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AN ALGORITHM FOR WELDING DEFECT RECOGNITION BY MEANS OF A LASER TRIANGULATION SENSOR

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ABSTRACT

Image sensors, especially with laser, need to overcome a number of obstacles to act in online inspection, mainly due to measurement uncertainties. The use of this type of sensor is predominant in the correction of trajectory and welding parameters, which allows a complete mapping of the geometry of the groove to be filled. The use of laser triangulation to identify welding defects (joint contraction, warping, high-low, porosity, undercut, etc.) and joint filling is a promising technique that can improve the visual inspection method and qualification of welded joints following pre-established requirements, monitoring of processes in locations of difficult access, joint traceability, among others. The objective of this work is to create an inspection method using a laser triangulation sensor to verify the incidence of welding defects. The method consisted, first, scanning the joint to extract the initial profile of the same, through the acquisition of the point cloud. Second, re-scan the joint after welding. In the tests, defects

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were induced to validate the method. The measurement of contraction and warping was performed from the previously scanned joint, calculating the difference between known points, e. g., edge of the upper groove. For the warping, the angle between segments of straight lines drawn on the base of the joint was calculated by means of trigonometric analysis. To check defects such as, porosity, undercut and so on, a different approach was taken. It consisted in drawing a parallel plane at the base of the joint and the greatest values of distance from the plane to the part were measured, thus it was possible to identify the regions with greater depths, being these the regions with porosity and bite. To quantify these regions, the initial profile of the defect was measured and the measurement was expanded to the periphery until quantifying the volume that approached the profile initially established for the defect. However, the tests performed serve to identify distortions due to the welding process, geometric information of the joint (gaps, high-lows, etc.) and values relating to distortions and defects. This is a non-destructive non-contact test and, if improved for execution together with the welding process, will result in a reduction of the total execution and inspection time. In addition, the software allows analysis at points of interest.

Key-words: Laser Sensor; Profileometry; Welding; Welding Inspection.