Texture Analysis for Flaw Detection in Ultrasonic Images

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Abstract: In this paper, we present two approaches for flaw detection in TOFD (Time of Flight Diffraction) images based on texture features. Texture is one of the most important features used in recognizing patterns in an image. The paper describes texture features by two methods: Multiresolution analysis such as wavelet transforms and Gabor filters bank. The two-dimensional wavelet transform is used to decompose the input image into a multiresolution framework. The textural statistical parameters are used to allow the choice of the decomposition channel. The Gabor filter is a Gaussian kernel function modulated by a sinusoidal plane wave. All Gabor filters can be generated from one mother wavelet by dilation and rotation. These filters represent an appropriate choice for tasks requiring simultaneous measurement in both space and frequency domains. The most relevant features are optimized by Principal Components Analysis (PCA) and used as input data on a Fuzzy C-Mean clustering classifier. We use two classes: 'defects' or 'no defects'. The proposed approach is tested on the TOFD image achieved in an industrial field.