

Deep Learning for Real-Time analysis of Ultrasonic B-scans Applied for Resistance Spot Welding Quality Control

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Ultrasonic B-scans allow to create a virtual cross-section of the inspected object in space or in time. In the first case, the ultrasonic sensor is moving along the surface, collecting A-scans at a fixed interval. In the second case, the ultrasonic sensor is collecting A-scans at the same point but at different moments of time. It becomes useful if the underlying object experiences some internal transformations such as melting or structure transformation. In any case, a collected 2-dimensional bitmap presents valuable information which needs to be interpreted. For a long time, B-scans were interpreted by an operator with subjective judgement. In the recent times, attempts are being taken to automate the inference of information using machine learning techniques. Tessonics Inc. has successfully developed and applied the new deep learning models for pattern detection on the B-scans and interpretation of the underlying physical processes. Several architectures such as Convolutional Neural Network (CNN) and Long Short-Term Memory (LSTM) have been tried. Tessonics, together with its strategical industrial partner, Obara Korea, has implemented the newly developed deep learning models for the B-scans collected for inspection of resistance spot welds. This joining technology is extremely important in the automotive industry. Implementation of the real-time ultrasonic inspection tool with use of deep learning, opens new avenue in the quality control in mass production and forms a solid basis for NDT Industry 4.0 applicability.