TECHNICAL
REPORT

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Textiles — Three-dimensional measuring apparatus for fabric appearance

Textiles — Dispositif de mesure tridimensionnelle pour évaluer l'aspect des étoffes

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Foreword

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Introduction

This Technical Report introduces two approaches, one by Japan and one by Korea, to three-dimensional seam pucker measurements. Other systems are emerging in the area but are not yet widely available. The two approaches were presented for consideration as ISO methodology to TC38/SC2/WG4 (Appearance Retention) in Gothenberg, Sweden on August 2nd-3rd, 2001 and will be processed jointly as a technical report to TC38/SC2. As the systems are further developed, resolution of measurements may improve. Contact the manufacturer for the most recent information on system capabilities.

Background

The American Association of Textile Chemists and Colorists (AATCC) provides a standard method of grading seam puckering based on samples rated on a scale of 1-5, where 1 is the most heavily puckered and 5 is the smoothest (Figure 1). The scale for wrinkles in fabric is comparable, although for this the AATCC provides replicas as samples (Figure 2). Typically, both seam and wrinkle grading is performed by human graders, a subjective assessment prone to both inter- and intra-grader variability.
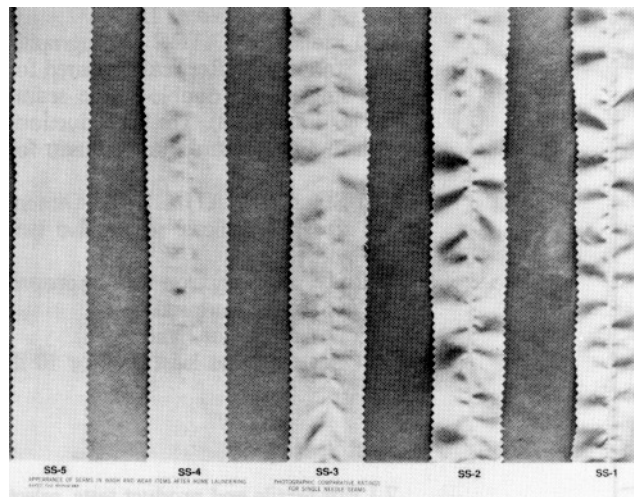
Figure 1 — AATCC sample for single-seam gradings 5 down to 1
(Similar double-seam samples exist)

Figure 2 — AATCC wrinkle replicas for gradings (left to right, top to bottom) 1, 2, 3, 3,5, 4 and 5

Comparison

These Japanese (Method 1) and Korean (Method 2) systems are intended to supplement the subjective visual grading of the appearance of seams with a reliable and reproducible instrumental method.

Method 1, detailed in Annex A, is image-analysis-based. Light is projected through a parallel grid (forming a striped pattern) on to a 250 mm × 250 mm area of the seam. The grid pattern appears warped on the surface, forming a topographical map. A CCD camera is then used to capture four images of the striped pattern on the fabric, each from slightly different positions. The images are then analysed in three dimensions. The software compares the analysis to the analysis of the five-grade seam puckering replicas used by human graders and produces a numerical rating for the seam's appearance.

Method 2, detailed in Annex B, uses spot laser sensing or line laser scanning. Once the topographical data are obtained, the software associates each point with a vector of five numbers between 0 and 1. These numbers represent the likelihood that the point could be considered a member of each of five different sets. Each line is sampled at 9 points and the series of vectors for points on a line forms a frequency distribution. These distributions are then input into a classic fuzzy neural network, which produces output patterns corresponding to AATCC pucker grades.

Table 1 — Comparison of the methods

	Method 1	Method 2
Software basis	Image processing/analysis	Artificial intelligence (neurofuzzy)
Input/image capture device	External CCD camera, parallel grid, light source, controller, PC Result is a 3-D data set	Spot laser sensing system or laser line scanner (with CCD camera), PC Result is a 3D data set
System output	Rating 1-9, which can be mapped to AATCC pucker grade	AATCC pucker grade
Sample measurement	Sampling distance is 0,5 mm, points in 250 mm × 250 mm image are sampled at approximately 1 mm intervals	Height resolution is 0,05 mm, points in the image area are sampled every 2,5 mm in the width and 1 mm in the length directions

Information on the Japanese system can be obtained from Dr. Ryohei Komatsubara, TechnoArts Laboratory Co. Ltd., 3-10-7 Kotobuku-cho, Fuchu-shi, Tokyo, Japan 1830056 (Tel: +81-42-362-9201; Fax: +81-42-362-9261; ryohei@talab.co.jp)

Information on the Korean system can be obtained from Dr. Chang Kyu Park, Department of Textile Engineering, KONKUK University, 1 Hwa-Yong, Kwang-Jin, Seoul 143-701, Korea. (Tel: +82-2-457-8895; Fax: +82-62-530-1779; cezar@konkuk.ac.kr)