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ON DIRECT AND INVERSE PROBLEMS FOR HYPERBOLIC HEAT EQUATION FOR L-SHAPE AND T-SHAPE SAMPLES[1]

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Hyperbolic heat conduction equation is used for describing intensive steel quenching (IQ) process that uses water as a quenchant, see [1] – [4]. Depending on the number of dimensions of the sample being quenched, there are several formulations of the problem.

In our publications [5], [6] we have considered formulation of 3D and 2D problems for L-shape samples. But in this paper we consider 2D L-shape and T-shape domain problems. As mentioned above, IQ process is described by the following hyperbolic heat equation (1):

$$\tau_r \frac{\partial^2 V}{\partial t^2} + \frac{\partial V}{\partial t} = a^2 \left(\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} \right). \tag{1}$$

By means of exponential substitution, equation (1) is transformed into Klein-Gordon equation (2):

$$\frac{\partial^2 u}{\partial t^2} = a_r^2 \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right) + cu, c = \frac{1}{4\tau_r^2}. \tag{2}$$

We have initial conditions for direct problem. But for inverse problem with regard to time we have conditions given at the final moment of the process. We use Green's function method to solve these problems. And we analyse the effect of the choice of the final moment T.

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