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Transforming Dress

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TRANSFORMING DRESS

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ABSTRACT

In this paper, we produce a fashion show in which a dress is transformed over time, with a storyline of a robot that experiences some emotional changes after falling in love, sheds a symbolic teardrop and at the end becomes a lovely woman. This transformability, which cannot be done in a real fashion show, could open the potential for a new kind of creativity in the fashion industry.

KEY WORDS

Digital clothing; DC Suite; 3D Virtual clothing; Fashion Design

INTRODUCTION

The boundaries of the contemporary arts genre have become blurred with the progression of digital technology. In the past, words like digital and computer represented merely technical values. However, today's works, produced with computer aided design, can include and be enhanced by combinations of diverse types of genre. Such a phenomenon, what we can call 'de-genre', was derived from the development of digital technology. Advancements in digital technology have led to the narrowing of the gap between art, design and engineering, and also to an increasingly complicated design environment. Due to this influence, customers' demands and requirements have drastically changed, and accordingly, designers are facing problems which are fundamentally different from what they have been accustomed. There is a wave of change in the tools, methods and user environment of design, as well as in the function and role of the object of design. As a result, a new direction in design is required.

The fashion industry is no exception to these changes. This sector is becoming more technical and inclined toward IT. Digital components are actively being used in all fashion sectors including planning and development, production, distribution, and fashion shows, away from the old analogue method. Due to this, designers are increasingly being required to incorporate a new genre, where free-form thoughts and expressions are possible and where identity and concept can be delivered while breaking the stereotypical conceptual processes of the past. Digital clothing is a field which enables fashion designers to show their creative expression in a more sophisticated and comprehensive way without the limitations of traditional practices.

This study shows the process of using a new method, digital clothing, through which fashion designers can express their ideas precisely, creatively, and free from fixed frames while reducing time and cost requirements. As opposed to the main focus of existing studies of similarities between actual garments and digital clothing, this study focuses on the innovative artistic possibilities that it can bring realistic 3D simulation in the fashion industry.

CASE STUDY ON THE TRANSFORMING EFFECT FASHION DESIGN

Up to now, fashion designers have made many attempts to display garments based on creative ideas. A recent technologically innovative method, transforming costume design has made it possible to turn one fashion design into a different one, and therefore is being used to appeal to designers' distinctiveness and intent of their designs. Transforming design which has been gradually introduced in each period of time in fashion history was given its first trial in the late 1990s, and new innovative attempts combined with digital technology are ongoing. Designers who have applied Transforming design include Hussein Chalayan, Yohji Yamamoto, and VIKTOR & ROLF. Among them, Hussein Chalayan is most representative of using digital technology to achieve transforming design. . He has attempted to design

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garments whose shapes are technically changed, such as Echoform in 1999, Remote Control Dress in 2000, and Robotic dresses in 2007, inspired by a variety of fields. In addition, the Bubelle dress, which was made by Philips in 2007, was designed to sense the wearer's emotions through a biosensor that can detect heart rate and breathing, and display changes through thin, layered pieces of cloth and 18 small projectors. The data collected by the biosensor even controls the illumination intensity shape, colour as well as the light projection intensity of the projectors. Dress 'Intimacy 2.0' by Dutch designer Roosegaarde is another example of transforming design. It was made of smart fibre that becomes transparent when the resting pulse rate increases, and by using smart foil, the level of transparency of the costume changes according to the chronotropism of the wearer. More precisely, when the wearer's heart beat becomes faster, the costume, which is naturally black, becomes more transparent. Transforming has been used not only in actual dresses but also in the virtual space. Virtual clothes that change in colour and textile were introduced by Fnc Kolon in 2007 and Digital clothing Center in 2009. <Table 1> presents images of the works mentioned above.

Transforming elements that fashion designers are continuously trying to use can substantially creative fashion shows and stimulate the imagination. In this study, we tried to use transformation factors in a 3D virtual space to produce a creative 3D digital fashion show by combining elements such as shape, colour and textile of the dress and a model of a certain concept.

Table 1: Cases when transforming was used in fashion design

Examples of real clothing	 Hussein Chalayan Spring 2000 collection. (Source: http://husseinchalayan.com)	 Hussein Chalayan Spring 2007 collection. (Source: http://husseinchalayan.com)
	 Bubelle dress 2007. (Source: http://www.dailymail.co.uk)	 INTIMARCY 2010. (Source: http://www.studioroosegaarde.net)
Examples of digital clothing		
	Fnc kolon-ELORD digital fashion show 2007 (source: http://www.clo3d.com)	

'Cloud & mist' digital fashion show 2009
(source: http://www.digitalclothing.org)

STEPS FOR THE TRANSFORMING DRESS

In order to accurately represent the concept and designs, in this paper, we produced a fashion show in which a dress is transformed over time. We produced 4 types of design to create transforming effects, which is more effective and natural from the planning stage <Table 2>. '**Design 1**' was panned to form a tear-shaped short skirt from which the thin chiffon inside can come out making it into a long skirt when the zipper is open. '**Design 2**' involves that a short skirt turning into a long skirt when the knots are untied, and the one layer of sleeves becoming three layers. It is supposed to it signify a courageous female warrior who wants to win love. '**Design 3**' involves a metal mini-dress that pieces on the outside skirt can be separated while the textile is changing. It changes again when the zipper is opened, transforming in to a long skirt with mesh textile coming out. From the results of the simulation tests of these four designs in the 3D space, we found that the '**Design 4**' demonstrated the most dramatic and natural transformation. We therefore we selected this design to create a complete concept of a fashion show for this paper. The main characteristics and details of the fashion show for Design 4 are described in the following.

Table 2: Planning stage of design sketches

Design 1	Design 2	Design 3	Design 4

This show is set against the backdrop of a storyline of a robot who experiences emotional changes after falling in love, sheds a symbolic tear, and in the end becomes a lovely woman. An attractive materialization of the transformability of the dress requires a comprehensive design, which entails: (1) an investigation of the pattern-making which allows for natural inter-dress transitions; (2) a simulation of two dresses in the same walking motion so that one dress can seamlessly switch to the other through dynamic draping; (3) a study of inter-dress colour/textile transitions; and Work 1 has the same pattern, but we transformed it using a different textile (4) the fading away of sleeves by applying gradually increased values of transparency.

We used the software DC Suite to create the dresses. First, instead of the basic body shape provided by DC Suite, we used an imported body shape to which we applied the motion we designed.

In order to achieve the motion data we intended, we employed a model who had rich experience in fashion show in a form of performances. The motion was started with a robot-like posture and finished with elegant walking, and it was recorded as a form of motion data <Figure1 and 2>.

Figure 1: Motion capture of a robot-like posture

Figure 2: Walking motion capture

We produced the patterns in the pattern tab of DC Suite and then placed the panels around a virtual body in the garment tab to simulate the clothing. For the sake of natural transformation shown in the <Figure 3>, we designed the upper part of the dress remained visible until the end of the show; for the lower part, we changed the level of visibility to show other layers of its respective frame to make it seem as if the garment was changing.
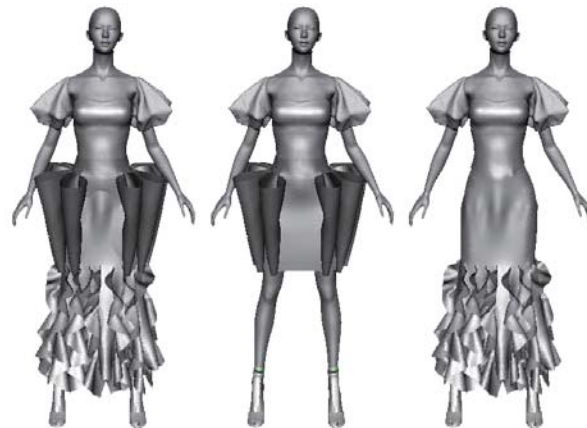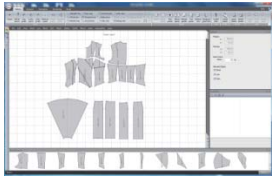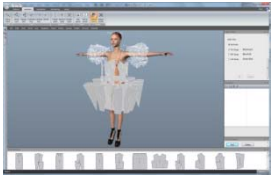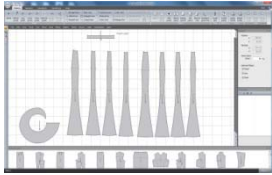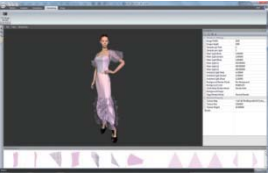

Figure 3: Two dresses in the same walking motion

In order to apply special effects, we exported the virtual garment into Maya, using the DC to Maya function. For the last step, we performed rendering using V-ray. The process of making clothes in DC Suite is illustrated in <Table 3>. The whole process took about a week to finish.

Table 3: The production process for transforming dress

DC Suite			
Pattern Making	Garment	Simulation	Rendering
Work 1 Production of futuristic dress with tear-shaped sleeve pattern	Positioning panels around virtual body	Simulation and adjustment of material properties and textiles	Expression of metal and leather to manifest an emotionless woman
Work 2 Production of long dress with ruffle	Positioning the ruffled dress (with the same upper part of dress from work 1)	Sequential simulation with dress from work 1	Rendering chiffon, mesh and silk material to express a woman in love

The production process of the surface detail and material properties is as follows.
For the expression of texture, we applied black leather and metal to evoke a futuristic sense of the dress of the robot character in the first stage. Then, in the next step, in order to signify a person without emotion, we used white patent leather and transparent chiffon. The textile images presenting the surface details were directly produced using Adobe Photoshop. By applying the Shader tool to the images, we created an even more realistic surface texture. The simulation was conducted by applying adequate level of material properties in DC Suite for the expression of the stiffness of leather or the softness of chiffon. We also applied light effects to the teardrop-shaped sleeves to describe the emotion that the robot gradually begins to feel. In work 2, we illustrated the rebirth of a woman who feels love. To describe the concept of love that has just begun, we designed a silk-ruffled dress with a touch of colour gradation from pink into yellow and

chiffon sleeves with some degree of transparency. Moreover, to represent a woman who is deeply in love, we made a bustier layered with mesh and silk, and a romantic chiffon skirt with ruffled mesh. This became more realistic as we added details like stitches and the hem of the dress. Detailed shots of the fabric are shown in the <Table 4>.

Table 4: Fabric detail

	Robot	Express a person without emotion
Work 1	 Black leather and Metal to express a touch of futuristic sense	 White patent leather and transparent chiffon
	Rebirth of a woman who feels love	**To represent a woman who is deeply in love**
Work 2	 A silk ruffled dress with a touch of color gradation of pink into yellow	 Bustier layered with mesh and silk, and a romantic Chiffon Skirt with ruffled mesh

RESULT OF THE TRANSFORMING DRESS

The most intricate stage in the process was the pattern-making of the sleeves, as it required a delicate design and subtle composition to obtain patterns which could produce the faceted shape (which imitates the shape of the tear) <Figure 4>. When the simulation was run on the tear-shaped sleeves, they began to fall apart as they were composed of many pieces. To solve this problem, constraints were used to attach the garment to the body. However because the shape was unnatural, a transparent extra pattern piece connecting the sleeves to the chest was created <Figure 5>.
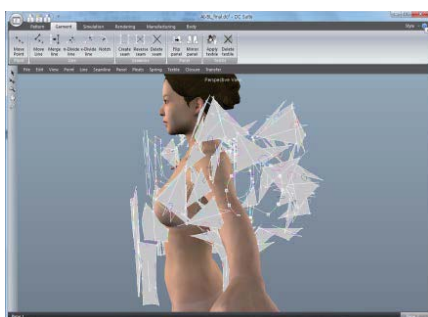

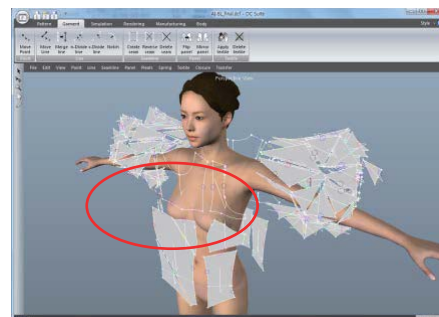**Figure 4: The sleeve symbolizes a tear**   **Figure 5: Transparent pattern connecting sleeve with chest**

We produced a 3D digital fashion show by utilizing technology-based transformations. The most important consideration when planning a 3D digital fashion show is thoroughly planning the outfits beforehand so that the process of transformation progresses as naturally as possible. As a result, the length, shape, detail, colour, material and even the

model could be modified. However, in terms of the appearance, the shape of the clothes was technically impossible to be changed into something totally different, because we used the layer function of the software for the sequential simulation. In our project, we found that gradual changes were the most effective way to express the transformation of a dress. On the other hand, for the material and texture, the transformation effect was more noticeable when the change was dramatic. To achieve professional image quality for the movie, Maya and V-ray were applied. Through the images of Maya and V-ray and the created storyline, the fashion show was able to be directed more dramatically. For more effective scene direction, the continuity of scenarios, camera and effects were carefully controlled, and the images rendered as Targa files were edited using an editing tool for video clips, After Effect. The main effects applied were as follows. Firstly, raining characters, emboss, glow, and drop shadow effects were applied to create cybertic text animation. Secondly, images of a robot and human character were exposed by applying a fade in/out effect to imply the concept that the fashion show intended along with the appearance of the robot character and edited the music to maximize the footage along with characters' foot step rhythm to increase the degree of completion.

This work was especially distinctive in the sense that the fabric and colour of the dress were changed to reflect the character's emotions. To further accentuate the emotion, a lighting effect was applied to the sleeves which symbolized tears. This is only possible in digital clothing technology. Lastly, we applied a switch-on effect to the light inside the sleeves, which synergises with the rhythm of the robot character's foot step to maximise the direction. Additionally, the music was edited to enhance the progression of the show.

As a result of this project, we found that the transformability was an interesting element by itself, opening new creative possibilities for a fashion show.

Table 5: Visual expression rendered by Maya and V-ray

1st stage	2nd stage	3rd stage	4th stage
Robot outfit: dress made from metal and leather clip: light from sleeve that represents tear	A woman looking for a person outfit: dress made from chiffon and enamel leather clip: change in sleeve and color from stage one	A female that feels love outfit: long dress made from chiffon & silk clip: change in form, fabric and colour of dress skirt from stage two	Mature woman from love outfit: long dress made from chiffon & silk clip: sleeve gone and change in fabric, colour and transparency from stage three

CONCLUSION

In this study, we sought ways to expand the artistic range of expression for fashion show production. Digital clothing is a sector which has great potential for moving the fashion industry on to the next level. Its potential applications are very extensive, as it can be used not only for fashion production and fashion advertising, but also for 3D movies, games, and animation. However, for 'digital clothing technology' to be useful to a wide range of consumers, it should (1) enable simulation which is practical for creating three-dimensional clothing (such as tear-shaped sleeves), (2) simplify the gradual simulation process, and (3) develop image tools to emphasize details on garments (e.g., light effect on sleeve). When this happens, this study expects that this technology and art will synergize to create a new artistic genre – "de-genre."

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