Conditional neighborhood algorithm: exploring the non-uniqueness of surface wave inversion

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The Neighborhood Algorithm (NA) is a popular direct search inversion technique. For dispersion curve inversion problems, physical conditions between parameters V_s and V_p (linked by Poisson's ratio) or conditions coming from prior information on the geological structure may limit the parameter space with complex boundaries, not natively handled by classical search algorithms. In order to account for such complexities, we extend in this work the NA formulation to parameter spaces limited by irregular boundaries. Moreover, for problems affected by non-uniqueness, prior information may isolate one single minimum of the misfit function but generally we need also a powerful exploration tool. The original NA, exploiting the properties of the Voronoi cells, has proved to be efficient for such a task. However, we show that a continuous scaling of the parameters during the convergence to the solutions drastically improves the exploration.

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