CAMOLUTION
Contemporary surface pattern expressions in textile design.

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Mum and my Dad
# TABLE OF CONTENTS

1 Title 4  
1.1 Representative image 4  
1.2 Abstract 8  
1.3 Keywords 8  

2 Introduction 9  
2.1 Introduction to the field 9  
2.2 Motive and idea discussion 12  
2.3 Aim 14  

3 Method & Development 15  
3.1 Design method & Design of experiments 15  
3.2 Development & Design rationale 15  

Chapter A: Process to create design experiments 16  
A.1 Visual Deception: main direction 16  
A.2 Influence: orientation of the design style 17  
A.3 Colour: contrast choices 18  
A.4 Method summary 18  

Chapter B: Experiment Patterns 19  
B.1 Brand Symbols 19  
B.2 Textile Collection 20  
B.3 Experiments 20  
B.4 Selection and Analyse 35  

Chapter C: Material 38  

Chapter D: Context & Collection 38  

4 Result & Discussion 39  
4.1 Result 39  
4.2 Presentation 41  
4.3 Conclusion 44  
4.4 Discussion 45  

5 References 46  
5.1 References 46  
5.2 List of figures 47
1.1 Representative Images of Work (fig.1-10)

Fig. 1 - general overview
1.2 Abstract

*Camolution* is a project that explores the camouflage pattern in a textile design context. The motive is to reinterpret an obsolete concealment function and instead, to hide and reveal visual textile aspects within the pattern. The primary aim of this work is to develop a contemporary camouflage pattern collection of printed and knitted textiles, and to explore the concealment function through visual deceptions. The patterns were developed with a method that uses a selection of rules in colour contrasts, style influences and textile proprieties to design a series of pattern experiments. The final pattern designs were screen printed, digital printed and knitted, and applied as garment prototypes. This part was done in collaboration with the fashion brand Björn Borg. The result sets out a collection of textiles and clothes connected by three different concepts of misled vision. It was found that the camouflage function in this work was an efficient tool to advertise the brand symbols within the textiles. This work proposes an alternative design method of using the camouflage concept in textile design, contributing with new expressions, techniques and qualities.

1.3 Keywords

Surface patterns, textile printing techniques, collection, camouflage, knitting techniques, textile design.
2 Introduction

2.1 Introduction to the field

Camouflage nowadays has turned to be one of the most used commercial surface patterns in fashion and textile design. Born out of war and inspired from nature, colours and forms are developed by living organisms to produce visual subterfuge to purpose concealment and disguise for a protective or aggressive intention. Natural camouflage intends to blend in with the background, matched by the ability to stay motionless for periodic transformations. Naturalists and zoologists started at end of 1800s to study the field of animal concealment. The American painter and naturalist Abbot Thayer was one of the first to introduce the concept of *counter shading coloration in the animal kingdom* (Thayer 1909) (fig.11). He observed that the variety of colours which afford many creatures with a generalized resemblance to their surroundings are often supplemented by patch, stripes and blotches whose abrupt shapes break up the contours by which they would otherwise be identified. Initially, the concept was experimented by the French camoufleur during the first world war mostly on structures to hide from the planes (fig.12).

The disruptive pattern is a helpful note of confusion and serves to divide the attention of the observer into a number of conflicting shapes. Areas of dark and light tone next to each other have the effect of breaking up shape and outline (Miller 2007). During the second world war the disruptive coloration has been developed the most. The British zoologist Hugh Cott influenced the disruptive camouflage with his research in the continuation of Thayer’s work (Cott 1940) (fig.13).
The disruptive coloration has been developed to create the military prints of the soldier outfits during the second world war then renewed and still used today. More than the concealment, a military print has a function of identification (Naylor 2007), affiliation to a specific group and recognition of allies and enemies. Citizens started to claim what was a military tool for themselves, as a protest during the Vietnam war, this was the beginning of a new trend that turned into a future commercial success (Miller 2007). Many of the military prints became famous; they have been seen in all kind of military representation, photography, movie and reportage. Some of them are known even if we can not define exactly wherefrom, **US Woodland, US Desert chocolate-chip and British DPM** are iconic examples (fig.14-16).

There is a similar type of camouflage called **dazzle camouflage** created during the first world war. A form of ship camouflage in which bright stripes and swirls of colour are painted on ships in such a way to confuse the enemy about the ship's course (Covert 2007) (fig.17-18).
In 1987 Andy Warhol started a series of work using military camouflage. He developed in his screen prints (fig.19) unexpected shades of colours turning the concealment print into a symbol with an artistic point of view. The designer Stephen Sprouse used in the same year his print onto a jacket, this was the first transformation of the print itself into a fashion print instead of a recycling (fig.20).

In fashion camouflage print, the concealment function is gone, there is not background matching, only stay the symbol which is turned into trend (Dery 2006). Paul Smith introduced a digital print called camouflage ivy leaves where the relation with disruptive coloration seems to change, the print is getting realistic and match only his own background (fig.21). The British designer Hardy Blechman and his company DPM, studied and developed camouflage in the field of the army and design development (Blechman 2004). Through his label Maharishi founded in 1996, Blechman has become one of the most innovative adapters of camouflage to civilian fashion, many collaborations have been made with well-known fashion brands. Blechman claimed that civilians are attracted to camouflage not because of its military context, but because it represents something else (Miller 2007). This is then not about concealment, but as a symbol. The 2008 collaboration with Northface called DPM Rocky Mountain States is an example of the military origins with a peaceful reinterpretation (fig.22-23).
2.2 Motive and idea discussion

Artists and designers already worked on camouflage in textile and fashion design.

The fashion designer John-Daniel Isacsson used the camouflage military pattern to explore new design expressions within quilting and filling techniques. The patterns were used as tools to experiment with three-dimensional structures and new solutions for filled garments (Isacsson 2015) (fig.24). This investigation of the expressional form possibilities of quilting using camouflage pattern permit to enhance a technique with the support of an existing pattern structure, the functional concealment function of the military pattern is abandoned in favour of an intermediary to develop new textile technical findings.

The textile and fashion designer Lola Van Praag used in her master degree work contrasting contemporary images of naked female bodies with classical paintings (fig.25). Hidden images are developed with the combination of jacquard knitting and heat transfer print where textiles can be used as a narrative expression. The two techniques together propose knitted structures that play with printed images by focusing the attention on the print as on the surface variation of the textile (The Issue Magazine 2017).

Camouflage is often created in relation to the spatial environment. The work of the artist Desiree Palmen explore the conceptual realm of urban camouflage patterns. In 2002, Palmen launched a project called STREETWISE, in Rotterdam then extended in Israel in 2006 (fig.26). She would camouflage people to match a particular public scene that she had photographed with costumes she painted herself to match up the surrounding; the camouflage aspect works only from a specific angle and distance like a security camera. Her work shows how humans, like chameleons, might be able to blend in to the environments we created for ourselves.
Background matching is also recurrent in the work of the Peruvian artist Cecilia Paredes. Paredes is using her own body to create sets that explore the space using the body as part of the intended space, photography is the medium that catches the sets designs. Her body painting matches the wallpaper behind the model by copying the pattern and colours and blend in (fig.27). Paredes’ photographs talk about personal struggle with comfort, body-identity politics and belonging.

The motivation of this work is to find a valuable use of the concealment function, which will develop new design expressions in the field of surface pattern design for apparel. The primary goal of this work is to create a camouflage pattern collection of printed and knitted textiles, applied as sportswear garment and underwear prototypes. The project is done in collaboration with the fashion company Björn Borg. Based in Stockholm Sweden, Björn Borg design and produce sport apparels and underwear (BJORN BORG 2017).

The main question is what the pattern is hiding and to explore the brand as an object to hide within the pattern. Concealment by camouflage is passive rather than active; the problem is to balance hiding/revealing in order to communicate the subject (the brand). This form of hidden object has been approached in *Digital Camouflage Images Using Two-scale Decomposition* (Hui, Xiaogang & Xiaoyang 2012), where camouflage was used to hide to hide portraits in landscape photography. The portrait is inserted in the landscape as a layer over the other then decomposed with different variation such as image resolution, transparency or black and white contrast.

The concept of this work is developed for the textile design field. The concealment function is experimented through the action of misleading the vision; in this work, it is called visual deceptions. The use of three different visual deceptions leads the project.
2.3 Aim

The aim of this work is to develop a contemporary camouflage pattern collection of printed and knitted textiles, and to explore the concealment function through visual deceptions.
3 Method & Development

3.1 Design method & Design of experiments

A pre-study has been conducted to explore the gradient colours with different textile print techniques. A gradient is composed of two points that contrasts each other (with one or several parameters) in order to work; the exploration permit to study seven different types of colour contrasts that have been developed further in several repeated patterns. The colour contrasts findings are exported in this work to be developed further.

To achieve the aim, the framework is composed by the experimentations setup to build the pattern collection, the making of the experimentation followed by the analysis. The choice of arranging a pattern textile collection derives from the decision to introduce diversity for wider pattern research. This diversity brings further multiples point of views to the subject, the general analyses generate additional finding.

The pattern construction constitutes the largest part of the process in knitting and printing to realize the finished textiles. To explore the concealment function through visual deceptions, a structure is needed to experiment the different deceptions with the same base. The patterns are developed with a method taken from Artistic development in fashion design (Thornquist 2010). This method called restriction has been translated to textile design: “To train open-end creation through given restrictions and to build courage to create”. An adjusted method that uses a selection of rules in colour contrasts, style influences and textile proprieties that support a design series of pattern experiments.

In order to work efficiently in collaboration with the company some decisions have been made early in the working process: the exclusive use of knitted textile, a scale adapted to garment and the production of prototypes with the design of the company to elevate the textiles to step of an end product.

The printing and knitting exploration are developed differently through the parameters of each experimentation. Jacquard Knit or ready-made knitted textile, the textile support selection of each of the experiment is made individually for each of the exercise. Each sketch is first analysed to see if there is a valuable potential for a jacquard production, otherwise the pattern is digitally printed. This analysis is done by counting the number of colours required to produce the pattern from a sketch, because of the weight of the fabric, the maximum colour limit for a jacquard knit is settled here to four.

3.2 Development & Design rationale

The workbook will be developed under four chapters.

Chapter A: Process to create design experiments
Chapter B: Experiment Patterns
Chapter C: Material
Chapter D: Context & Collection
A.1 Visual Deception: main direction

The meaning of a visual deception is the action of mislead the vision and breaking up the outlines of an element with a strongly contrasting pattern. Nine possible directions have been identified as visual deception (fig.28). To achieve the aim of this work, three directions are chosen. To explore the most iconic camouflage aspect, disruptive coloration and Dazzle design have been selected. Hidden image, the last direction, has been chosen for the integration potential of the brand. Each of the approaches is assigned with a keyword that represents its general function.

Dazzle Design: **disassemble/divide**

Dazzle Design has been developed mostly during the first world war on warships (Covert 2007), the geometrical aspect relates directly to cubism and optical illusion (Calder 2011). Mostly in black & white, the design break shapes with geometrical and sharp shapes (fig.29).

Disruptive Coloration: **extend/combine**

Organic and directly inspired from nature, a pattern turns into a form frequently due to the large scale of this one (Kristensen Johnstone 2014). Animal such as Butterfly and salamander are a perfect example of contrast colour that breaks the shape and mislead the identification of it (fig.30).

Hidden Image: **embed/place in**

To transform visual input into interpretable object (Hui, Xiaogang & Xiaoyang 2012), to use grid to insert a cognitive illusion (Maharam 2015) (fig.31).
A.2 Influence: orientation of the design style

In order to start experimenting and get a large overview on the subject, different parameters are settled. This way, every combination is tested with the three deceptions. Patterns style can be visually identified under different family of styles (Clive 2009). A list of four influences has been chosen, which gives the resource to provide different aspects of the general concept.

Details and description of each influence is thought through in accordance with the general trends of Björn Borg. Four words have been requested from the company in order to select four families of styles: flower, abstraction, typography and tennis. *Floral, Abstract, Object* and *conversational* have been selected from these words (fig.32).

**Floral**  
ex: leave, tree, fruit, flower, grass, basquet, bouquet.

**Abstract**  
ex: patchwork, painterly, spirals, art deco, psychedelic.

**Objects**  
ex: calligraphy & lettering, domestic, machine, toy garden, architecture.

**Conversational**  
ex: sport, pictorial, hunting scene, map.
A.3 Colour: contrast choices

Colour contrast has been researched in the pre-study of this work. Based on colour gradients to extend the qualities of disruptive coloration (Chevreul 1839, Itten 1973), the research was conducted to explore different type of colour contrasts to develop design potential in pattern. The *complementary contrast* has been chosen for this work, for his dynamic and strong visual opposition (fig. 33). An additional colours contrast based on shades is added to propose a colour variation; this contrast is called here *chiaroscuro*.

The colour palette was picked out from the fashion trend forecasting WGSN (2017), from the colour card trend AW18/19. It is composed to have enough colour that can create complementary colour contrast that can be used for the experimentations (fig. 34).

A.4 Method summary

The method is composed of three parameters (deception, influence and colour), where all the combinations are tested to get a bigger diversity of result and possibilities (fig. 35). Once a sketch is created with one of the three deceptions (fig. 36), this one can be developed further for digital print, screen print, transfer print or jacquard knit.
Chapter B: Experiment Patterns

B.1 Brand Symbols

The subject concealed within the pattern is the company identity. Elements that highly represent the firm are used and inserted in each pattern to explore the potential of concealment and its hiding-revealing balance. Five symbols have been identified to represent at best the company (fig. 37):

- the brand name: the typographic logo and the name of the company.
- the tennis ball: the tennis ball represents the main sport supported by the company.
- the tennis court line: the tennis court line is a strong graphic element used here in a scale that does not propose visually the entire tennis court, this is an indirect symbol.
- the tennis court grid: the grid is here an indirect way to communicate the tennis racket and the grid from the tennis court.
- Björn the player: Björn Borg was a famous Swedish player that established the company; he is the face representing the brand.
B.2 Textile Collection

With 3 deceptions, 4 styles and 2 colour contrasts, a number of 24 different combinations are possible. Different sketch methods are used and inspired from Textile Tectonics (Spuybroek 2011) and Autogenic Structures (Evan 2013). A mood board has been made with AW18/19 WGSN trend to work as a guideline for creating the sketches (fig. 38).

The Oxford dictionary describes the word collection as “a group of accumulated items of a particular kind” (Oxford 2017). The definition of a textile collection in this work is translated into “a group of accumulated textiles of a particular kind”. This “particularity” is constructed around the brand symbols that appear in each textile, it is the subject that connects the textiles to each other. The second “particularity” is that each of the textiles is composed with an all-over repeated pattern (knitted or printed). The colour contrast is the visual connection and the knit exclusivity is a part of the physical cohesion. The large diversity of pattern styles provided by the method does not break off the collection because it is designed only to highlight the brand elements.

To reinforce the unity of the collection, each of the finalized textile experiment is combined with a sport elastic provided by Björn Borg with the closest matching colours (fig. 39).

B.3 Experiments

A number of 14 from the 24 sketches have been produced as textile experimentations and are in this chapter described, they are presented with an ID-card made from used method: deception / influence / colour contrast / brand element.
**EXP #1 “flower jacquard”** (fig. 40-43)
dazzle/floral (flower)/complementary contrast/word BORG

**Technical information**
- circular jacquard knit CO(red) PA-EL(black) PES(neon green) CV(white)
- overprint with screenprint pigment (BORG)

**Description**
To design a floral style, two flowers are picked from an 18th century still life painting, and translated in adobe illustrator with strong geometrical lines. The composition is created with these two flowers using different scales, the background is then filled with lines connecting the flowers together to create a disassembling effect. Four colours are selected to create a green/red complementary contrast supported with black and white to emphasize the broken view.

The design of a second layer is added to hide the brand symbol. A perforated BORG is overprinted with screenprint; the hiding is made by scaling up the word to create several ways to read the fabric. At a close range the overprint creates a graphical layer that interact with the broken flower, from a distant range, the word BORG appears and the flowers become abstraction.
EXP #2 “map screen” (fig. 44-47)
dazzle/conversational (map)/complementary contrast/initial BB

Technical information
- screenprint pigment on grey jersey melange CO-PES
- reactive dye (grey)

Description
The conversational style is constructed around a Swedish-European map scanned from a 15th century atlas, where all the names have been erased with the use of Adobe Photoshop. To include the disassemble/divide input, the design of multiples short lines directly inspired from a dazzle boat design is created as a second layer. Both layers are screen printed with pigment on the top of each other with a contrast blue/orange taken from the colour card. The initial BB are printed scattered all over with a typography close from the 15th century to merge the elements historically to trick the actual meaning of the letters.
EXP #3 "nett filling borg" (fig. 48-51)
dazzle/object (letters)/chiarosuro/grid net

Technical information
- circular jacquard knit PES(shinny surface) CO(pattern) PA-EL(stretch) PET+CO(back) with filling (PES)
- reactive dye (black)
- overprint transferprint (BJÖRN BORG)

Description
The experimentation is though around a filled knit pattern that disassemble/divide a design printed on the surface of it. A jacquard pattern tennis net is designed to be the brand symbol AND the breaker element. The transfer printed surface layer is designed to represent the influence with the use of letters (BORG). When the fabric is stretched or folded, the pattern net appears and dismantle the surface print.
EXP #4 “digital flower” (fig. 52-55)
dazzle/floral (flower composition)/chiaroscuro/grid net

Technical information
- digital print on Organic Cotton Knit Ultra 100%CO

Description
The net is in this experimentation the hidden symbol and a tool to create colour shades. It is constructed in two layers: a repeated flower composition made in adobe photoshop that has no colour contrast restriction and black and white grids. The grid is partially concealed; creating contrast shades to the other layer (the flower composition). The combination of both layers creates the disassembly needed to the striving dazzle effect. The symbol is the breaker element as in EXP #3.
EXP #5 “net filling colour” (fig. 56-59)  
dazzle/abstract (ikat)/complementary contrast/grid racket

Technical information  
- circular jacquard knit PES(shiny surface) PES(neon orange) PA-EL/stretch)  
PET+CO(back) with filling (PES)  
- overprint transferprint (ikat)

Description  
This experimentation is the continuation of the idea developed in EXP #3. Here the jacquard pattern stays invisible if the textile is not folded or manually stretched. The notion of hiding-revealing the symbol is more interactive. By stretching the fabric, the abstract transfer-printed surface is disassembled as in EXP #3 but also acting as a dynamic blue colour contrast with the orange knit fibers colour.
**EXP #6 “tennis gradient”** (fig. 60-63)
dazzle/abstract (geometrical gradient)/complementary contrast/tennis ball

**Technical information**
- circular jacquard knit PES(neon green) PES(lurex) CV(black) CV(white)
- overprint screenprint reactive (tennis balls)

**Description**
The concept of this experimentation is to reveal-hide the brand symbol only through printing proprieties. To proceed, an abstract jacquard pattern is designed with two objectives: disassemble the print with a gradient design and break the print with a contrast of two fibre families (plastic/organic). Due to the reactive screenprint, the tennis ball is revealed only on the white viscose. They create the complementary contrast green-red.
**EXP #7 “jacquard tennis balls”** (fig. 64-67)
disruptive/abstract (organic camo)/complementary contrast/tennis balls

**Technical information**
circular jacquard knit PES(neon orange) CO(black) CV(black intense) CV(blue)

**Description**
The disruptive coloration is based on extension and combination. The tennis ball design from the EXP #6 is reused for this exercise. An abstract camouflage pattern inspired from the US army is designed for a jacquard knit with four colours to create a complementary contrast blue-orange. The tennis balls are inserted in the repeat, they are combined with the same background shapes that have the same colour, and the symbols are extended instead of being divided.
**EXP #8 “camo leaves”** (fig. 68-71)
disruptive/floral (leaves)/complementary contrast/BORG

**Technical information**
- digital print on Performance Piqué 100% PES
- screenprint overprint coating

**Description**
Three layers are combined to realize this exercise: the main visual, the extender and the company symbol. The main visual is the style, a repeat of leaves orange and blue. The extender is developed to extend the main design with an abstract shape to disturb the view-identification by intensifying the colour contrast blue-orange.

The symbol is working as an independent textile technic, a “BORG” of transparent coating is overprinted all over the fabric. When this one is stretched (and only when stretched), the digital print fades because of the white basis of the fabric. The colour fades except where the coating is placed because it retains the binding (piqué) together. This is why this technic works only with dark printed background.
EXP #9 "camo typo" (fig. 72-75)
disruptive/object (calligraphy)/complementary contrast/BORG

Technical information
digital print on Performance Knit 100%PES

Description
The notion of extension is tested here with the use of the same drawing technique for two layers. The layers contrast each other with the attribution of a main colour for each (blue-yellow). The design is drawn with a method that consist of reproducing a animal pattern with a light table, one with the BORG and one abstract. The first result shows a perfect merging of the two layers but the symbol BORG is not readable or identifiable at all. A second repeat of the pattern is created with empty spaces to make the elements visible.
**EXP #10 “racket screenprint”** (fig. 76-79)
disruptive/conversational (sport racket grid)/complementary contrast/court line

**Technical information**
- screen print pigment + gold
- overprint transferprint (court line)

**Description**
A racket net is used to create a pattern then screen-printed on a white jersey. A second abstract pattern is covering and hiding the first with a new layer of screenprint. A third layer, a transfer-printed overprint is realized with large lines to represent the tennis court line with a solid transferred black colour. All the colours disappear except the gold (the shiny attribute of the gold is not affected by the transferprint ink), revealing only the racket net in the black area. The court line is a symbol and the combination to reveal the hidden pattern.
**EXP #11 “Björn toile”**  (fig. 80-83)

**disruptive/conversational (toile de Jouy)/chiaroscuro/the tennis player**

**Technical information**

digital print on Modern Jersey 96%PES 4% EL

**Description**

This exercise uses the idea of EXP #9 that consists to merge two layers to extend theirs shapes. The first layer is drawn, made of the tennis player Björn. Inspired from the toile de Jouy, the hand and composition tend to look like this specific style of wallpaper. On the top of it, a second layer realized after a military camouflage blends to hide parts of the first layer.

Leaving his context, the tennis player figure is balanced between two graphic styles and two timelines that tend to confuse the reader of the obvious brand intention.
**EXP #12 “hidden BORG” (fig. 84-87)**
hidden/abstract (abstract surface)/chiaroscuro/BJÖRN BORG

**Technical information**
- circular jacquard knit PES(shinny) PES(neon yellow) PES(black) PA-EL(stretch)
- overprint transfer (black colour)

**Description**
The first hidden image deception refers to EXP #3 & #5 to place in an image in the recess of the filling knit. A black solid colour is transfer-printed on the top of the fabric to cover the entire fabric. It is only by manipulation of the fabric that the hidden image is revealed, once the textile is flat again the image disappears again.
**EXP #13 “hidden ball”** (fig. 88-91)

hidden/object (tennis ball)/chiaroscuro/one tennis ball

**Technical information**
- transfer print on stripped knit 100%PES

**Description**
This exercise is made to experiment with another type of hidden image. An image is embedded to a simple graphic structure through the thickness of it and though a difference of scale. The print shows to different visual aspect from far and close.

![Fig. 88 - zoom exp #13](image1)
![Fig. 89 - computer pattern](image2)
![Fig. 90 - render on unflattened surface](image3)
![Fig. 91 - result exp #13](image4)
**EXP #14 “hidden Björn” (fig. 92-95)**

hidden/conversational (sport)/chiaroscuro/the tennis player

**Technical information**
- transfer print on sport mesh knit 100%PES

**Description**
The same method is used as experience #13 but with the tennis player Björn. In close scale, the reading of the pattern is only a curve that is more or less bold. From a larger perspective appears the embedded silhouette.
B.4 Selection and Analyse

Five different forms of concealment have been identified from the experimentations (fig. 96).

Scale and viewer distance (EXP #1 #13 #14)
According to the distance between the pattern and the viewer, two different readings are possible. One is visible in a small scale range and the second is revealed on a larger surface or the textile. This form of concealment is possible by incorporation two different scale images in one textile, but the printing technique is free.

Diversion in a situation (EXP #2 #11)
The diversion works with visual anachronisms, the subject is diverted from a settled situation with an unexpected graphic inspired from a different timeline.

Reveal by physical manipulation (EXP #3 #5 #8 #12)
A physical stretch reveals hidden fibers or altered colours that show a new image. When there is no longer stretch, the image or the pattern disappears. An overprint is needed to play with two different physical layers. Only a body stretch reveals a pattern, this type of concealment has a particulate relation to the body, which make it an interesting choice for garment development.

Deception vision trick (EXP #4 #7 #9)
The vision trick is the core or the original camouflage pattern that breaks shapes with various contrast, it makes the subject more difficult to identify.

Printing characteristic (EXP #6 #10)
This concealment is technical and physical; with the use of a print technic in

Fig. 96 - Overview of the 5 forms of concealment found
relation to the nature of the fibers of the textile support appear or disappear a print. An overprint is required to get one of this effect.

The experimentations are analysed though the concealment forms with different parameters technical parameters. The analyse shows that the deceptions and forms of concealment or not connected; jacquards and overprints are also independent from the concealment forms (fig. 97).

Several technical discoveries have been made during the experimentation phase.
- The principles of layering have been applied in all the patterns. The layers can be physically printed or digital.
- Hide and reveal balance can never be unbalanced or the subject either completely hidden or not hidden at all.
- Each experimentation set up a different way to communicate the subject.
- A colour contrast is engaged when an overprinting is realised, with a relation colour print and colour fiber.

<table>
<thead>
<tr>
<th>#</th>
<th>form of concealment</th>
<th>jacquard knit</th>
<th>overprint</th>
<th>deception</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXP #1</td>
<td>scale and viewer distance</td>
<td>x</td>
<td>x</td>
<td>dazzle design</td>
</tr>
<tr>
<td>EXP #2</td>
<td>diversion in a situation</td>
<td></td>
<td>x</td>
<td>dazzle design</td>
</tr>
<tr>
<td>EXP #3</td>
<td>reveal by physical manipulation</td>
<td>x</td>
<td>x</td>
<td>dazzle design</td>
</tr>
<tr>
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<td>deception vision trick</td>
<td></td>
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<td>reveal by physical manipulation</td>
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<td>dazzle design</td>
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<td>printing characteristic</td>
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<td>dazzle design</td>
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<td></td>
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<td>disruptive coloration</td>
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<td>EXP #9</td>
<td>deception vision trick</td>
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<td>disruptive coloration</td>
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<td>EXP #10</td>
<td>printing characteristic</td>
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<td>disruptive coloration</td>
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<td>EXP #11</td>
<td>diversion in a situation</td>
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<td>disruptive coloration</td>
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<td>EXP #12</td>
<td>reveal by physical manipulation</td>
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*Fig. 97 - the selection of the three textiles*
Three textiles are selected to represent the three different visual deceptions. Each must represent a different form of concealment to present different findings.

**EXP #1 “flower jacquard”** (fig. 98) > scale and viewer distance
dazzle/floral (flower)/complementary contrast/word BORG
The different reading possibilities of this textile offer an excellent use of the dazzle design; it **disassembles** the content in independent parts. The hidden word BORG cannot be seen at a close range and do create supplementary graphic layer to this scale.

**EXP #7 “jacquard tennis balls”** (fig. 99) > deception vision trick
disruptive/abstract (organic camo)/complementary contrast/tennis balls
This textile represents the classical method to create a disruptive military camouflage. But the extended shapes of the tennis balls have high potential for the connection brand/viewer. The balance of what is hidden and revealed makes the tennis balls an effective visual communication. Moreover, in comparison to a digital print, this jacquard pattern adds an interesting mix of textures to the surface.

**EXP #12 “hidden BORG”** (fig. 100) > reveal by physical manipulation
hidden/abstraction (abstract surface)/chiaroscuro/BJÖRN BORG
This experimentation is the result of the experimentation #3 and #5; it enables to push the knitting technicality further with a hidden image. The double circular knit allows **placing** an image. The physical manipulation is a powerful tool to play with. It has a design potential to be a garment with a body relation based on interaction.
**Chapter C: Material**

The selection of material follows the need required in sportswear and sustainability. The relation between textile and body is important in sportswear; the fabric needs a good resistance to motion and distortion. This is why the main fibers used for the project are polyester for the digital prints, recycled polyester, elastane and cotton for the self-designed jacquard knits. It offers performance, comfort and sustainability concern to the textiles.

**Chapter D: Context & Collection**

Garment prototypes are directly developed with Björn Borg using basic shapes to keep the focus on the presentation of the pattern rather than the complexity of a cut. The fabrics and the pattern have been elaborated in relation to the body. The notion of skin friendly and wearability were questioned during the experimentation process, so the final fabric is pleasant to wear on the body.

With a view to propose a coherent presentation and an interesting overview, it has been decided to create several pieces to create three looks, each representing the Dazzle Design, Disruptive Coloration or Hidden Image. The confection of a t-shirt, jogging, sweatshirt, legging and a long sweatshirt is planned. The scale of the patterns is thought to fit this range of size (fig.101-102).
4 Result & Discussion

4.1 Result

The result of this work is a textile collection of twenty different jacquard knitted and printed patterns. A capsule collection complements the textiles with two outfits (t-shirt/jogging & sweatshirt/legging), one experimental piece shaped as a sweatshirt and three underwear with pattern from the pre-study work (fig.103).

There are three directions dividing the work, each of them represents a visual deception that hide different Björn Borg’s elements of the brand:
- disruptive coloration (fig.104) (disassemble/divide)
- dazzle design (fig.105) (extend/combine)
- hidden image (fig.106) (embend/place in)

The method base on restrictions used to create this collection is a result of the evolution of three versions, and may be used as a base of development for commercial surface pattern design.
4.2 Presentation

The final work is exhibited as a capsule collection at the Borås Textile Museum (fig.107-113). The exhibition is built around two aspects. First, an access to all the textiles of the collection to visualize, touch and consider the work as a collection. The second aspect is three outfits representing the different directions of the work, presented on mannequin for a better projection of the use and the scale of the patterns. Additional elements are presented to show the commercial potential of the project in relation to Björn Borg.
Fig. 109 - CAMOLUTION exhibited at the Borås Textile Museum, the experimentations

Fig. 110 - CAMOLUTION exhibited at the Borås Textile Museum, pre-study
Fig. 111 - Dazzle design prototypes
Fig. 112 - disruptive colorton prototypes
Fig. 113 - hidden image prototype
4.3 Conclusion

CAMOLUTION presents an exploration on how the camouflage pattern can be developed further in textile design. This work proposes an alternative point of view for camouflage pattern in textile design; used as a communication tool, balancing the reveal and the hiding side of symbols from a fashion brand. Each visual deception has a particular way to incorporate symbols in his pattern. This brand communication concept could be explored further with other iconic pattern such as paisley or check; it can be exported to another fashion brand that uses surface pattern too.

Digital Camouflage Images is a useful powerful tool of visual communication the experimentations. #13 and #14 opened to a new concept of camouflage image in a small-scale pattern. The superposition of images has been the core of the pattern development by using multiple layers for each of them. It shows also the efficiency in the combination of knitted pattern with printed pattern. What could be explored further is the interaction of colours in a textile collection, with for example the use of Josef Albers’ work (1963) using colour contrast with a deeper coherence.

The collaborative work with Björn Borg set up the base for the work without restraining it. Moreover, the core of the project would have been impossible to realize since the subject hidden in the patterns was the identity of the company. The working process in relation to the company was based on a complete freedom of creativity, in the interest to propose a fresh and inspirational eye to the design team of the company.

The relation between knitting and the body shows the material stretchability, body movement create a colour reaction; it guides to a readable pattern scale. An interesting part was the jacquard knitting with elastane, to play with the fiber to hide and reveal colour and overprinted patterns. Overprint was a powerful tool to work with layering, to cover and transform visual and contrasts too.

The methodology developed in this work has proven its utility and can be used to develop a diversity of directions of pattern ideas, this is useful in an early design process to investigate unexpected combinations of styles, colours and graphic directions. The use of the three keywords to guide and constantly remember the direction taken has been a great help, it is an efficient and simple method to use.

The result shows the discovery of different layers of concealment in pattern for textile design, and the integration of objects opens dialogues concerning surface patterns. This textile collection connects indirectly to a fashion brand and their direct customers with the hidden brand communication. The primary function of a textile pattern is to embellish a surface, military camouflage is designed to dissimulate, but new functions can be developed. This work proposes a different concealment function with concealed objects within a pattern.
4.4 Discussion

Camouflage patterns have proven they can deliver more than a look. Inspired directly from nature, the primary function can be translated to different variation of concealment for different type of use. The experimentations were an efficient way to discover new aspect in textile design. Digital Camouflage Images Using Two-scale Decomposition (Hui, Xiaogang & Xiaoyang 2012) was a great starting point that led to work with layers in the design process. Jacquard knitted pattern shows great potential in comparison to digital printed pattern. Even though the number of colour in jacquard knit is very limited since it directly affects the weigh and the density of the textile, the patterns facilitate specific three-dimensional effects, stretchability-interactivity and numerous surface assortments. In addition, it provides a support to overprint on other layer with transferprint or screen-print mediums.

The analyses of the samples revealed a lot of thought-provoking ideas. One unexpected aspect is that the forms of concealment or the deception have no connection to the techniques; jacquards, overprints or specific fibers are never a requirement to create a pattern.

A specification that was not realised at the beginning, concerns the nature of the pattern, each base pattern in this work is always fully repeated, placed print are used only as overprints; it gives a visual coherence to the collection and the work in general.

This work, by its large production, was a great way to apply the knowledge acquired in textile print, the vast mix of printing technics experimented was beneficial to improve the skills in relation to fiber knowledge. The improvement of the computer pattern knowledge was significant too. The next step would be to improve the knitting part to develop further the interactive possibilities of concealment along with fiber characteristics.

Camouflage pattern touch a variety of field, this work explores how to hide a fashion brand by means of surface pattern in textiles, where the concept of hiding took the main focus. This direction was not the first intention when this work started, but the technical textile aspect of printing and knitting revealed to have a lot of potential for experimentation. An enormous data of different point of view and direction on camouflage pattern were discovered during the initial research. Isacsson works in a fashion context, he created a garment collection where pattern construction and quilting-filling techniques are the focus and camouflage pattern is a tool to achieve the aim. Van Praag, on the other hand, is works strictly towards art issues. The work of Palmen and Paredes are both related to a spatial context, more precisely to a specific angle and viewer place. The relation object (the model) and background (the street or the wallpaper) is the topic where the subject is blending in the space as a chameleon. This direction was in the early process of this work taken away, there was a wish that the pattern should be developed without any environment relation and be influenced by it.

The commercial potential of the prints is irrefutable; the digital prints can be directly applied in the production as well as the screen-prints. On the other hand, the knitted patterns would need adjustment in order to be produced, while a plain jacquard knit would deliver a perfect answer to garment, knitting with filling are too thick to be used in apparel. A full material research would be necessary but not impossible. This work could be easily developed and researched further by opening up for the combination of restrictions to new colour contracts, influences or new visual deceptions. With a starting point in the design method developed for this work, a new range of pattern and new collections could be created.
After the exhibition, a number of patterns have been selected by the design team and incorporated in one of the Björn Borg collection for the underwear production. The colours have been changed to match the collection’s colourcard and the scale reduced to fit the size of underwear.

Future ideas would be to continue the development of functional pattern research. Those functions seem to be based on the viewer’s vision and the effect that a pattern can produce; for example, a pattern that could confuse or calm the viewer or a pattern with interacting qualities.
5 References

5.1 References


5.2 List of figures

4 Fig. 1 - general overview
Photography by Jan Berg

5 Fig. 2 - disruptive Camouflage, scale
Photography by Mathieu Porcher

5 Fig. 3 - disruptive Camouflage, detail
Photography by Mathieu Porcher

5 Fig. 4 - disruptive Camouflage
Photography by Mathieu Porcher

6 Fig. 5 - dazzle Design
Photography by Mathieu Porcher

6 Fig. 6 - dazzle Design, scale
Photography by Mathieu Porcher

6 Fig. 7 - dazzle Design, detail
Photography by Mathieu Porcher

7 Fig. 8 - hidden Image, detail
Photography by Mathieu Porcher

7 Fig. 9 - hidden Image, scale
Photography by Mathieu Porcher

7 Fig. 10 - hidden Image
Photography by Jan Berg

9 Fig. 11 - Thayer 1909, concealing coloration in the animal kingdom

9 Fig. 12 - colour palette camoufleur 1920

9 Fig. 13 - Cott 1940, adaptive coloration in animals
Cott, Hugh B. (1940) Adaptive coloration in animals. London: Methuen & Co Ltd.

10 Fig. 14 - US Desert chocolate-chip
US Desert chocolate-chip. [ONLINE] Available at: https://s-media-cache-ak0.pinimg.com/originals/3e/d0/10/3ed01053be6b5ec7a45af156b5b2ab3b.jpg [Accessed 15 August 2017].

10 Fig. 15 - US Woodland

10 Fig. 16 - British DPM

10 Fig. 17 USS Nebraska (1918)
Dazzle ship. (1918) [ONLINE] Available at: https://s-media-cache-ak0.pinimg.com/originals/cf/d1/7b/cfd17b7aa84464ae4d978eab62c8370e.jpg [Accessed 15 August 2017].

10 Fig. 18 USS Charles S Sperry (1944)

11 Fig. 19 - 1987 Andy Warhol screen print

11 Fig. 20 - 1987 Stephen Sprouse suit

11 Fig. 21 - Paul Smith camouflage ivy leaves
1. Fig. 22 - DPM Rocky Mountain 2008

2. Fig. 23 - Maharishi x Northface

3. Fig. 24 - quilting with camouflage pattern by John-Daniel Isacsson

4. Fig. 25 - jacquard knit and transfer print by Lola Van Praag
This is not a flower. (2017) [ONLINE] Available at: http://payload531.cargocollective.com/1/20/641954/12922078/Lola-Van-Praag_1000.JPG [Accessed 15 August 2017].

5. Fig. 26 - Desiree Palmen 2006

6. Fig. 27 - Cecilia Paredes 2015

7. Fig. 28 - 9 direction possible as visual deceptions
image by Mathieu Porcher

8. Fig. 29 - Horta de Ebbo painted, Picasso 1909

9. Fig. 30 - Monarch Butterfly
43 Fig. 43 - exp #1
photography by Mathieu Porcher

22 Fig. 44 - image source detail
photography by Mathieu Porcher

22 Fig. 45 - zoom exp #2
photography by Mathieu Porcher

22 Fig. 46 - print colour tests
photography by Mathieu Porcher

22 Fig. 47 - result exp #2
photography by Mathieu Porcher

23 Fig. 48 - raw knit before reactive dye and transferprint + knit pattern
photography by Mathieu Porcher

23 Fig. 49 - test colour transferprint
photography by Mathieu Porcher

23 Fig. 50 - zoom exp #3
photography by Mathieu Porcher

23 Fig. 51 - result exp #3
photography by Mathieu Porcher

24 Fig. 52 - first layer dazzle
photography by Mathieu Porcher

24 Fig. 53 - zoom exp #4
photography by Mathieu Porcher

24 Fig. 54 - background colour experimentation
photography by Mathieu Porcher

24 Fig. 55 - result exp #4
photography by Mathieu Porcher

25 Fig. 56 - left: test pattern knit; right: raw knit before transferprint
photography by Mathieu Porcher

25 Fig. 57 - print and colour tests
photography by Mathieu Porcher

25 Fig. 58 - zoom exp #5
photography by Mathieu Porcher

25 Fig. 59 - result exp #5
photography by Mathieu Porcher

26 Fig. 60 - first knit yarn test
photography by Mathieu Porcher

26 Fig. 61 - test print with pigment
photography by Mathieu Porcher

26 Fig. 62 - material test print
photography by Mathieu Porcher

26 Fig. 63 - result exp #6
photography by Mathieu Porcher

27 Fig. 64 - knit pattern
photography by Mathieu Porcher

27 Fig. 65 - brand object
photography by Mathieu Porcher

27 Fig. 66 - zoom exp #7
photography by Mathieu Porcher

27 Fig. 67 - result exp #7
photography by Mathieu Porcher

28 Fig. 68 - layer1, the main visual
photography by Mathieu Porcher
Fig. 69 - layer2, the extender
photography by Mathieu Porcher

Fig. 70 - layer3, company symbol
photography by Mathieu Porcher

Fig. 71 - result exp #8
photography by Mathieu Porcher

Fig. 72 - layer1
photography by Mathieu Porcher

Fig. 73 - drawing
photography by Mathieu Porcher

Fig. 74 - layer2
photography by Mathieu Porcher

Fig. 75 - result exp #9
photography by Mathieu Porcher

Fig. 76 - overprint test
photography by Mathieu Porcher

Fig. 77 - zoom exp #10
photography by Mathieu Porcher

Fig. 78 - colour print test
photography by Mathieu Porcher

Fig. 79 - result exp #10
photography by Mathieu Porcher

Fig. 80 - overlaping test
photography by Mathieu Porcher

Fig. 81 - drawing
photography by Mathieu Porcher

Fig. 82 - zoom exp #11
photography by Mathieu Porcher

Fig. 83 - result exp #11
photography by Mathieu Porcher

Fig. 84 - computer pattern knit
photography by Mathieu Porcher

Fig. 85 - circular knit double bed
photography by Mathieu Porcher

Fig. 86 - transferprint test for a deep black overprint colour
photography by Mathieu Porcher

Fig. 87 - result exp #12
photography by Mathieu Porcher

Fig. 88 - zoom exp #13
photography by Mathieu Porcher

Fig. 89 - computer pattern
photography by Mathieu Porcher

Fig. 90 - render on unflattened surface
photography by Mathieu Porcher

Fig. 91 - result exp #13
photography by Mathieu Porcher

Fig. 92 - computer pattern
photography by Mathieu Porcher

Fig. 93 - render on unflattened surface
photography by Mathieu Porcher

Fig. 94 - zoom exp #14
photography by Mathieu Porcher
34  Fig. 95 - result exp #14
    photography by Mathieu Porcher

35  Fig. 96 - Overview of the 5 forms of concealment found
    photography by Mathieu Porcher

36  Fig. 97 - the selection of the three textiles
    photography by Mathieu Porcher

37  Fig. 98 - EXP #1 “flower jacquard”
    photography by Mathieu Porcher

37  Fig. 99 - EXP #7 “jacquard tennis balls”
    photography by Mathieu Porcher

37  Fig. 100 - EXP #12 “hidden BORG”
    photography by Mathieu Porcher

38  Fig. 101 - Example of cut fabric for a sweatshirt 1
    photography by Mathieu Porcher

38  Fig. 102 - Example of cut fabric for a sweatshirt 2
    photography by Mathieu Porcher

39  Fig. 103 - general result
    Photography by Jan Berg

40  Fig. 104 - disassemble/divide
    photography by Mathieu Porcher

40  Fig. 105 - extend/combine
    photography by Mathieu Porcher

40  Fig. 106 - embend/place in
    Photography by Jan Berg

41  Fig. 107 - CAMOLUTION exhibited at the Borås Textile Museum 1
    photography by Mathieu Porcher

41  Fig. 108 - CAMOLUTION exhibited at the Borås Textile Museum 2
    photography by Mathieu Porcher

42  Fig. 109 - CAMOLUTION exhibited at the Borås Textile Museum, the experimentations
    photography by Mathieu Porcher

42  Fig. 110 - CAMOLUTION exhibited at the Borås Textile Museum, pre-study
    photography by Mathieu Porcher

43  Fig. 111 - Dazzle design prototypes
    photography by Mathieu Porcher

43  Fig. 112 - disruptive coloration prototypes
    photography by Mathieu Porcher

43  Fig. 113 - hidden image prototype
    photography by Mathieu Porcher

0  COVER - exp #4
    image by Mathieu Porcher