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Zhuojun Magnant* (ztang4@emory.edu), 858 Willivee Dr., Decatur, GA 30033, and **Eldad Haber**. *Finding the optimal L2 regularization.*

In various areas such as medical imaging and geophysics, inverse problems frequently arise. Since many of these problems are ill-posed, solutions cannot be obtained directly from the observed data. Hence, additional information needs to be added to the problem by regularization techniques. In this work, we introduce optimal design techniques and several optimality criteria will be proposed to find the best possible L2 regularization matrix. Certain sparsity constraints will be added to the regularization matrix in order to reduce the computational cost and the solution will be obtained through an optimization approach. Numerical experiments will include a 1D magnetotelluric example and MRI reconstructions as well. (Received July 19, 2010)