

Data fusion of multi-view images for improved defect detection performance

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Oblique incidence ultrasonic arrays enable multiple views of the interior of a component to be generated from one Full Matrix Capture (FMC) dataset by exploiting mode conversions and reflections. This paper demonstrates a general statistical approach for fusing multi-view data to improve defect detection performance compared to a single view. The minimum required prior information is a representative dataset from a defect-free region; this is used to determine the noise level and position of artefacts in each view. Strategies are discussed for combining the multi-view data to detect departures from the defect-free case. If prior information on the defects of interest is available, this can be included to improve performance. In this case, the data from multi-view data is combined using a matched-filter formulation to form an optimal fused image for each defect of interest. Then the fused images for each defect of interest are combined to a single image in a way that ensures a common probability of detection for all candidate defects. Examples using both simulated (via finite element) and experimental data are presented for representative defects in a weld in a thick-walled component. It is shown that improved detection performance can be achieved through the proposed data fusion approach.