Skew Detection and Yarns Density Calculation for Woven Fabric *

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Abstract

Automatic identification of fabric structure is a vital research according to the fabric texture. Due to the skewed phenomenon which is inevitable during the scanning process, Hough transform is utilized for skew detection. Then wavelet filter is proposed to separate warps from wefts to enhance the information in vertical and horizontal direction, respectively. Finally, the gray projection curve including peaks and valleys is obtained in warp and weft directions. According to the peaks, the yarns can be located and segmented apparently and the fabric density could be obtained. Experimental results show that the precision of skew detection could be controlled within 2° while the accuracy of yarns density detection can reach up to 100%, which demonstrate that the proposed method is effective in skew detection and fabric density calculation.

Keywords: Skew Detection; Fabric Density Detection; Hough Transform; Wavelet Transform; Gray Projection

1 Introduction

Woven fabric structure parameters, including yarn density, weave structure, the arrange of color yarns et al. are important parameters to evaluate the quality and level of woven fabrics, which have great influence on the mechanical response and the high-speed projectile impact under the condition of energy absorption characteristics of fabrics [1]. Then fabric density detection will be researched in this paper. Nowadays, density detection is often done artificially in textile industry, which consumes time and requires sustained attention by human inspectors. In recent years,
Three elementary weaves with different yarns density are respectively captured via Canon Scan 9000F scanner with resolution of 600 dpi. To reduce the calculating amount, RGB images with 256×256 pixels are cut from the center of the captured images, which can be converted into gray images to improve the processing speed. In order to improve the visual effect and facilitate machine to analyze the images, image enhancement is carried out to reduce noise and make fabric texture more outstanding. Hence, changing the shape of histogram can enhance the fabric images contrast effect. The results of one plain woven fabric taken for example are shown in Fig. 1.

3 Skewing Detection for Fabric Images

During the processing of capturing fabric images, woven fabric samples are put into the scanner artificially. It is inevitable that the captured images will be skewed to a certain extent. Under the circumstances, fabric density detection via gray projection will not be accuracy. Therefore, skew rectification for the preprocessed images is required to keep warp vertical and weft horizontal. In this paper, Hough transform is used to complete the skew detection. The principle of Hough