towards creating wearable fashion using modern technology.

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