CLASHING TRADITION TEXTILE PATTERN DESIGN BASED ON TARTAN PROPORTIONS

Dr. Chaoran Wang [1], Prof. [Dr.] Michael Andrew Hann [2] and [BA] Samuel How Lai Luk [3]

1 Lancaster Institute for the Contemporary Arts, Lancaster University, Lancaster UK chaoran.wang@lancaster.ac.uk, Lica Building, Lancaster University, Bailrigg, Lancaster LA1 4YW

2 School of Design, University of Leeds, Leeds, UK

3 School of Media, Communications & Creative Industries, University of Central Lancashire, Preston, UK

Abstract:
Tartan, the woven checked wool textile considered to be originally from Scotland is common to many cultures and historical periods. The checked feature is due to the assembly of different coloured threads in 90 degree warp and weft directions (known as the 'sett'). Originally (at least in the late eighteenth and nineteenth centuries) the colour of the sett was originally associated with different families, clans or geographic regions. Although tartan-type textiles have attained popularity the world over, it is also a predicted fashion wish for the forthcoming Autumn/Winter 2019/20 season (at least as suggested by exhibitors at Première Vision). Forthcoming fashionable designs may include 'deconstructed tartan', 'textured checks', 'patched checks' and 'geometric printed checks' etc. This paper aims to explore the proportions between tartan sett, the underlying grid structure and how these grids can be distorted for novel textile pattern design uses. A refreshing insight into textile pattern design methodology is thus provided.

Key words:

tartan, textile, grids, pattern design.

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Introduction

Tartan-type textiles is a predicted fashion trend for the forthcoming Autumn/Winter 2019/20 season (at least as suggested by exhibitors at Première Vision). Forthcoming fashionable designs may include 'deconstructed tartan', 'textured checks', 'patched checks' and 'geometric printed checks' etc. This paper explored the geometric presentation (grid structures) based on the numerical proportions between tartan sett, and how these grids can be distorted for novel textile pattern design uses. The origin of tartan and its making methods was firstly reviewed. Grid distortion's application in art and design practice was then identified. 10 examples were presented in the end of this paper with the colour trend of 2020 colours filled in (predicted on dezeen.com and fashionunited.uk) to illustrate how the traditional textile artefact could contribute to the future textile design industry.

Background information and research hypothesis:

Tartan as a name was derived from French '*tiretaine*' and used in Scotland since 1530 (Coltman, 2010, p. 183). It was once used to describe a type of fabric material (Coltman, 2010, p. 183; Dickens, 1873, p.178). 'A twilled stuff alike on both sides' (Dickens, 1873, p.178). The more up to date definition of tartan is a 'pattern or distribution of colour of a plaid/garment (Dickens, 1873, p.178). It is 'a traditional art form based on the regular interweaving of warp and weft stripes to form repeated pattern blocks or squares.' (Grossman and Boykin, 1988, p.15). The majority of tartan at the present are more than 100 years old, many are 150 years and some are over 200 years old (Stewart, 1950, p.37).

Tartan has long affection on Scottish people in both highlanders and lowlanders on the aspects of social, cultural political and economic aspects (Coltman, 2010, p.190; Stewart, 1950, p.1). Tartan has a strong link with families and clans in Scotland (Stewart, 1950, p.16; Dickens, 1873, p.177; Grossman and Boykin, 1988, p.15). The first evidence that tartan linked with local clan was Crown Charter, which can be dated back to 1578 (Stewart, 1950, p.9). A greater number of tartan produced in middle of 18th century and later was found only represent a few leading families in highland (Stewart, 1950, p.22). The highlanders usually wear tartans of their leaders (Stewart, 1950, p.26). Furthermore, social ranks can be indicated by the brightness of colour and the complexity of pattern (Stewart, 1950, p.8). Therefore, group significance was strongly attached to tartan (Stewart, 1950, p.2). Tartan was once regarded as Scottish nationalism as it was as uniforms in war (Stewart, 1950, p.2; Dickens, 1873, p.179). This also increased the popularity of wearing tartan (Stewart, 1950, p.2). British government realised the power of tartan plaid in 1746 (Coltman, 2010, p. 183) and published an act to prohibit people from wearing tartans apart from military (Dickens, 1873, p.178; Coltman, 2010, p.182). The community use of tartan then lost even the government prohibition was been removed (Stewart, 1950, p.15, Dickens, 1873, p.180).

Tartan is a calculated means of dressing up (Coltman, 2010, p. 185). The presentation of tartan depends on the numerical proportion of setts (Stewart, 1950, p.4). The 'cloth sett' (or simply 'sett') of a tartan gives the planned colour order and number of warp threads and weft threads per unit length (inch or centimetre) (Urquhart, 2000, p.14). Therefore, a tartan plaid can be woven larger or smaller by adding or removing the threads in the setts proportionally (Grossman and Boykin, 1988, p.15). 'The full sett is the sequence of colours read from right to left, turned about the pivot, and repeated left to right' (Urquhart, 2000, p.14). The pivot point thus acts as a point of reflection symmetry (Fig. -1), and the warp and

weft setts are identical (Grossman and Boykin, 1988, p.15, Stewart, 1950, p.23). In the waving process, the warp and weft setts intersect in 90 degrees, Therefore, repetition of square pattern blocks then created to provide visual order (Grossman and Boykin, 1988, p.15).

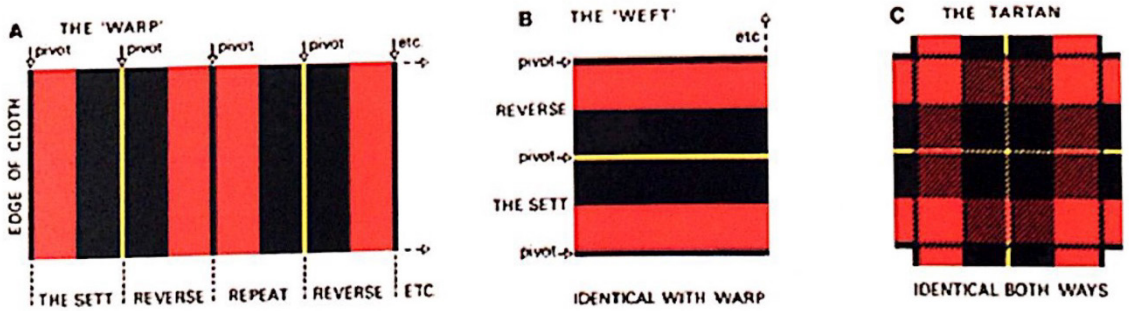


Fig. -1 Example of Scottish tartan construction showing pivot points
Source: Shin, 2011: 128

For example, 'a MacKeane tartan has warp threads ordered as follows: 4/yellow, 2 black, 24 red, 16 black, 8 red, 16 black and 8/red (considered at the 'sett' or, occasionally, with symmetrical tartans, as the 'half sett') which is reversed or reflected to continue in reverse order as 16 black, 8 red, 16 black, 24 red and 2 black; reflection occurs therefore at each of the two pivots (4/yellow and 8/red), and the yarns at each pivot are not themselves reflected (Stewart, 1974). In shortened form this order of threads (in both warp and weft directions) can be represented as 4/Y, 2 Bk, 24 R, 16 Bk, 8R, 16Bk, 8/R which is reversed at either of the two pivots (each shown as an oblique stroke) to produce a 'symmetrical' arrangement of twelve bundles of yarn which repeat in the same colour sequence in both warp and weft directions' (Hann and Wang, 2016, p.167).

Although most tartans today are symmetrical, some asymmetrical tartan can be found in the record. For example, according to Stewart (1950, p.18), Buchanan tartan is the most striking asymmetrical tartan, and the sett numbers are 2 black, 18 white, 8 Cr (Crimson or Cardinal?), 4 white, 8 Cr (Crimson or Cardinal?), and 4 white (Stewart, 1950, p.47). In this case, there is no pivots, and the sett or order of threads will simply repeat across and down the cloth (Hann and Wang, 2016, p.167).

In the previous research Hann and Wang (2016) have selected 25 tartan setts colour and numbers for the research of proportions in tartan sequences. In this research 10 of those were chosen, the underlying grid structure were discovered for novel textile pattern design uses. Further pattern design methodology is provided in the following section.

Methodology:

Grid structure has long been applied in design practice in multiple disciplines. Evidence can be found in textile fabric pattern design (Qayum and Naseer, 2016; Shaw, 2010; Adams, 1989; Guilmain, 1985 and 1987; Liu and Zhang, 2009; Adanur and Vakalapudi, 2013), computer image recognition (Lu, Mok, Jin, 2017; Ma, Baciu, Hu and Zhang, 2010, Zhang and Xin, 2016; Hu, Luo, Ding, Guo, Jie, Zheng, Cai, 2017; Wang, Yang, Huang, Jin, 2012, Liu, Mok, Jin, 2014;), material study (Hausding , Lorenz , Ortlepp , Lundahl and Cherif, 2011; Rybicki, 2018; Böhm, Hufnagl, Kupfer, Engler, Hausding, Cherif, Hufenbach, 2013), biology (Damyanovich, 2018; Arad, 1997), math (Azarenok, 2003), geography (Myklestad ,Birks, 1993; Crawford, 1983; Davies, 1974; Mackay, 1969),

chemistry (Michl , Magnera, 2002), art (Johnson, Martin, 1998; Peden, 2004 and 2012;) and architecture (Collins, 1962, Jacobson, 1986). Grids can provide proportions in design practice. Grid subdivision and grid distortion are the common methods to create visual effects.

In the aspect of textile pattern design, grids (without distortion) are commonly used in pattern design to provide units and functioned as an underlying structure (Qayum and Naseer, 2016, p.62; Shaw, 2010, p.315), a design (or a motif) may occupy one of more grid units and repeat along the entire fabric in both horizontal and vertical directions (Qayum and Naseer, 2016, p.62; Shaw, 2010, p.315). Examples could be found in a garment, a rug, a wall hanging, a canopy and a carpet (Shaw, 2010, p.316). In the handmade textile craft in Africa, the symmetry provided by underlying grids allows a piece of work that can be made by a few people while still remain an aesthetic order (regularity) (Adams, 1989, p.42).

When the patterns underlying grid structures was made superposition, nesting, combination and parameter variations, the type and quantity of design patterns may increased (Liu and Zhang, 2009, p.1080). These patterns are called '*quasi-regular patterns*'(Liu and Zhang, 2009, p.1080). Fig. -2 shows the examples of 4 quasi-regular patterns.

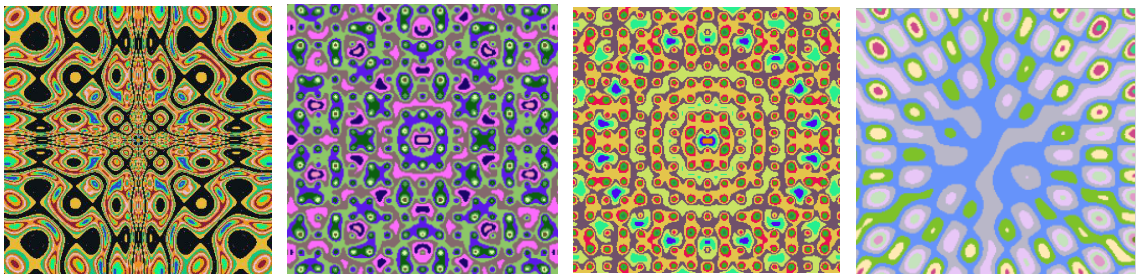


Fig. -2 Example of quasi-regular patterns
Source: Liu and Zhang, 2009, p.1081-1082

Lu, Mok, Jin (2014) distorted a pattern by changing its pattern functions, and according to them, the set of pattern functions including Tine-line, Comb, Wavy, Circular tine-line, Vortex Stylus and Ripple (Lu, Mok, Jin 2014, p.127). Fig. -3 shows the original pattern and its distortions via changing pattern functions.

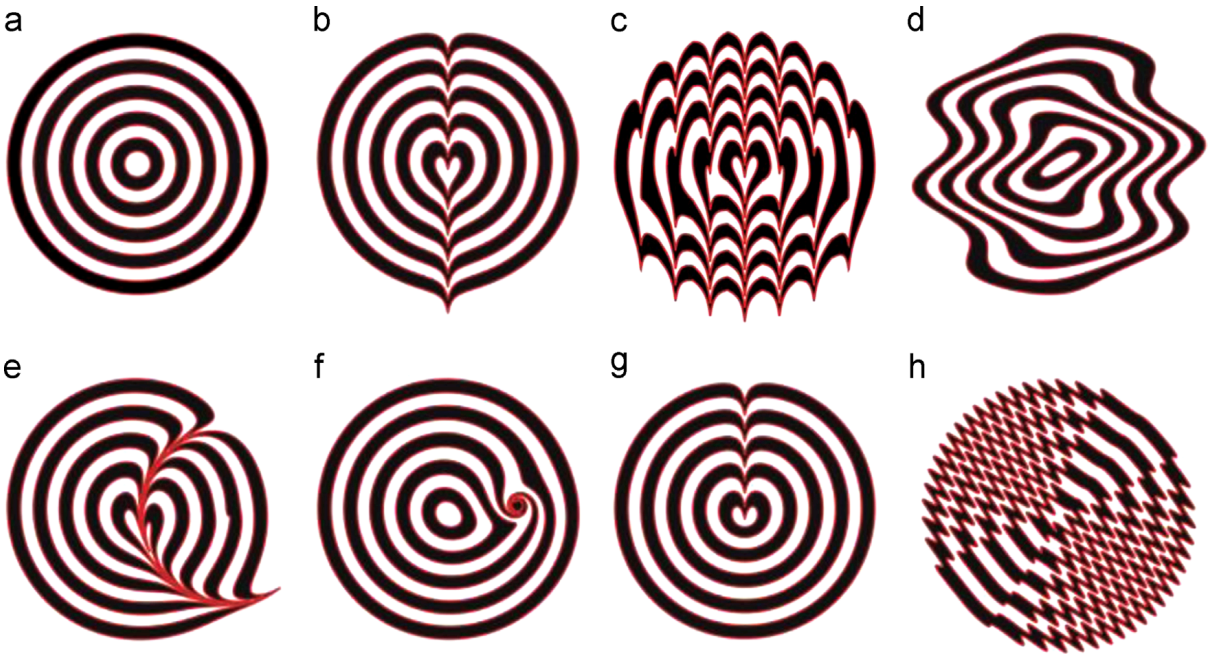


Fig. -3 (a) An initial state, (b)tine-line result on the initial state, (c) comb result on the initial state, (d) wavy result on the initial state, (e) circular tine-line result on the initial state, (f) vortex result on the initial state, (g) stylus result on the initial state, and(h) ripple result on the initial state. Source: Lu, Mok, Jin, 2014, p.127

By combining the adjustment in different pattern function, a grids-like pattern was created from distorting concentric circles (Lu, Mok, Jin 2014, p.129), which is shown in Fig. -4. Marbling effects can be created according to this pattern-distorting method with colour filled in (Fig. -5), which can be used in the textile patterns (Lu, Mok, Jin, 2014, p.124).

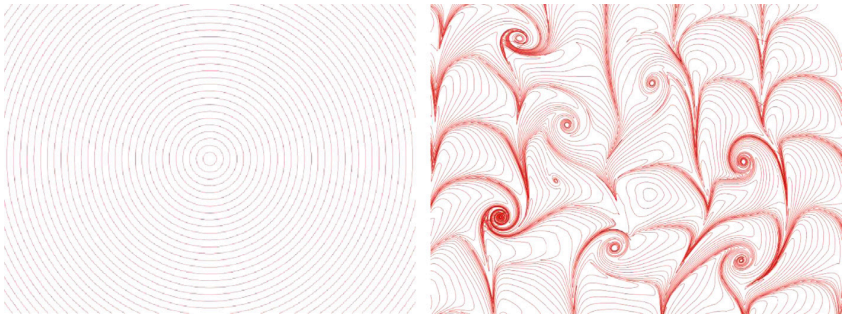


Fig. -4 Pattern distortion by changing pattern functions
Source: Lu, Mok, Jin 2014, p.127

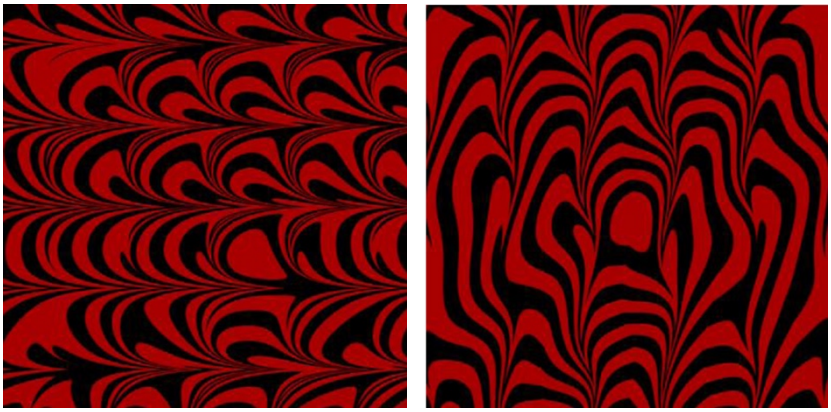


Fig. -5 Marbling effect Source: Lu, Mok, Jin 2014, p.130

Another application of grid distortion in textile is to map two-dimensional patterns on three-dimensional models (Lu, Mok, Jin, 2017, p.38). As almost all the textile patterns are design on two-dimensional basis, and human body is three-dimensional, it is inevitable to have a pattern distortion followed the body curves in the real wearing effect (Lu, Mok, Jin, 2017, p.36). Designers then use grids system to calculate the exact distort rate between the textile pattern and the real wearing effect. Firstly, grids were drawn on a piece of two-dimensional pattern, then the same grids were distorted to tile a three-dimensional surface (as shown in Fig. -6), by comparing the positions of the grids vertex on both textile pattern and the three-dimensional model, the distort rate can be calculated (Lu, Mok, Jin, 2017, p.39).

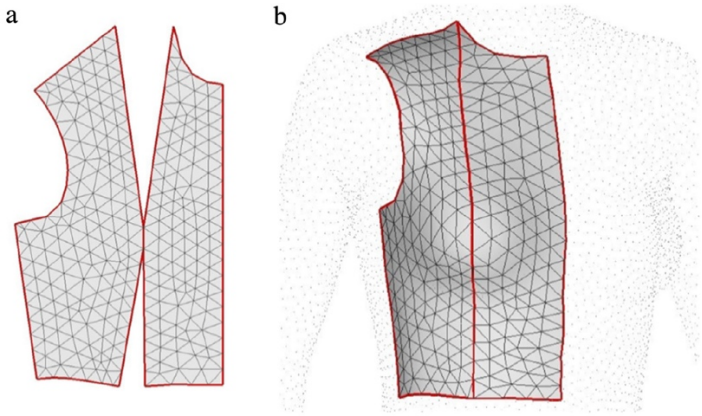


Fig. -6 Two-dimensional pattern distorted on three-dimensional model
Source: Lu, Mok, Jin, 2017, p.39

Map systems usually use distorted grids to accurately reflect the distribution patterns in a particular area. For example, Myklestad and Birks (1993, p.9) used a grid-based map to study the species distribution of the floristic regions in Europe. This is shown in Fig. -7. The map with shaded grids is also used in census survey (Davies, 1974, p.232). In terms of areas with irregular boundaries, the grid-based data usually have a limitation of accuracy, in which the smaller cells on a map, the more accurate data its reflected (Davies, 1974, p.233).

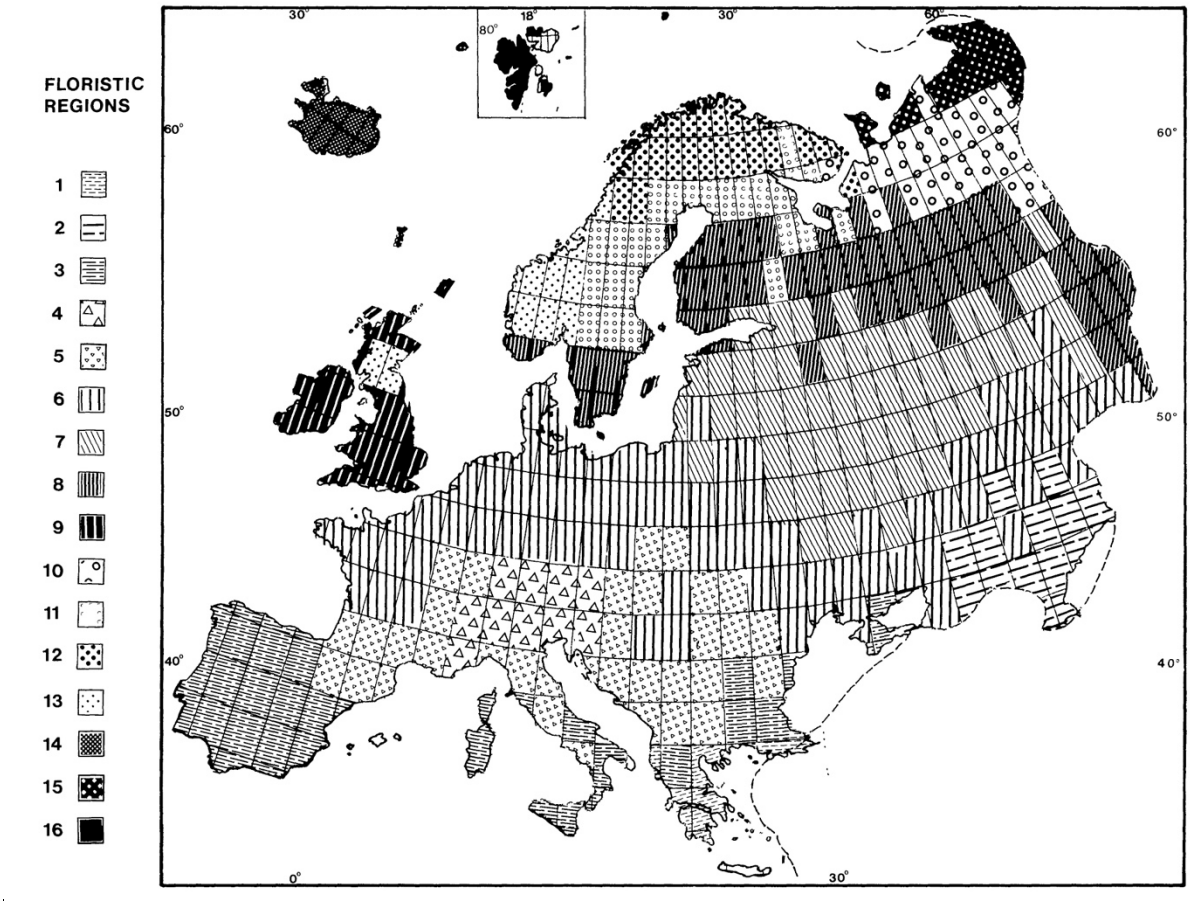


Fig. -7 Grid-based map system
Source: Myklestad and Birks, 1993, p.9

The application of grid distortion can be found in creative art works. The anamorphic art style (Johnson, Martin, 1998, p.24) and the wave space art (Peden, 2004, p.377) all contains distorted grids as underlying guidelines. Anamorphic art is a type of 'artwork that is indistinct when viewed from a normal perspective but becomes recognizable when the image is viewed from a different perspective or reflection' (Fig. -8 a) (Johnson, Martin, 1998, p.24). In the creation process, an anamorphic grid was used as guidelines by European artists (Johnson, Martin, 1998, p.24)(Fig. -8 b).

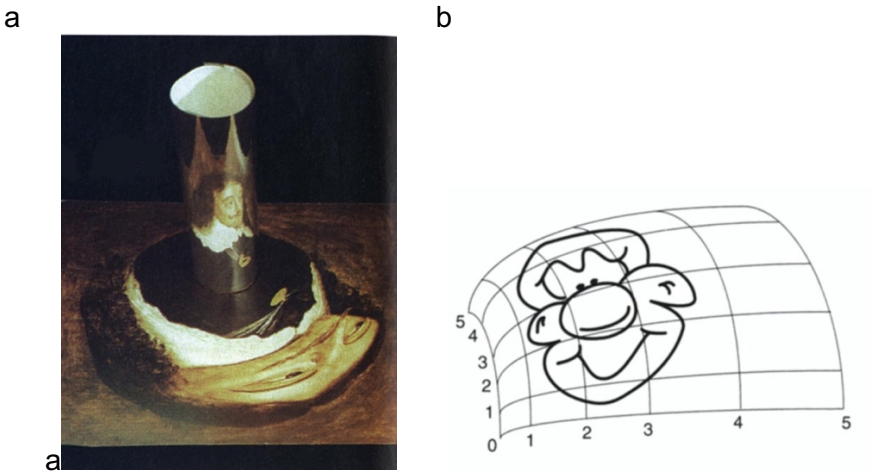


Fig. -8 The anamorphic art work (a) and the drawing grid (b)
Source: Johnson, Martin, 1998, p.24 and p.26

Peden (2004) made the wave pattern effect based on the twisted square modular grids (Peden, 2004, p.377) (Fig. -9).

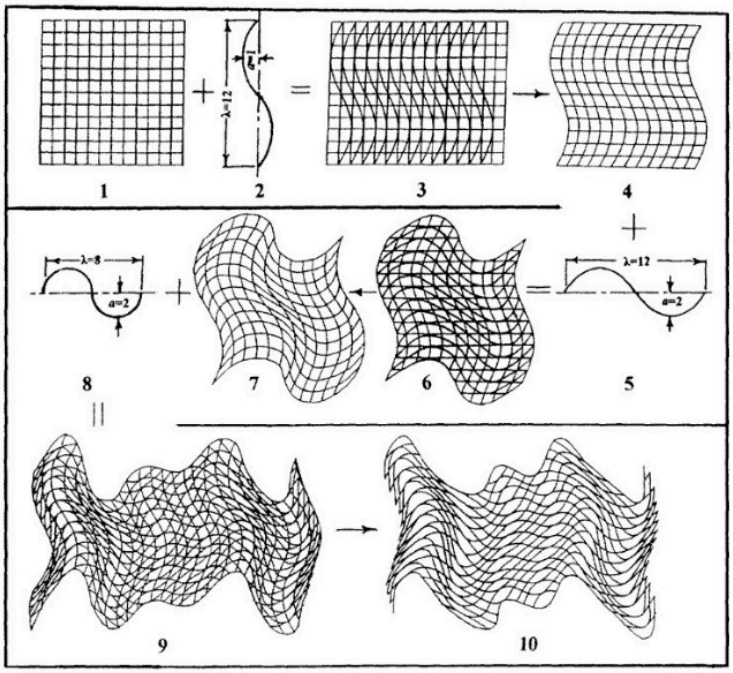


Fig. -9 Wave pattern effect made of square modular grid
Source: Peden, 2004, p.377

The division or sub-division of grids as design methods are widely used in carpet design, due to the nature of the technique of weaving, the thickness of the band may be sub-divided to suit certain pattern designs. Therefore, the original guide grids need to be sub-divided accordingly. Fig. -10 shows an example, which illustrates the sub-division of grid units to suit pattern design (Guilmain, 1987, p.36).

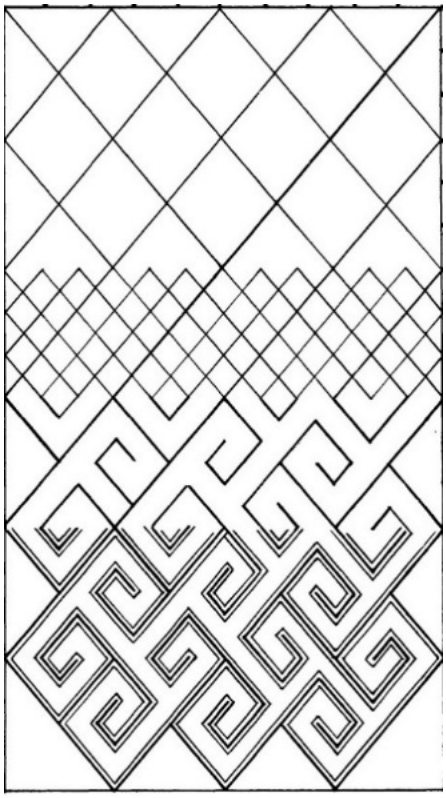


Fig. -10 The sub-division of grid units
Source: Drawn from Guilmain, 1987, p.36

Findings and Discussion:

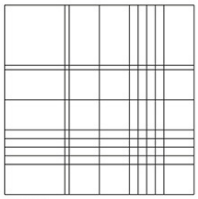
'The dominant aesthetic characteristic of tartans is their checked appearance, based on warp threads in a given order of colours interlacing at right angles with weft threads in the same order.'(Hann and Wang, 2016, p.880), proportional relationships exist between the number of threads (or setts) in each colour. Frameworks were generated based on 10 tartan numerical setts numbers provided by Stewart (1974), including Baird (Thread count: 6 2 2 16 16 16 4 6); MacPherson (Thread count: 2 2 16 2 2 2 16 2 2); Abercrombie (Thread count: 28 2 14 14 4 4 4 4 14); Balmoral (Thread count: 4 2 16 4 4 2 2 2 8 4 2 2 2); Davidson (Thread count: 2 12 6 12 2); MacCallum (Thread count: 2 12 12 8 2 4 16); MacLeod (Thread count: 6 4 30 20 40 4 4); Macrae: Hunting (Thread count: 6 2 30 28 8 4 8 4 28); Montgomerie (Thread count: 8 10 8 56 8 10 8); Stewart of Galloway (Thread count: 6 48 8 2 4 2 8 12 6 2 4 2); then these grids-like frameworks got distorted in PhotoShop by modifying 10 different settings: Freehand; Mirror; Waves; Two-points; Poke; Pinch; Growth; Circuit; Shutter and Pages. Then the patterns are filled with colours including: Neo mint; Banana Sorbet; Black Forest Gateau; Cactus Green; These are womenswear colours trend in the Spring/Summer 2020 season (https://www.dezeen.com ;https://fashionunited.uk/). Similar colours or complementary colours of the above colours were also added in some of the pattern designs.

Abercrombie

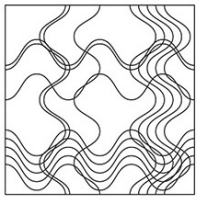
Thread count:
28 2 14 14 4 4 4 14

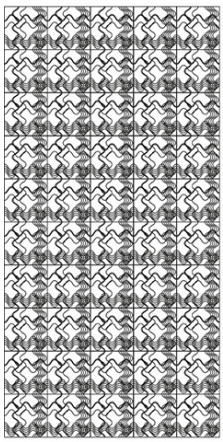
Method:
Waves

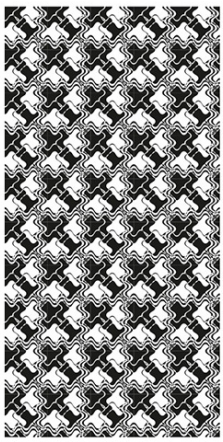
Colours:
Blue Lightning
Purist Blue
Columbia Blue
Alice blue

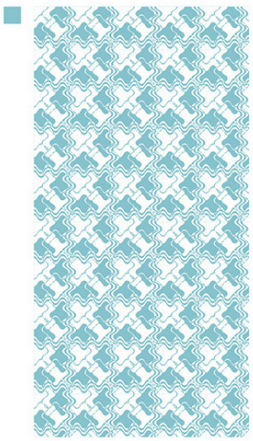


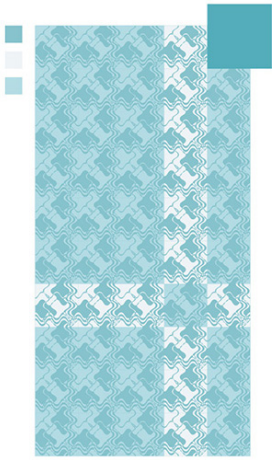
At 50%









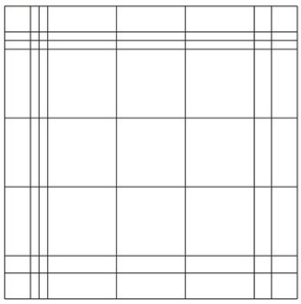


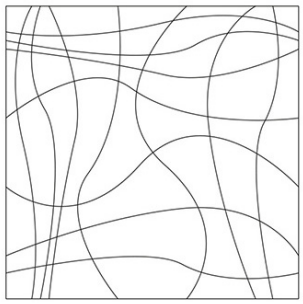
Baird

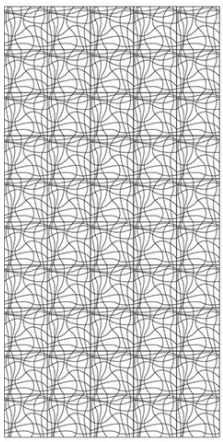
Thread count:
6 2 2 16 16 16 4

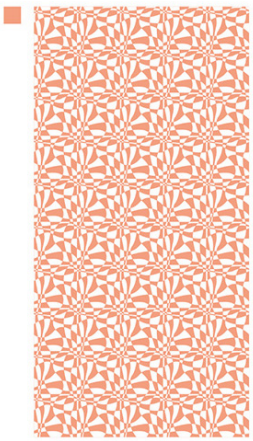
Method:
Freehand

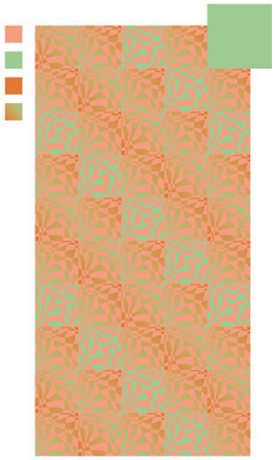
Colours:
Neo mint
Cantaloupe
Solar Orange









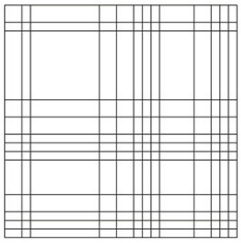


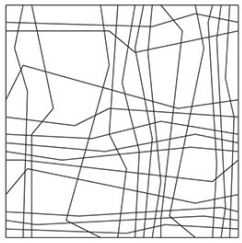
Balmoral

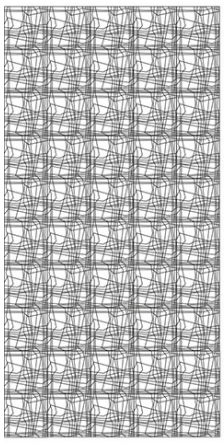
Thread count:
4 2 16 4 4 2 2 2 8 4 2 2 2

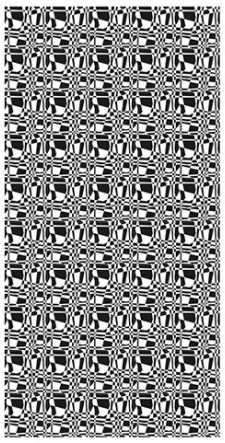
Method:
Two-Points

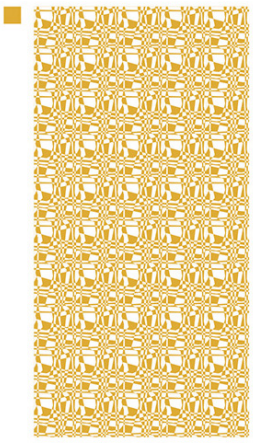
Colours:
Mellow Yellow
Golden Brown
Lemon Fizz
Black

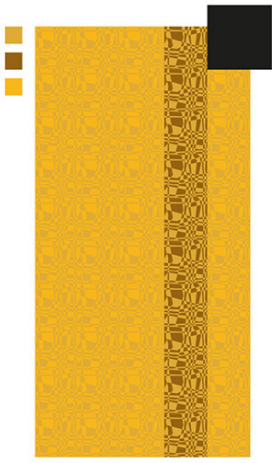










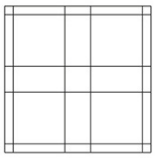


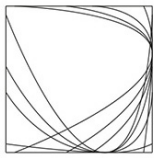
Davidson

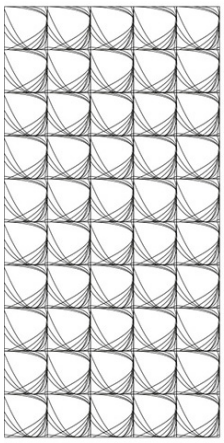
Thread count:
2 12 6 12 2

Method:
Poke

Colours:
Banana Sorbet
Beige
Brown





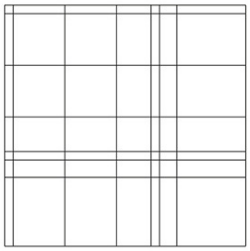


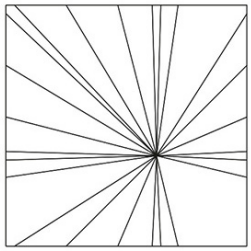
MacCallum

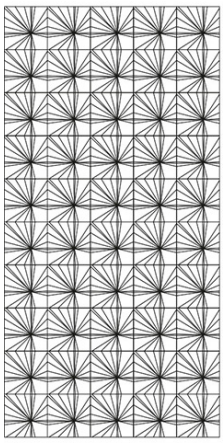
Thread count:
2 12 12 8 2 4 16

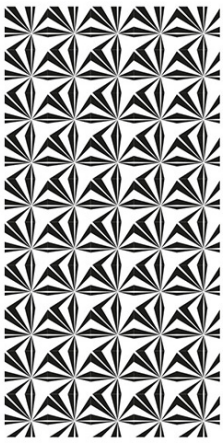
Method:
Pinch

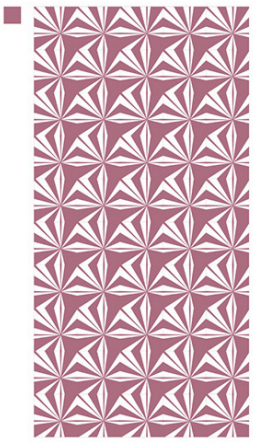
Colours:
Cassis
Mountbatten Pink

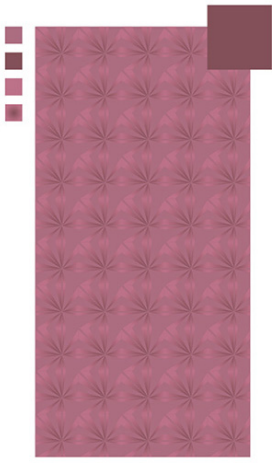










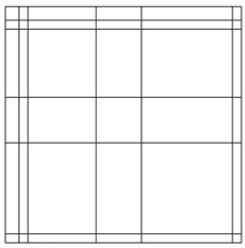


MacLeod

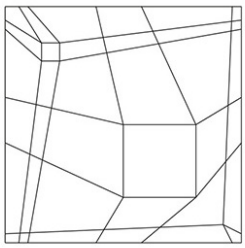
Thread count:
6 4 30 20 40 4 4

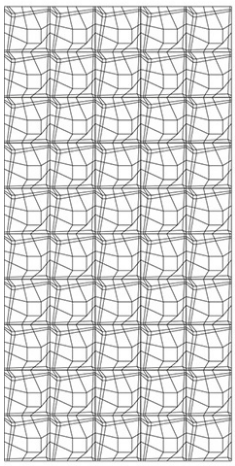
Method:
Growth

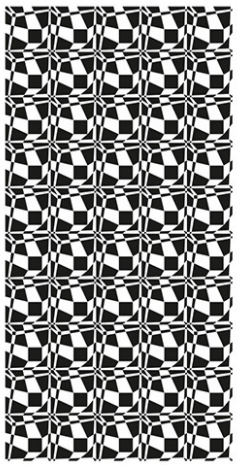
Colours:
Purist Blue
Alice blue

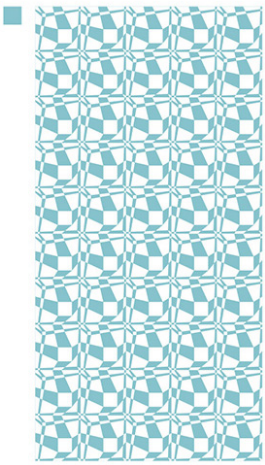


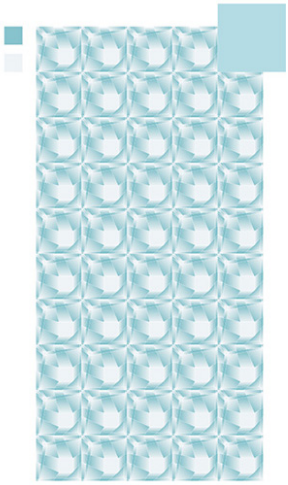
At 50%









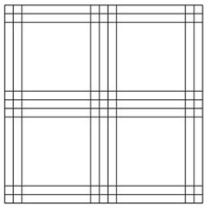


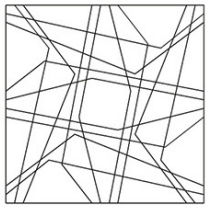
MacPherson

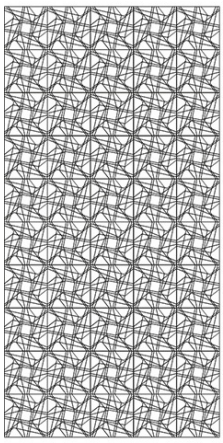
Thread count:
2 2 16 2 2 2 16 2

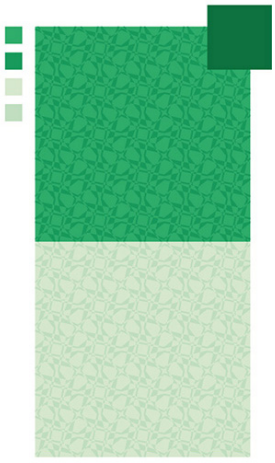
Method:
Mirror

Colours:
Cactus Green
Sea Green
Paris Green
Tea Green
Honeydew







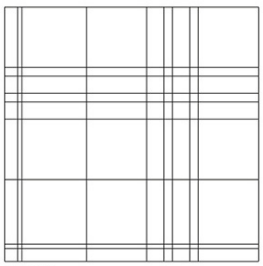


Macrae (Hunting)

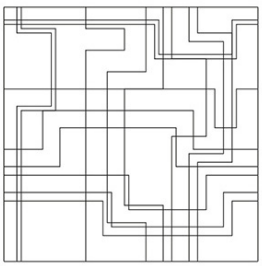
Thread count:
6 2 30 28 8 4 8 4 28

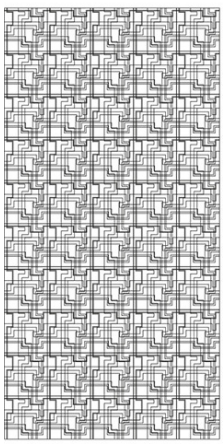
Method:
Circuit

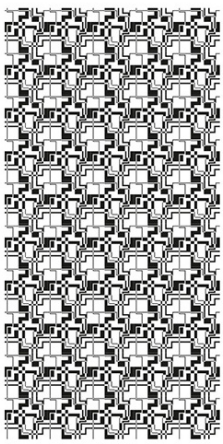
Colours:
Black Bean
Jasmine
African Violet
Black
Charcoal

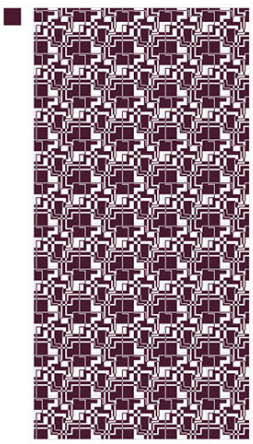


At 50%







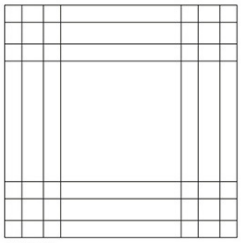


Montgomerie

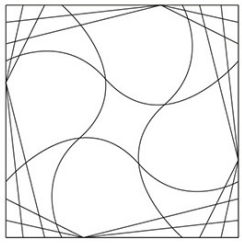
Thread count:
8 10 8 56 8 10 8

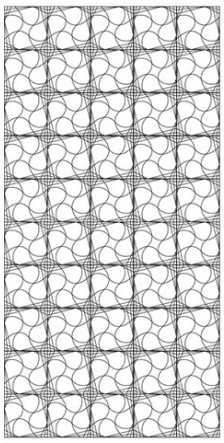
Method:
Shutter

Colours:
Neo mint
Tea Green
Beige
Bone



At 50%



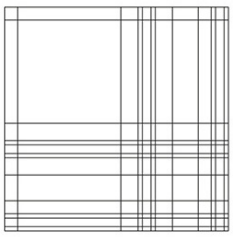


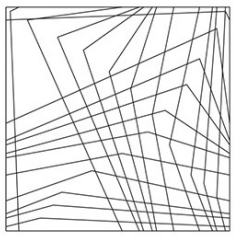
Stewart of Galloway

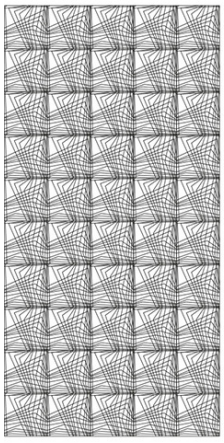
Thread count:
6 48 8 2 4 2 8 12 6 2 4 2

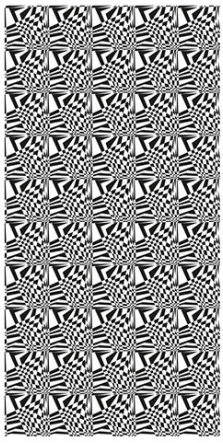
Method:
Pages

Colours:
Neo mint
Cantaloupe
Solar Orange









Summary, Conclusion and Implications

Tartan as a is long existing textile pattern which has checked features; its derivation type has been predicted as a fashion trend in 2019/20 seasons. Grid and grid distortion is a common method in art and design practice. This paper provided a methodology for textile pattern design by distorting tartan's underlying grid structure in 10 different ways via Photoshop. In this paper, the origin and nature of tartan was firstly reviewed. Grid distortion's application in art and design was then identified. The possibilities to distort grids structure underlying 10 tartans were discussed and illustrated in detail which will benefit for the future development of textile pattern design, computer graphics, and creative thinking.

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