NM-AIST Repository

https://dspace.mm-aist.ac.tz

Computational and Communication Science Engineering

Research Articles [CoCSE]

2016

A review of image reconstruction methods in electrical capacitance tomography

Nombo, Josiah

J. Math. Comput. Sci.

http://scik.org

Provided with love from The Nelson Mandela African Institution of Science and Technology

A review of image reconstruction methods in electrical capacitance tomography

Josiah Nombo, Alfred Mwambela, Michael Kisangiri

To download a complete text, please click the clink below;

DOI: http://scik.org

Abstract

In this paper, we review image reconstruction methods and their suitability in electrical

capacitance tomography measurement system. These methods can be grouped into direct and

iterative methods. Direct methods include Linear back projection, Singular value decomposition,

and Tikhonov regularization. Iterative methods are further divided into algebraic and optimization

methods. Algebraic reconstruction methods include iterative linear back projection, iterative

Tikhonov, Landweber iteration, simultaneously algebraic reconstruction, and model\$ - \$based

reconstruction. Optimization methods include fuzzy mathematical modeling, genetic algorithms,

artificial neural networks, generalized vector sampled pattern matching, total variation

regularization, regularized total least squares, extended Tikhonov regularization, simulated

annealing, compressed sensing principle, population entropy, adaptive differential evolution,

least\$ - \$squares support vector machine, and self-adaptive particle swarm optimization. Some of

these methods have been examined through experiments and their comparative analysis have been

given. Results show that iterative methods generate high quality images compared with non-

iterative ones when evaluated over full component fraction range. However, iterative methods are

computationally expensive, and hence used for research and off-line investigations rather than for

on-line process monitoring.

Keywords: Electrical capacitance tomography; Inverse problem; Image reconstruction.