Numerical reconstructions with large data sets in optical tomography

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Abstract

One of the major recent advances in optical tomography is the ability to obtain large data set through the use of CCD cameras. Analytical reconstructions in simple geometry show that the use of such large data sets can potentially improve the quality of reconstruction significantly. It is, however, extremely challenging to use such large data sets in most model-based numerical reconstruction algorithms because of the overwhelming computational cost involved.

We will present some numerical reconstruction algorithms that allows us to use extremely large data sets while keeping the computational cost reasonable. The essential idea behind those methods is the efficient usage of fast direct solvers. The methods we will present depend on the forward model chosen for light propagation in tissues. We can deal with both diffusion and transport type of models. Numerical examples with synthetic data will be shown to demonstrate the performance of the methods.