

Numerical methods based on topological derivatives for defect detection in non-destructive testing

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The problem of determining the location, size, and shape of objects hidden within a medium has attracted a lot of attention in recent years. This challenge is of paramount interest in a variety of fields, including medical imaging, non-destructive material testing, and natural resource exploration.

In this presentation, we will introduce numerical methods based on topological derivative computations for detecting multiple defects. These methods generate indicator functions that can classify each point in the region of interest as either part of the background medium or an object, without any prior assumptions about the number, size, shape, or location of the objects. The effectiveness of the method will be illustrated through applications in acoustic, electromagnetic, and thermographic inspections.