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Inverse problem for an anisotropic heat equation with nonlocal overdetermination conditions

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We investigate an inverse problem of identification a triple of functions $(a_1(t), a_2(t), u(x, y, t))$ in the domain $Q_T := \{(x, y, t) : 0 < x < h, 0 < y < l, 0 < t < T\}$, that satisfy

$$u_t = a_1(t)u_{xx} + a_2(t)u_{yy} + f(x, y, t), \quad (x, y, t) \in Q_T, \tag{1}$$
$$u(x, y, 0) = \varphi(x, y), \quad (x, y) \in [0, h]\times[0, l], \tag{2}$$
$$u(0, y, t) = \mu_{11}(y, t),\ u(h, y, t) = \mu_{12}(y, t),\ (y, t) \in [0, l]\times[0, T], \tag{3}$$
$$u(x, 0, t) = \mu_{21}(x, t),\ u(x, l, t) = \mu_{22}(x, t),\ (x, t) \in [0,h]\times[0,T]. \tag{4}$$

and the overdetermination conditions

$$\nu_{11}(t)u_x(0, y_0, t) + \nu_{12}(t)u_x(h, y_0, t) = \mu_{13}(t), \quad t \in [0, T], \tag{5}$$
$$\nu_{21}(t)u_y(x_0, 0, t) + \nu_{22}(t)u_y(x_0, l, t) = \mu_{23}(t), \quad t \in [0, T], \tag{6}$$

where y_0, x_0 are fixed values from the intervals $(0, h)$ and $(0, l)$ respectively.

The conditions of existence and uniqueness of the solution to the problem are established.