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Research Article

A Penalized Linear and Nonlinear Combined Conjugate Gradient Method for the Reconstruction of Fluorescence Molecular Tomography

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Abstract

Conjugate gradient method is verified to be efficient for nonlinear optimization problems of large-dimension data. In this paper, a penalized linear and nonlinear combined conjugate gradient method for the reconstruction of fluorescence molecular tomography (FMT) is presented. The algorithm combines the linear conjugate gradient method and the nonlinear conjugate gradient method together based on a restart strategy, in order to take advantage of the two kinds of conjugate gradient methods and compensate for the disadvantages. A quadratic penalty method is adopted to gain a nonnegative constraint and reduce the illposedness of the problem. Simulation studies show that the presented algorithm is accurate, stable, and fast. It has a better performance than the conventional conjugate gradient-based reconstruction algorithms. It offers an effective approach to reconstruct fluorochrome information for FMT.