Ultrasonic flaw detection using threshold modified S-transform

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Abstract: Interference noising originating from the ultrasonic testing defect signal seriously influences the accuracy of the signal extraction and defect location. Time–frequency analysis methods are mainly used to improve the defects detection resolution. In fact, the S-transform, a hybrid of the Short time Fourier transform (STFT) and wavelet transform (WT), has a time frequency resolution which is far from ideal. In this paper, a new modified S-transform based on thresholding technique, which offers a better time frequency resolution compared to the original S-transform is proposed. The improvement is achieved by the introduction of a new scaling rule for the Gaussian window used in S-transform. Simulation results are presented and show correct time frequency information of multiple Gaussian echoes under low signal-to-noise ratio (SNR) environment. In addition, experimental results demonstrate better and reliable detection of close echoes drowned in the noise.

Keywords : Flaw detection, Ultrasonic signal, Time–frequency signal analysis, Modified S-transform