



Plaid Waltz

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Significance, Rationale, Contribution

Azuma (1997) surveyed the field of Augmented Reality (AR) to define its concept and to describe how it had performed in many different settings. Subsequently, Azuma et al. (2001) updated the definition of AR to have the following three properties; “(a) combines real and virtual objects in a real environment, (b) runs interactively, and in real time; and (c) registers (aligns) real and virtual objects with each other (p.34).” In other words, AR is an interactive experience of a real world environment where the computer-generated virtual objects reside in the real world. As people can see the virtual objects in the real world environment via AR, AR makes everything possible beyond imagination. In this respect, it has recently received enormous attentions from apparel retailers. For example, leading apparel retailers, such as Amazon, Zara, and Gap, started applying AR online to attract consumers’ attention to their brands, and further allow them try on clothes virtually with AR. Indeed, Forbes indicated that AR is one of main trends to look for in fashion of the future and experts predicted the AR market could grow to be worth \$130 billion by 2020 (Morgan, 2019).

Despite its numerous applications in the field of retail, there are not sufficient discussions regarding the utilization of AR in the field of apparel design. Only few designers attempted to use AR in their design (Howarth, 2016; Min & Kim, 2018), but the method of applying AR to apparel design has not been demonstrated in the academic community. This work, *Plaid Waltz*, addresses the gap in the literature by demonstrating how AR can be applied to apparel design. To demonstrate, we developed the dress for an AR app through three programs, Vuforia (AR software development kit), Blender (3D animation software), and Unity (game engine software).

Contextual Review and Concept

The main inspiration for the dress came from waltz. Waltz is a dance performed by a couple in triple time. The designers attempted to convey the inspiration by the physical fabrics of the dress and AR added to the dress. By using five different plaid fabrics, the designers visualized the rhythmical movement of waltz. In addition, viewers are able to see numerous geometric 3D shapes moving along with waltz music via the AR app.

Process, Technique, and Execution of the Dress

First, the designers utilized pattern-making techniques to create a dress. Based on basic slopers, patterns of the dress were created and a test garment was constructed. The fitting then proved that the measurements that were originally taken and conveyed into the pattern pieces were precise. To communicate the inspiration of the dress, five different plaid fabrics were chosen and cut with different grainlines. Then, facings, seven buttons, and a waistband were attached to the dress.

In terms of AR added to the dress, the plaid fabrics became visual targets for the AR to activate 16 different animations using Vuforia (AR software development kit), which is able to recognize and track visual targets by analyzing the contrast-based features of the target that are visible to the camera. The designers created 16 visual targets using Vuforia. Using Blender (3D animation software), 16 animations corresponding with the 16 visual targets were created. For the animations, other 3D modeling programs, such as Rhino or AutoCAD, can be used, but we chose Blender due to our expertise in the program as well as its free access to users. The 16 animations were created based on the colors and shapes of the plaid fabrics. Then, Unity (game engine software) allowed us to create an interactive AR application by activating visual targets with Vuforia; and importing the 16 animations and waltz music from Blender. Please see how the 3D objects animate with the waltz music from the following link:

<https://www.youtube.com/watch?v=4Cdku1zJi20&feature=youtu.be>.

Cohesion

To communicate the inspiration more clearly, we focused on various colors of different plaid fabric and augmented 3D animations of cubes with AR technology. Along with the plaid's pattern and colors, the animations highlighted dynamic motions of colorful cubes with sounds of waltz like dancing cubes. If viewers detect the plaid fabrics of the dress with the AR app through their mobile device, they can interact the cube animations associated with the shapes.

Originality and Innovation

In the future, we believe that AR-assisted fashion will be an essential means to express one's identity and messages to others. The dress demonstrates an example that designers can create AR for their garments; and provides insight into its potential for designers who would like to apply AR technology to their design. We hope this work sparks designers' interests in AR and its application to fashion design at the ITAA.



Figure 1. AR added to the left sleeve



Figure 2. AR added to the front skirt



Figure 3. AR added to the back bodice

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