Persistent Homology for Defect Detection

in Non-Destructive Evaluation of Materials

José Fernando Cuenca Jiménez and Armin Iske

Department of Mathematics, University of Hamburg, Germany

e-mail: jose.cuenca@uni-hamburg.de

The Time of Flight Diffraction Method (TOFD) has worldwide been used for automated weld inspection, especially in applications of steel industry, where welding processes are rather important to guarantee the quality of pipelines. In this method, ultrasonic waves are sent through the inspected material in order to gather data that encloses important information about the existing defects. This leads us to a shape recognition problem from noisy data, since the studied defects (crack propagation and pores) present different shapes in the received data [4]. To ensure a fast classification and detection of the different types of defects without human interaction, different approaches have been tried already. For example, in [1] an artificial neural network is used. We propose a method that relies on persistent homology applied to tangent spaces of curve point cloud data [2]. A barcode for shape description is computed to create a finger print of the different types of defects that may appear in TOFD measurements.

REFERENCES

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