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Ranadhir Roy* (ranadhir.roy@utrgv.edu), University of Texas Rio Grande Valley, School of Mathematics and Statistical Sciences, 1201 W University Drive, Edinburg, TX 78539. *ILL-POSED INVERSE PROBLEMS IN MOLECULAR IMAGING*.

Inverse problems arise in medical (molecular) imaging. The inverse problems are posed as a nonlinear optimization where the unknown parameters are found by minimizing the difference between the predicted data and the measured data. In inverse problems, the Tikhonov's regularization method is generally used and the determination of the Tikhonov regularization parameter is very time consuming. To alleviate these difficulties we have applied the penalty/modified barrier function (PMBF) method instead of Tikhonov regularization technique to make the inverse problems well-posed. Unlike the Tikhonov regularization method, the constrained optimization technique, which is based on simple bounds of the optical parameter properties of the tissue, can easily be implemented in the PMBF method. The PMBF method limits the size of the condition number of the Hessian matrix of the given objective function. The accuracy and the rapid convergence of the PMBF method require a good initial guess of the Lagrange multipliers. To obtain the initial guess of the multipliers, we use a least square unconstrained minimization problem. Three dimensional images of fluorescence absorption coefficients and lifetimes were reconstructed from contact and noncontact experimentally measured data. (Received August 03, 2016)