A sequential minimisation algorithm based on the convexification approach

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Abstract

A sequential minimisation algorithm for the numerical solution of inverse problems of frequency sounding is presented. The algorithm is based on the concept of convexification of a multiextremal objective function proposed recently by the authors. A key point in the sequential minimisation algorithm is that unlike conventional layer-stripping algorithms, it provides the stable approximate solution via minmisation of a finite sequence of strictly convex objective functions resulted from applying the nonlinear weighet least squares method with Carleman's weight functions. Another advantage of the proposed algorithm is that the starting vectors for the descent methods of minimisation are directly determined from the data eliminating the uncertainty inherent to the local methods, such as the gradient or Newton-like methods. The 1-D inverse model of frequency sounding is selected to demonstrate its computational feasibility. Based on the localising property of Carleman's weight functions, it is proven that the distance between the approximate and "exact" solutions is small if the approximation error is small. The computational experiments with several realistic and synthetic marine shallow water configurations are presented to demonstrate the computational feasibility of the proposed algorithm.

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