

# A Hybrid Method for Two-dimensional Sound-soft Crack Reconstruction

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We are interested in solving the inverse problem of acoustic wave scattering by sound soft cracks in two-dimensions. Therefore, we present a method to approximate the position and shape of a two-dimensional sound-soft crack from a given incident field and the corresponding far-field pattern of the scattered wave. The method is based on a recent paper by Chapko and Kress, where a hybrid method is presented for the reconstruction of sound-soft domains. The method can be seen as a hybrid between a regularized Newton method applied to a nonlinear operator equation, where we consider the operator that maps the unknown curve (representing the crack) on the solution of the direct problem, and a decomposition method, in the spirit of the Kirsch and Kress method. As well as in the method developed by Chapko and Kress, the method does not require a forward solver for each Newton step. The theoretical background of the method is based on the minimization of a cost function, where we add an additional penalty term in order to recover the crack tips. The method is illustrated by numerical examples, showing its feasibility and stability with respect to noisy data.

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