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PROJECT REPORT ON

"QUANTIFICATION of Damaged Area of CFRP Specimen through Ultrasonic C-Scan Images "

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ABSTRACT

Quantification of Damage Area of CFRP Specimen through Ultrasonic C-Scan Images is a digital image-processing project for supporting damage growth study on the Carbon Fiber Reinforced Plastic composite materials, which is to be used on one of the aircrafts under development. The main objective of this project is to determine damaged area in CFRP specimen ultrasonic images accurately by image processing techniques. The CFRP specimens submitted to cyclic acoustic loading with impact on damage induced on it. The CFRP specimens scanned through ultrasonic C-Scan imaging method before loading and same specimens scanned after applying few cycles of acoustic loading. The damaged area evaluated on the ultrasonic C-Scan images using the Image processing software tools. The algorithms are implemented for area of quantification.

The methodology involves pixel counting on specified closed contours to quantify the damage area on the digital images. The study of noise effects on area quantification, using new filtering structures based on mathematical morphology that overcome the limitations of median filters while retaining their emphasis on shape. The proposed morphological filter, which sharpens edges and provides noise-smoothing equivalent to linear filtering. The idea of dividing a filter window into several smaller neighborhoods or sub windows is similar to the window structure that develops automatically in morphological opening or closing. These two operations are essentially in parallel, because they both rely only on the original image values for their basic computations. Opening and closing, by contrast, result from consecutive filtering operations; that is, the values output by the first operation are used to compute the final output. Any information destroyed by the first operation of opening or closing cannot be recovered by the second operation, finally the results are compared with manually determined i.e. (by attenuation property of material) damaged area. The results are verified using visual C++ and graphical user interface (GUI).