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Fadil Santosa (santosa@math.umn.edu) and **Carl Toews*** (toews@ima.umn.edu). *Position Registration From Voltage Samples.*

We are interested in determining the position of an electrode within a bounded homogeneous region B . Across this region we apply three orthogonal voltage potentials, and for each field collect a data point corresponding to a voltage measurement at the probe. Were the fields linear, the positions of the probe could be read directly from the voltage data. Unfortunately, the unknown conductivity of the medium surrounding B induces non-linearities, and the problem becomes an inverse problem for which the objective is to determine the probe positions and the fields distortions.

To approach this task, we model each field as linear plus a perturbation term that has a low order expansion in a harmonic basis. We then propose and analyze an iterative algorithm to solve the problem in a least-squares sense. Our principle result concerns the behavior of the solution in the limit as the number of measurements becomes large. The method is assessed on simulated data. (Received September 26, 2006)