A Capacitance Tomography for Two-phase Analysis using Feedforward Neural Networks

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Abstract

This article represents an algorithm to reconstruct cross-sectional distribution the capacitance tomography sensor. The electric field in the test tube is calculated by a newly proposed PDE solver based on artificial neural network. Newton-Raphson method minimizes the square of error between the measured and calculated capacitance signals for the back projection of tomographe image. The present PDE solver within 10^{-5} accuracy could successfully identify electric field in the test tube. Also, for the good initial guess, the back projection was made efficiently to identify well the cross sectional distribution of void for the annular flow, core flow, and stratified flow.

Key word : Capacitance Tomography, Back Projection, Partial Differential Equations, Neural Networks,

Natural Ray Computer Tomography with Radon Transformation for Two-phase flow

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Abstract

This paper describes the computer tomography using digital image technique under natural light to analyse two-phase flow. Recent progress in the digital image processing support to develop the present tomography in a low cost and with high resolution. Since complex two-phase structure needs three dimensional understanding of the interfacial deformation and spatial distribution, the tomography with high resolution in low cost is developed using the CC camera.

For back projection for the cross sectional image, Radon transformation is coded with appropriate filter algorithm. The test results for the various flow regime, the present algorithm successfully reconstructs cross sectional image as detail as representing ripples at the two-phase interface.

It was found that the present work is applicable to the air-water or air-steam two-phase flow and that it could be directly extend for the neutron tomography.

Key words: Digital, Image processing, Computer Tomography, Two-phase flow