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A Parallel Reconstruction Scheme in Fluorescence Tomography Based on Contrast of Independent Inversed Absorption Properties

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Abstract

Based on an independent forward model in fluorescent tomography, a parallel reconstructed scheme for inhomogeneous mediums with unknown absorption property is proposed in this paper. The method considers the two diffusion equations as separately describing the propagation of excited light in tissues with and without fluorescent probes inside. Then the concentration of fluorophores is obtained directly through the difference between two estimations of absorption coefficient which can be parallel inversed. In this way, the multiparameter estimation problem in fluorescent tomography is transformed into two independent single-coefficient determined schemes of diffusion optical tomography (DOT). Any algorithms proved to be efficient and effective in DOT can be directly applied here. In this study the absorption property is estimated from the independent diffusion equations by a gradient-based optimization method with finite element method (FEM) solving the forward model. Simulation results of three representative occasions show that the reconstructed method can well estimate fluorescent property and tissue absorption distribution.