

Sensor Fusion Techniques for Phased-Array Eddy Current and Phased-Array Ultrasound Data

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Sensor (or Data) fusion is the process of integrating multiple data sources to produce more consistent, accurate and comprehensive information than is provided by a single data source. Sensor fusion may also be used to combine multiple signals from a single modality to improve the performance of a particular inspection technique. Industrial nondestructive testing may utilize multiple sensors to acquire inspection data depending upon the object under inspection and the anticipated types of defects that can be identified. Sensor fusion can be performed at various levels of signal abstraction with each having its strengths and weaknesses.

A multimodal data fusion strategy first proposed by Heideklang and Shokouhi that combines spatially scattered detection locations to improve detection performance of surface-breaking and near-surface cracks in ferromagnetic metals is shown using a surface inspection example and is then extended for volumetric inspections. Utilizing data acquired from an Olympus Omniscan MX2 from both phased array eddy current and ultrasound probes on test phantoms, single and multilevel fusion techniques are employed to integrate signals from the two modalities. Preliminary results demonstrate how confidence in defect identification and interpretation benefit from sensor fusion techniques. Lastly, techniques for integrating data into radiographic and volumetric imagery from computed tomography are described and results are presented.