ABSTRACT

A novel objective evaluation method has been developed to measure the wrinkle, smoothness appearance, and seam pucker of the fabric surface reliably and quantitatively. A slit laser projection method, stereo vision techniques, and image processing techniques are utilized for 3D reconstruction of fabric surface. The quantitative measurement of fabric surface ruggedness has been evaluated using fractal algorithm. The fractal dimensions of the AATCC Test replicas are obtained from the 3D measurement. The correlation has been established from a linear regression between the fractal dimensions of replicas and their subjective grades. Experimental results show that the new grading method based on fractal dimension corresponds very well with the visually subjective assessment of the fabric surface with higher accuracy and reliability. The newly defined equation based on fractal dimension can determine an objective rating of fabric wrinkle, smoothness appearance, and seam pucker, which can substitute the conventional subjective AATCC rating method. This method gives a quantitatively reliable value to assess the fabric surface roughness regardless of fabric pattern or color.

Fabric geometric properties can be analyzed by using non-contact 3D measurement at high magnification so that fabric structural information such as fabric density, linear density, cover factor, etc. can be obtained. Also the pilling properties of fabric can be graded with more precision and reliability.

A cyber replica system has been developed, which can complement and
substitute the standard physical replicas used in the manual evaluation method of fabric surface ruggedness by AATCC. The standard replicas show some geometrical weakness such that the differences among the AATCC replicas are not linear and the amplitude distribution of surface irregularity does not have a consistency among the grades. To overcome such geometric problems, we have developed a cyber replica system that maintains linear differences and consistent distribution of irregularity. By analyzing and simulating the intrinsic nature of irregularity formation on the fabric surface, the cyber replicas have been developed that can be freely resized, translated, and rotated in the cyber space.

KEY WORDS: