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Signal Quality Improvement Using a New TMSSE Algorithm:Application in Delamination Detection in Composite Materials

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Abstract: This paper introduces a novel method to improvethe quality of ultrasonic phased array signals for localizingwith accuracy delamination defects. The improvementis achieved by the introduction of a new threshold for theShannon energy. In first, we have applied the threshold modifiedS-transform algorithm (TMST) in the case of ultrasoundB-scan. Thereafter, we have adapted and applied the StransformShannon energy (SSE) algorithm in the field ofultrasonic testing. At last, we have proposed a novel algorithmbased on threshold modified S-transform and Shannonenergy (TMSSE) to increase the improvement of the ultrasoundB-scan. A simulation study has been carried outsimulating a composite material containing three defects indifferent positions in order to highlight the phenomenon ofdelamination. Experimental tests were performed on a sampleof carbon fiber reinforced polymer composite material(CFRP) with a delamination defect close to the front face.Both experimental and simulated results show that the proposedmethod can improve the quality of ultrasound B-scanwhich enhances the localization of delamination defects.

Keywords : Ultrasonic signal