

Inversion of Temperature-dependent Thermal Conductivity for 2-D Transient Heat  
Conduction Problems Based on BEM

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Abstract:

the gradient regularization method is represented for estimating temperature dependent thermal conductivity for 2-D transient heat conduction problems. For the direct problem, the nonlinear heat conduction equation is transformed into linear equation through Kirchhoff's transform. Then the calculated values of measuring points are obtained by the boundary element method. For the inverse problem, the temperature dependent thermal conductivity is treated as the optimization variable, and the errors between calculated values and exact ones of the measured points are defined as the objective function. Due to the nonlinear ill-posedness of the problem, the gradient regularization method is developed to obtain the iterative formulas. Several numerical simulations are tested to the effectiveness and the precision of the method. And the influence of random noise and the regularization parameter on the result of inversion are discussed.

Keywords: inverse problem; transient heat conduction; temperature dependent thermal conductivity; boundary element method; regularization

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