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ALTERNATING DIRECTION METHOD FOR THE TWO–DIMENSIONAL DIFFUSION EQUATION WITH NONLOCAL INTEGRAL CONDITION

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We consider the implicit alternating direction method for solving the folowing two-dimensional time-dependent diffusion equation:

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + f(x,y,t), \qquad 0 \leqslant x, y \leqslant 1, \quad 0 < t < T$$

with initial condition

$$u(x,y,0) = \varphi(x,y),$$

and boundary conditions

$$\begin{aligned} u(0,y,t) &= \mu_1(y,t), \quad u(1,y,t) = \mu_2(y,t),\\ u(x,1,t) &= \mu_3(x,t), \quad u(x,0,t) = \mu_4(x)\mu(t), \end{aligned}$$

and the nonlocal boundary condition

$$\int_0^1\int_0^1 u(x,y,t)dxdy = m(t),$$

where $u(x,y,t)$ and $\mu(t)$ are unknown functions.

We solve the system of one-dimensional difference equations by two different methods [1], [2].

The influence of the condition $\mu(0) = \mu(1) = 0$ is analysed.

REFERENCES

[1] R. Čiegis. Economical difference schemes for the solution of a two-dimensional parabolic problem with an integral condition. *Differ. Equations*, **41** (7) pp. 1025–1023, 2005..

[2] R. Čiupaila, K. Jakubėlienė and M. Sapagovas. Solution of two-dimensional elliptic equation with nonlocal condition. In: *Mathematical Modelling and Analysis*, 13, 2008 (In Press).

[3] J. R. Cannon, Y. Lin and A. L. Matheson. The solution of the diffusion equation in two-space variables subject to specification of mass. *Applic. Anal*, **50** 1–15, 1993.