

Evaluation of the Clothing Simulation Technology in the aspects of Color, Material, Structural Details, and Silhouette

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Introduction

Recent technologies in the physics-based simulation of clothes enable fashion designers to preview a clothing product by putting it on the 3D character in the virtual space before producing it with real fabrics. This work is an experimental study on the clothing simulation technology. We tried to estimate the quality the technology can create by (1) reproducing a number of real outfits with the simulation technology, and (2) comparing the results with the real clothes. For this purpose we used six outfits (products of 2008 F/W) sponsored from "École de PARIS" of Raeman Co., Ltd. A group of researchers majoring in clothing were asked to observe the results and score the evaluation sheet. The evaluation sheet was composed of 46 questionnaires covering the following four aspects: color, material, structural detail, and silhouette. The scores were given according to the resemblance of the simulated results with reference to the real outfits, with five points being the highest score and zero point being the lowest score.

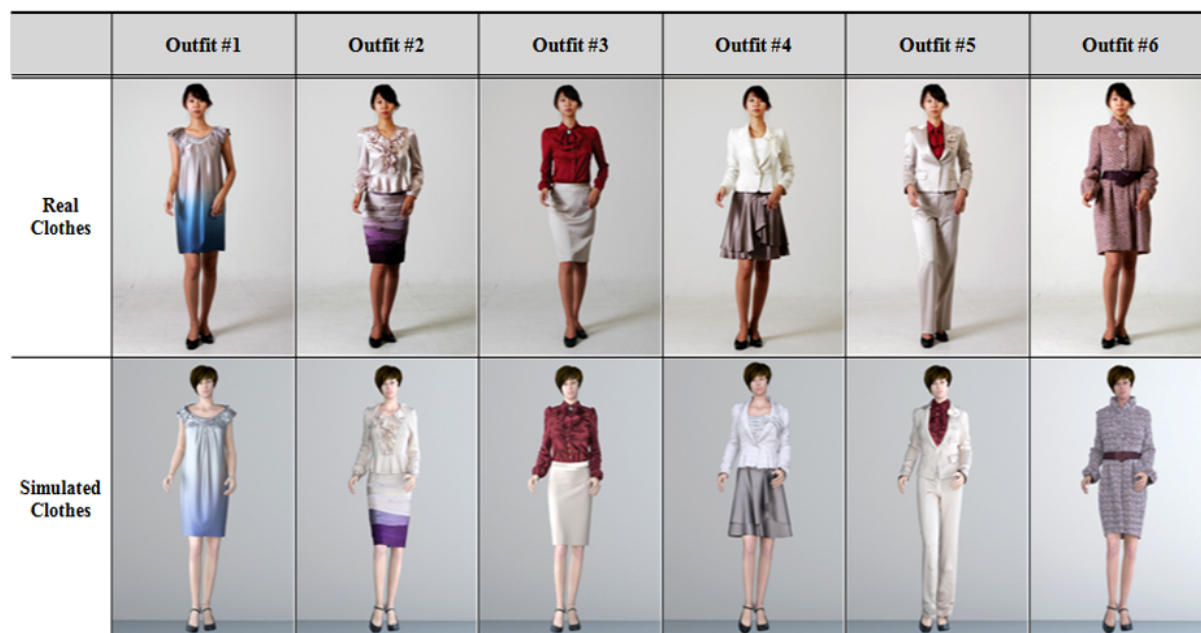


Figure 1: Comparison of Real and Simulated Outfits

Steps for the Experiment

The outfits sponsored from "École de PARIS" were for the female body with bust 84cm, waist 64cm, and hip 92cm. For this experiment we hired a fashion model with that body size. We captured the 3D motion of a person who took the pose shown in Figure 1 for the simulation. Then, following the steps summarized in Figure 2, we simulated the draping of Outfits #1~#6 and rendered the front, side, and rear views of each outfit. We asked the model to wear the same (this time real) outfits and take the same pose.

We took pictures of the model from the front, side, and back. For each outfit, we provided a total of six pictures (three from the simulation and the other three from the real outfit) for evaluating the resemblance.

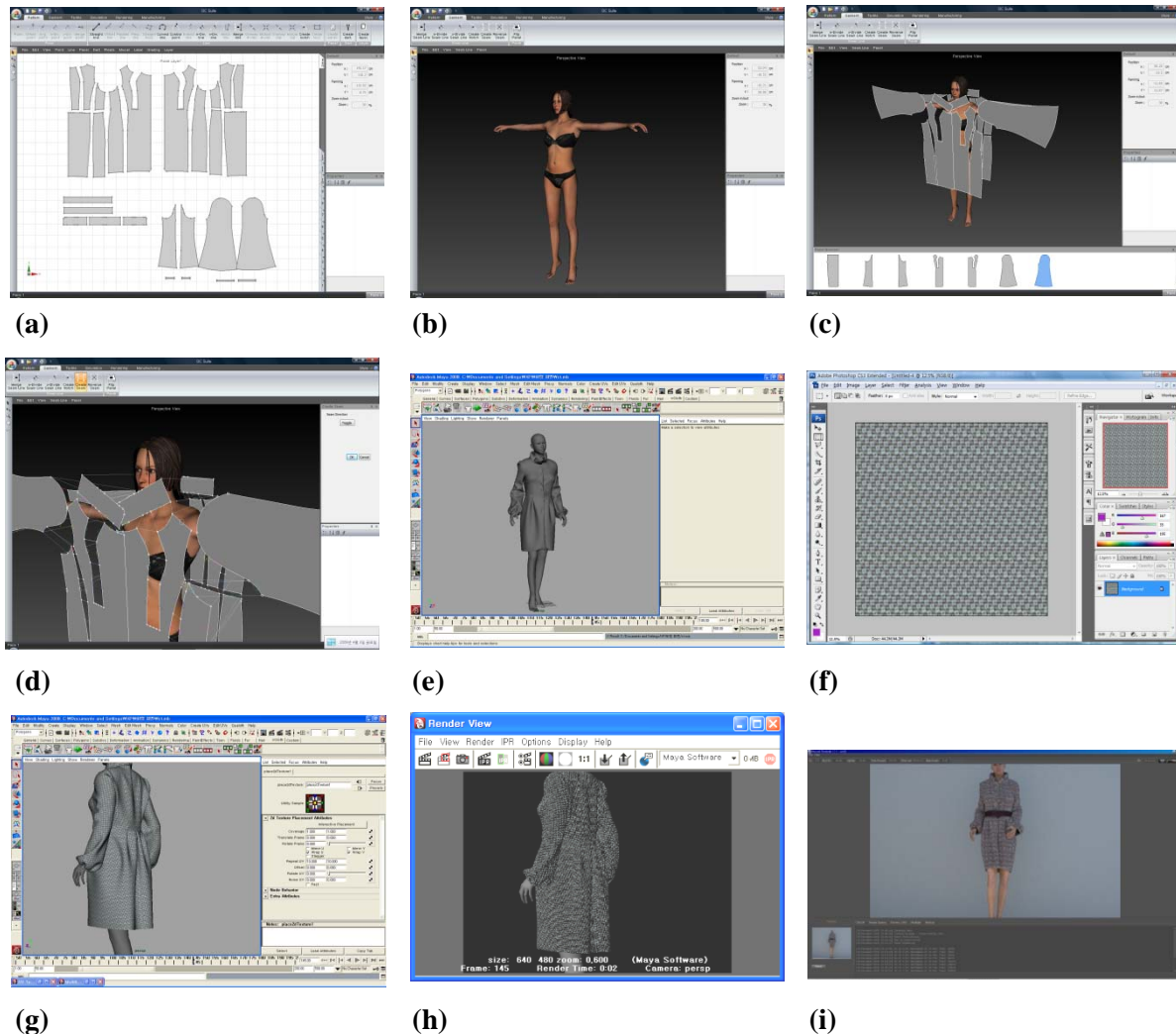


Figure 2: The simulation was performed by taking the steps (a) through (i) in that order: (a) Loading the pattern-making file. (b) Loading the body. (c) Creating the panels. (d) Constructing the garments by specifying the seams. (e) Draping simulation. (f) Textile design. (g) Textile mapping. (h) Texture mapping. (i) Rendering.

Experimental Results

Reproduction of clothes in this work was based on the immediate buckling model proposed in [1, 2, 3]. Forty seven clothing experts were asked to evaluate the resemblance between the real and simulated outfits. Table 1 summarizes the average scores in the aspects of color, material, structured details, and silhouette for Outfits #1~#6. In some cases, scores do not describe the whole situation. In this section we put some explanations which are complementary to the collected scores.

	Outfits #1	Outfits #2	Outfits #3	Outfits #4	Outfits #5	Outfits #6
Color	2.91	2.54	3.28	2.18	3.36	1.88
Material	3.65	2.92	3.51	3.17	3.47	2.98
Structural Details	3.39	3.59	3.48	3.34	3.34	3.56
Silhouette	3.74	3.7	3.74	3.6	3.77	3.67

Table 1: Average scores for Outfits #1~#6

(1) Color

The evaluators noticed some differences in the color between the simulated and real clothes, particularly in Outfits #1 and #6. But we note that the color comparison could have scored higher if the experiment had assistance from a rendering expert; the color in the rendered images is sensitive to the location, intensity, and color of the light sources; the textile/texture mapping on the simulated clothes could have been done in a better quality. In the aspect of color, therefore we estimate that the simulation technology has more potential than what is indicated in the scores.

(2) Material

In the aspect of material, the evaluators could not make a substantial comparison from the given images, except for the differences in the specular reflection on the fabric surfaces.

(3) Structural Details

Although the simulated and real clothes did not match in the minute details, in the aspect of structural details, the resemblance was higher than what the evaluators normally expected. As a result, it got high scores. Figure 3 shows closer shots for the comparison of the structural details.

(4) Silhouette

As can be observed from Figure 1, the real and simulated clothes showed strong match in the silhouettes.

Conclusion

We conclude this paper by noting that (1) the clothing simulation technology can now simulate fairly complex outfits with striking realism, (2) when the technology is used to reconstruct real clothes, it produces quite comparable results, and (3) unfortunately the present work does not seem to have exploited the full capacity of the technology. A more through experiment might reveal if this technology can be used for more significant purposes in clothing (e.g., substituting the sample clothing production).



Figure 3: Comparison of the structural details in the real and simulated clothes.

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References

- [1] Kwang-Jin Choi and Hyeong-Seok Ko. Stable but Responsive Cloth. ACM Transactions on Graphics (Proceedings of SIGGRAPH 2002), Volume 21, No. 3 (July 2002), pp. 604-610.
- [2] Kwang-Jin Choi and Hyeong-Seok Ko. Extending the Immediate Buckling Model to Triangular Meshes for Simulating Complex Clothes. Short Presentations in EUROGRAPHICS 2003, pp.187-191, Granada Spain. September 2003.
- [3] Kwang-Jin Choi and Hyeong-Seok Ko. Research Problems in Clothing Simulation. Computer Aided Design, Volume 37, Issue 6 (May 2005), pp. 585-592.