13th EUROPEAN CONFERENCE ON NON-DESTRUCTIVE TESTING
LISBON – PORTUGAL, 3 – 7 JULY 2023

Ultrasonic Spot Weld inspection system based on Industrial Robotic, Artificial Intelligence and Artificial Vision

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ABSTRACT

An inspection system, based on the ultrasonic propagation, is described. The main challenges faced are presented, such as the location of the spot weld, using artificial vision, the definition and positioning of the probes until a reliable signal, and the final analysis through a development based on artificial intelligence.

Artificial Intelligence System

AI system for automatic evaluation, in real time and without human intervention, based on the ultrasonic indications.
Able to adapt easily to test conditions, learning different results for different types of materials and thicknesses.

- ✓ Easy to use
- ✓ Classification in real time
- ✓ Possibility to learn one time and repeat always
- ✓ For two or three sheets
- ✓ Optimization of inspection time
- ✓ An expert operator is not required

Artificial Vision Camera

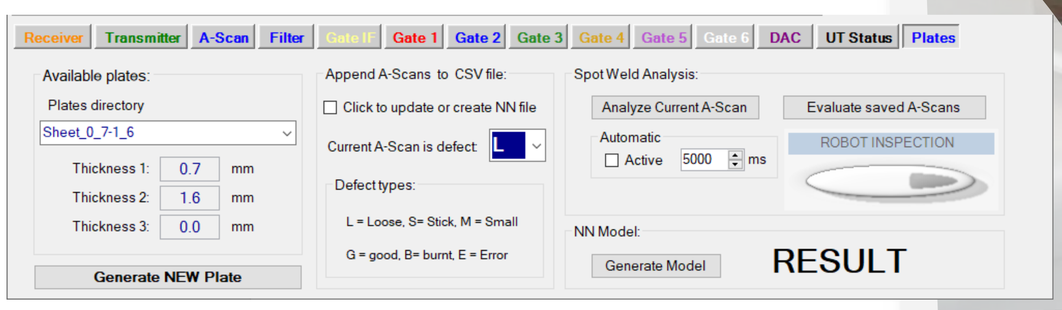
The robot approaches, takes a picture and the software can locate the centre of the spot weld and send to the robot, in real time, their exact X, Y, Z coordinates and the inclination to make the final focus and carry out the measurement without human intervention or predefined position.

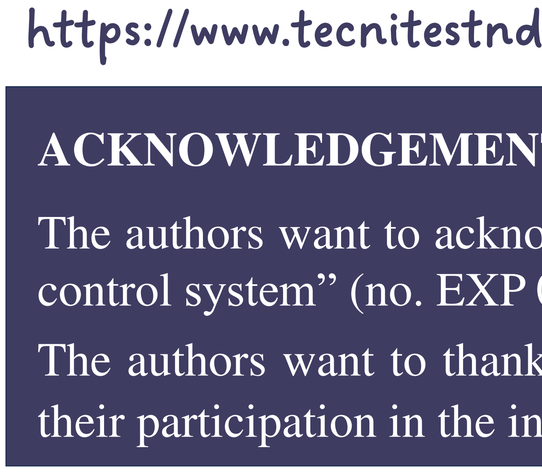
Dry contact with no coupling

Special delay which absorbs spot weld "indentation" providing good UT signal even in those with greater one.
No Phased Array used, only a single mono element probe 15-20MHz.

Evaluation and Control

Software for evaluation very friendly,





The system is controlled by an easy-to-use software interface, which allows to control the ultrasonic system and perform spot weld evaluation, all in the same interface window.

This automatic inspection and evaluation system has been developed and tested in Tecnitest on a car chassis with up to 200 different spot welds types.

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CONCLUSIONS

The system, that has been presented in this paper, was developed by Tecnitest, and validated with real samples in a production plant in which all possible types of defects were analysed.

The first results showed an in-line detection capacity of 85%.

When it was only needed to discriminate between OK/not OK, the probability of detection was close to 100%.

https://www.tecnitestndt.net/spot-weld/

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ACKNOWLEDGEMENTS

The authors want to acknowledge CDTI for funding partially the Eureka Project "Robotic Ultrasonic spot welding testing and control system" (no. EXP 00113921 / IDI-20181298).

The authors want to thank the Turkish company, Tofaş Türk Otomobil Fabrikası A.Ş for the collaboration in the project and their participation in the in-line tests.