

Automatic diagnosis for weld inspection PAUT using advanced signal processing and machine learning

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During weld inspection by Phased Array Ultrasonic Testing method, data acquisition has been significantly facilitated due to a lot of effort made by manufacturers to take advantages of phased array technology. Nevertheless, the last step of the inspection that consists to analyze data and to provide an examination report requires a lot of time and some experimented inspectors. The implementation of automated analysis is widely practiced in mastered and limited contexts, and is generally reduced to detecting and sizing indications from pre-defined thresholds. Besides, many research results show that technologies based on machine learning and artificial intelligence can give very interesting results and are particularly suited to automation. This paper presents an automated diagnostic procedure based on a complete software chaining using CIVA software. This approach combines on one side signal processing and segmentation steps inspired by industrial practice and current standards, and on the other side inversion features exploiting machine learning techniques. The use of simulation will allow to generate large training sets and to improve the reliability of the diagnostic, by taking into account the uncertainties and by providing confidence bounds associated to estimation of one or several flaw characteristics. Results on experimental trials will also be presented.

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