New results for the Topological Derivative Method

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The topological derivative is defined as the first term (correction) of the asymptotic expansion of a given shape functional with respect to a small parameter that measures the size of singular domain perturbations, such as holes, inclusions, source-terms and cracks (Novotny and Sokołowski, 2013, 2020). This relatively new concept has applications in many different fields such as shape and topology optimization, inverse problems, image processing, multi-scale material design and mechanical modeling including damage and fracture evolution phenomena. In this work the topological derivative method is presented, together with a portfolio of applications into three spatial dimensions in the context of structural topology optimization and seismic inverse problems (Novotny et al., 2019).

Keywords. Structural topology optimization, self-weight loading, seismic inverse problems, elastodynamics, topological derivative method.

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