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Effect of Fabric Pattern and Color on Impression Evaluation of Textile Images Rendered by a Textile Simulator

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Abstract

The expression ability of a commercial textile simulator was investigated by simulating textile images taking into account the effect of yarn count, weave density, yarn types and weave. The performance of the simulator was investigated by evaluating and comparing impressions of real textiles and simulated images. The effect of pattern and textile color on the simulation performance was also studied. It was found that simulated images of textiles with more complicated and multicolored patterns were perceived to be more alike to the real textiles. Simulated images with large patterns were also evaluated and found to compare favorably to real textiles. Color was observed to have no effect on the impression of simulated textile images. Therefore, textile simulation in the textile trade is more effective on complex variations of textile patterns and colors.

Keywords: Performance; Textile Image; Textile Simulation; Color and Pattern

1 Introduction

Textile is made up of various yarns with various structures. Those affect the visual impression and the handle. The increased globalization of industry makes growing of internationalization in textile trading. In the international textile trade, many manufacturers participate in international exhibitions to present their products and locate new customers. Even in the domestic market, exhibitions are an important method of communicating with customers. However, time and monetary costs are high for exhibitors who wish to participate in international exhibitions, especially with regard to samples. Customers can request samples of differing colors, yarn type, weave and so on, and request that the new samples be posted to them. Making and sending

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these samples takes time and costs money, particularly in the case of trading between countries. Furthermore, all this effort does not always result in an order, so the production of additional samples increases the risk quotient. For smaller textile companies, these kinds of sample-making processes are difficult, even though they produce attractive high value textiles. To solve those problems, businesses have introduced textile simulation in addition to textile design. In many cases it is possible to produce simulated textile samples, by textile simulator, which can convey the same visual image and touch characteristics as a real textile. In addition, this methodology, when done correctly, can reduce costs and save production time.

Many researchers have investigated the geometrical [1, 2] and physical properties of textiles [3-10] to simulate textiles effectively. Moreover, garment simulation is a popular field of investigation for many research groups [11-15]. The relevant technology has already been put to practical use in the simulation of textiles. Because of the necessity of simulators in the textile industry, several commercial simulators have been developed [16-21]. Using those simulators, three-dimensional impressions of warp and weft knitting fabrics can be expressed. In addition, it is also possible to express the derivative and multiple-weave woven fabrics. However, there are still some limitations in yarn and weave structure modeling [22]. The performance of textile simulators is not set for any particular selection of fabric, but this expression ability is an important part of simulator use.

In this study, we investigated the performance of a current commercial simulator. We investigated the expression ability of simulator taking into account the effect of yarn count, weave density, yarn types and weave on the fabric simulation. Then, we evaluated the impression of real textiles and of simulated images by a sensory test. Comparing these results, we investigated the performance of the textile Computer Aided Design (CAD) system. We also investigated the effect of pattern and textile color on the performance of simulated images by evaluating the agreement of the simulated images with the real textiles.

2 Expression Ability of a Commercial Textile Simulator

Before the sensory test, we investigated the expression ability of simulator taking into account the effect of yarn count, weave density, yarn types and weave on the fabric simulation using a textile CAD system (DesignScope victor Dobby, EAT GmbH, Germany [3]). This system is a yarn-based textile simulator, on which we could choose the 3D shape, color and texture of each yarn. We simulated various fabrics by controlling factors such as yarn count, weave density, yarn types and weave. With the images, we investigated the limitation of the simulation.

2.1 Effect of Weave Density

We simulated fabric images by controlling the weave density. Cotton yarn of 11.7 tex (50 Ne_C) in the system was used for warp and weft yarns to simulate fabrics. The warp and weft densities were controlled as increasing 10/cm in warp and weft directions. Table 1 shows the simulated images. Fabric images of lower density expressed a gap between the yarn. In addition, fabric images of higher density with more than 40/cm both vertical and horizontal showed overlaped yarns and showed a moiré effect. It was understood that they were forcibly represented by overlapping the threads to each other. This exactly shows the weaving limit by the geometrical model [26].