NDT & E International

Volume 35, Issue 8, 2002, Pages 567-572

Time-frequency and wavelet transform applied to selected problems in ultrasonics NDE

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Abstract: In this paper, we contribute by the development of some signal processing in order to enhance the sensibility of flaw detection, to measure thin materials thickness and to characterize defects in nature (planar or volumetric). Features for discrimination of detected echos are extracted in time domain, spectral domain and discrete wavelet representation. Compact feature vector obtained is then classified by different methods: K nearest neighbour algorithm, statistical Bayesian algorithm and artificial neural network. Mallat decomposition algorithm is also developed in order to enhance flaw detectability. Finally, time frequency algorithms based on STFT, Wigner–Ville, Gabor transform are developed and applied to thickness measurements of materials with small thickness.

Keywords : NDT/NDE, Ultrasonic, time frequency representation, Wavelet transform