A Collaborative Study on 3D Dynamic Fashion Design Development, Using Digital Technology

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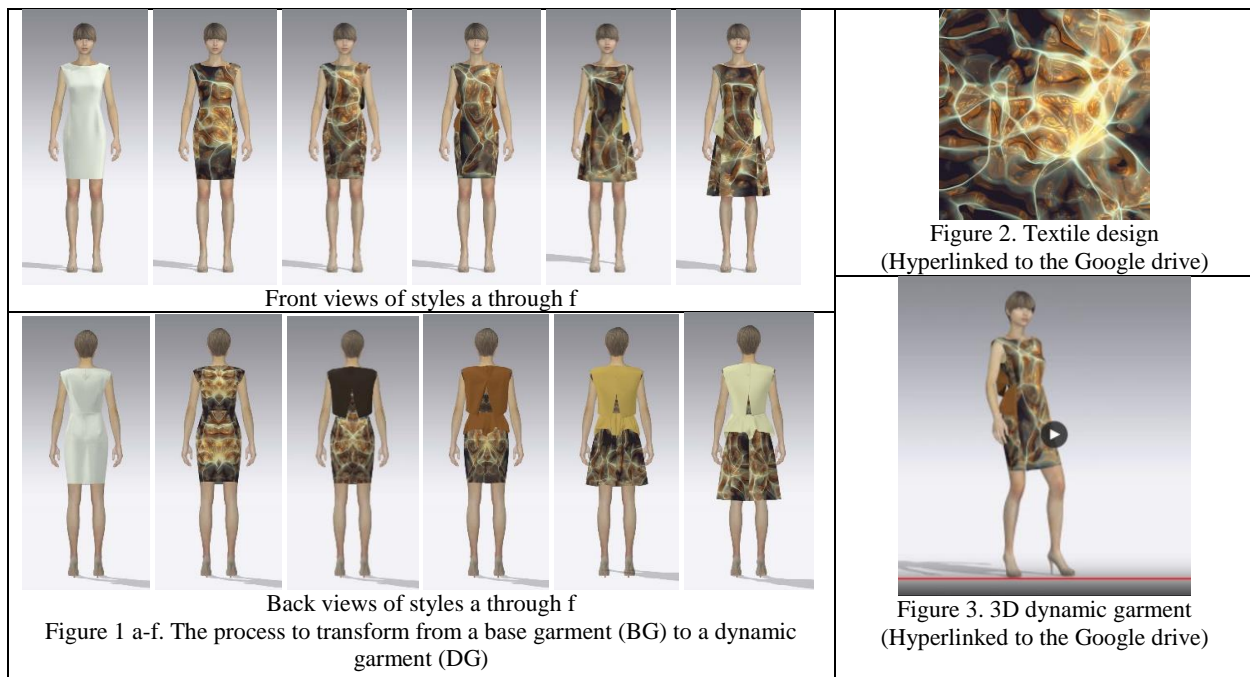
Keywords: Digital technology, 3D dynamic fashion design, online collaboration, sustainability

The increasing prevalence of digital tools in our everyday lives can provide fashion garments with greater flexibility and variability, and their elements can be changed into completely different substances. As Quinn (2012) noted, fashion garments, reacting to computational technology can dynamically change their aesthetic and functional expression during consumers' use/wear, in contrast with traditional ones with fixed and static expressions. Current studies on textiles and garments integrated with technology tend to involve not just technical dimensions but also emphasize their potential for personal expression and playful experimentation (Choi 2019; Mackey, Wakkary, Wensveen, & Tomico, 2017; Mackey, Wensveen, Wakkary, Hupfeld, & Tomico, 2019). Added to this were the formidable internet and the growth of social networks, which have provided an indispensable creative platform for users, as well as designers to communicate and collaborate on a variety of design ideas.

This study aims to present the substantial and customizable potential of 3D dynamic fashion design, simulated with avatars in a virtual space, exploring a collaborative design process between a fashion designer and digital textile designers through online social platforms. For this, as theoretical backgrounds, the meaning of dynamic fashion design and its aesthetic, expressive, and communicative effects were identified, and an online collaborative design process and its effects on creative fashion design practices were also examined. In the technical process to develop 3D dynamic fashion garments, the researchers used 'CLO 3D' and 'Aftereffects' to develop virtual avatars, wearing conceptual fashion garments of dynamic styles, and also tried an online collaboration with a motion graphic artist group by social network services to create digital textiles, including moving graphic imagery. Finally, sustainable and customized possibilities of 3D dynamic fashion design were inferred for a digitalized everyday lifestyle.

Based on previous studies (Choi, 2019; Farrer 2011; Mackey et al., 2017; Worbin, 2010), dynamic fashion design in this study was defined as fashion garments with transformable styles and animated colors or graphical patterns that visibly change from the garments' underlying colors or patterns, and even details to others and then return to the initial condition after a period of time. This demonstrates the potential of transformable digital expressions and aesthetics, not just technologies programmed to this effect. More to the point, with the rise of various online platforms the virtual aspect of digital garments lends itself to experimentation with fashion design and even customers' body images, inhabiting avatars in virtual social environments. In this sense, Makryniotis (2018) noted digital dress has the potential to become a strong link between the electronic entertainment world and the fashion world, both of which incorporate three aspects of self-identity, representation and commerce to certain degrees.

For the experimental explorations, we collaborated with 'Protobacillus', a group of graphic designers and motion artists via tumblr and creative commons for textile design, and created ten 3D dynamic fashion garments with the theme of 'Guilty Plastics' for visualizing dynamic garment constructions and details, with changeable graphical patterns and colors; one type of 3D dynamic garments was introduced in Figure 1. The technical process is as follows: 1) A base garment (BG) was created as a default condition of 3D dynamic garments (DG) by CLO 3D (Figure1a). 2) Five different styles (Figure 1b-f) from the BG were developed by mapping graphical patterns, adding back details to the BG, adding a peplum to the BG, transforming the dress silhouette, and increasing the dress length. 3) The animating images of a gif file (Figure 2), created by 'Aftereffects' were used as a textile design for the DG, which was inspired by plastic vinyl wastes. 4) The gif file (Figures 2) was taken apart, using 'Photoshop', and then fifteen separated textiles were mapped into five DG in various ways by CLO 3D; each style of five DG (Figure1b-f) included three different textile designs to be transformed. Finally, fifteen garments were completed. 5) Each of fifteen garments was converted into the animation mode by CLO 3D, presenting avatars' catwalks with different styles. 6) Collecting and editing the fifteen animations of .avi files by 'Aftereffects', a moving image of 3D dynamic garment was finally created, presenting changing graphical patterns, colors, and styles (Figures 3).

Front views of styles a through f

Figure 2. Textile design
(Hyperlinked to the Google drive)

Back views of styles a through f

Figure 1 a-f. The process to transform from a base garment (BG) to a dynamic garment (DG)

Figure 3. 3D dynamic garment
(Hyperlinked to the Google drive)

Figures 1 - 3. The technical process to develop a 3D dynamic fashion garment

From the virtual experiments of 3D dynamic fashion design, the contributions are as follows: First, considering the base garment's form and style as a generic object could provide fashion designers with a new agenda. If the dynamic garments were to be interactively integrated

with digital devices, then 3D dynamic fashion design, including changeable colors, patterns, logos, and even details would lead innumerable styles, created from the base garment. Second, as the interactivity of 3D dynamic fashion garments allows consumers or wearers to engage in designing customized styles with their avatars, the limitless possibilities of 3D dynamic fashion garments would present great promise for the fashion industry, such as online fashion stores, fashion promotions, and even entertainments. Moreover, digitally dynamic fashion will greatly contribute to the younger consumers' demand, highly interested in expressing their self-identities and individualities in online spaces. Third, 3D dynamic garments, integrated into a base garment could be directly connected to the sustainable practices of consumers, which could be rechargeable and changeable potentially without any waste in the virtual world. Digitalized versatile and iterative functions of the ultimate garment will be able to prolong the wearers' ownership and contribute to sustainability in future fashion. Finally, the online collaboration of two interdisciplinary design fields could generate new and innovative outcomes in 3D dynamic fashion design development for relevant themes, and social media platforms could also function as useful outlets to introduce and facilitate new communication modalities.

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