Turkish Journal

of

Electrical Engineering & Computer Sciences

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Authors

elektrik@tubitak.gov.tr

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Turkish Journal of Electrical Engineering & Computer Sciences

Use of the Magnetic Field Generated by the Internal Distribution of Injected Currents for Electrical Impedance Tomography (MR-EIT)

Y. Ziya İder and Özlem Birgül
Middle East Technical University,
Department of Electrical and Electronics Engineering,
06531, Ankara-TURKEY
email: ideryz@ed.eee.metu.edu.tr

Abstract: In two dimensional conventional Electrical Impedance Tomography (EIT), volume conductor is probed by means of injected currents, and peripheral voltage measurements are used as input to the reconstruction algorithm. The current that flows in the 2D object creates magnetic fields that are perpendicular to the plane of imaging. Such magnetic fields can be measured using magnetic resonance tomography. In this study, use of this magnetic field generated by the injected currents, for the purpose of reconstructing the conductivity distribution, is studied. Sensitivity matrix relating the magnetic field to the element conductivities is calculated using the Finite Element Method and Biot-Savart law. Linearization is made during sensitivity matrix formation. This matrix is inverted using singular value decompostion. Simulations for objects placed in different parts of the imaging region are made to understand the spatial dependency of the proposed method and it is seen that the method has uniform sensitivity throughout the imaging region. Finally, images reconstructed using data taken from an experimental phantom are presented.

Turk. J. Elec. Eng. & Comp. Sci., **6**, (1998), 215-226.
Full text: pdf
Other articles published in the same issue: Turk. J. Elec. Eng. & Comp. Sci.,vol.6,iss.3.