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# APPLICATION OF FINITE DIFFERENCE METHODS FOR SOLVING THE TWO-DIMENSIONAL EQUATION OF HEAT CONDUCTIVITY.

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**Abstract:** A comparison is made of finite-difference schemes with the exact solution of a parabolic partial differential equation. A stability analysis has also been carried out. To solve the parabolic equation, one-step and two-step finite-difference methods are used.

**Keywords**: two-step method, nonlinear equations, implicit scheme, heat equation, finite difference scheme, parabolic.

**Introduction:** In this article, various finite-difference schemes have been studied in detail, with the help of which it is possible to solve the simplest model equations of heat conduction. We restrict ourselves to considering the diffusion equation. Difference schemes with a first order of accuracy are considered. For the numerical solution of the heat equation, the

Kranko-Nicholson method and implicit methods of variable directions are used [1].

The two-dimensional heat equation is a parabolic partial differential equation that describes the process of heat propagation or diffusion [1-2].

$$\frac{\partial U}{\partial t}=\alpha(\frac{\partial^2 U}{\partial x^2}+\frac{\partial^2 U}{\partial y^2}) \quad (1)$$

This equation is the simplest model equation for parabolic equations. heat propagation rate.

Consider the problem of temperature distribution in a pipe. In this case, equation (1) takes the following form

$$\frac{\partial T}{\partial t}=\alpha(\frac{\partial^2 T}{\partial x^2}+\frac{\partial^2 T}{\partial y^2}) \quad (2)$$

We now turn to the study of finite-difference schemes for solving the two-dimensional heat equation.

**Numerical method**

Application of model methods for solving $\frac{\partial U}{\partial t}=\alpha(\frac{\partial^2 U}{\partial x^2}+\frac{\partial^2 U}{\partial y^2})$ the heat equation.

1. The Kranko-Nicholson method for the two-dimensional heat equation.

$$\left(\frac{T_{i,j}^{n+1}-T_{i,j}^{n}}{\Delta t}=\frac{\alpha}{2}(\partial_x^2+\partial_y^2)(T_{i,j}^{n+1}+T_{i,j}^{n})\right) \quad (3)$$

To shorten the notation, two-dimensional central-difference operators are introduced here

$\partial_x^2\, T_{i,j}^n$ and $\partial_y^2\, T_{i,j}^n$ defined by the relations

$$\partial_x^2 T_{i,j}^n=\frac{T_{i+1,j}^n-2T_{i,j}^n+T_{i-1,j}^n}{(\Delta x)^2}=\frac{\partial_x^2 T_{i,j}^n}{(\Delta x)^2}$$

(4)

$$\partial_y^2 T_{i,j}^n=\frac{T_{i,j+1}^n-2T_{i,j}^n+T_{i,j-1}^n}{(\Delta y)^2}=\frac{\partial_y^2 T_{i,j}^n}{(\Delta y)^2}$$

2. Th e implicit method of variable directions.

$$\text{Step 1} \left( \frac{T_{i,j}^{n+1/2} - T_{i,j}^{n}}{\Delta t/2} = \alpha(\partial_x^2 T_{i,j}^{n+1/2} + \partial_y^2 T_{i,j}^{n}) \right)$$

(5)

$$\text{Step 2} \left( \frac{T_{i,j}^{n+1} - T_{i,j}^{n+1/2}}{\Delta t/2} = \alpha(\partial_x^2 T_{i,j}^{n+1/2} + \partial_y^2 T_{i,j}^{n+1}) \right)$$

$\partial_x^2 T_{i,j}^{n+1/2}$, $\partial_y^2 T_{i,j}^{n}$ and $\partial_y^2 T_{i,j}^{n+1}$ defined by the relations

$$\partial_x^2 T_{i,j}^{n+1/2} = \frac{T_{i+1,j}^{n+1/2} - 2T_{i,j}^{n+1/2} + T_{i-1,j}^{n+1/2}}{(\Delta x)^2} = \frac{\partial_x^2 T_{i,j}^{n+1/2}}{(\Delta x)^2}$$

$$\partial_y^2 T_{i,j}^{n} = \frac{T_{i,j+1}^{n} - 2T_{i,j}^{n} + T_{i,j-1}^{n}}{(\Delta y)^2} = \frac{\partial_y^2 T_{i,j}^{n}}{(\Delta y)^2} \quad (6)$$

$$\partial_y^2 T_{i,j}^{n+1} = \frac{T_{i,j+1}^{n+1} - 2T_{i,j}^{n+1} + T_{i,j-1}^{n+1}}{(\Delta y)^2} = \frac{\partial_y^2 T_{i,j}^{n+1}}{(\Delta y)^2}$$

**Calculation results.**

Here are some specific examples illustrating the briefly described models above. The results of calculations are comparable to those of calculations [1].

In Fig. 1. The results of the temperature distribution by the Cranco-Nicholson method are derived.

1. Cranco-Nicholson Method.

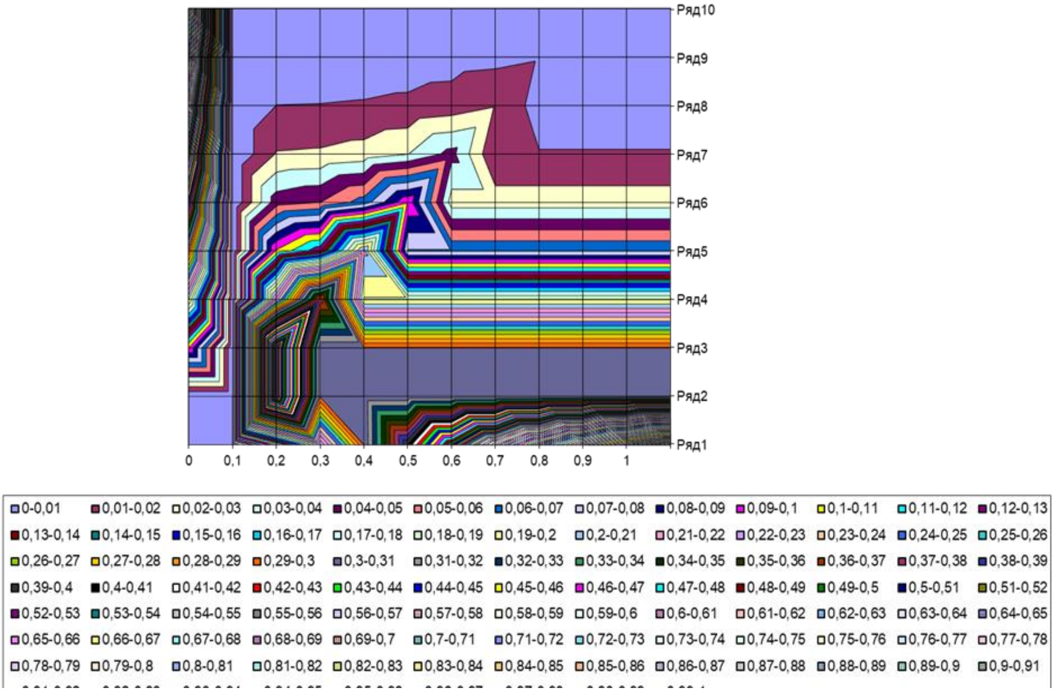

Fig. 1.

2. The implicit method of variable directions.

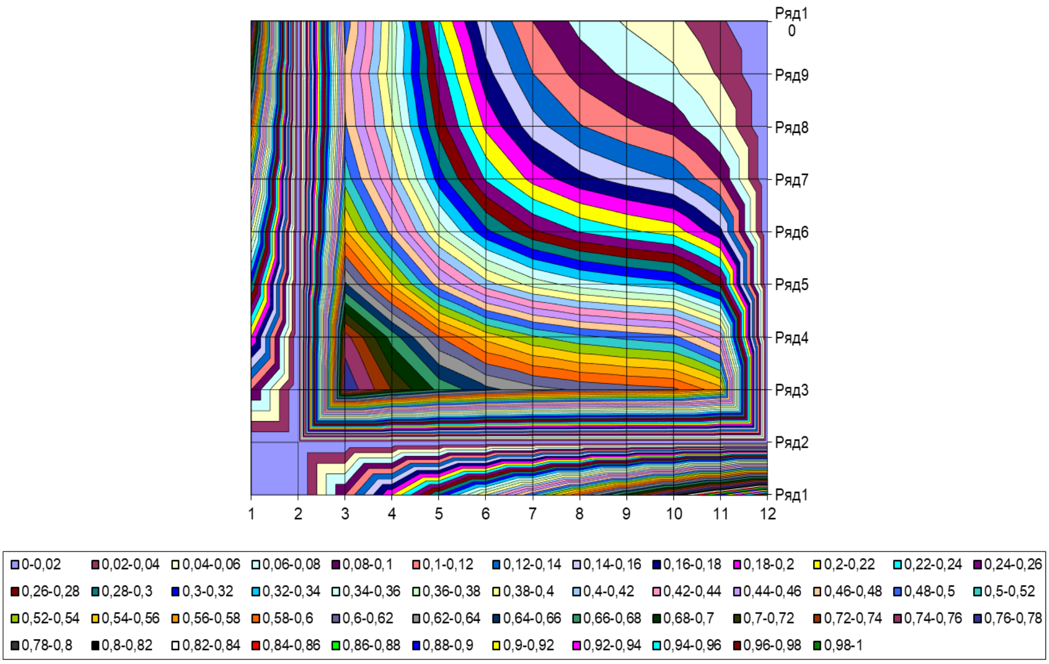

Fig. 2.

**Conclusion:** The calculation results are compared. It is shown that these finite-difference schemes give very close calculated results for the exact solution of the parabolic equation.

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## THE RELATIONSHIP OF METABOLIC DISORDERS WITH POLYCYSTIC OVARIAN SYNDROME IN YOUNG WOMEN

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**Annotation.** The article presents some pathogenetic mechanisms of the development of metabolic disorders in young women with polycystic ovary syndrome. In recent years, polycystic ovary syndrome is considered as part of metabolic disorders [1]. Metabolic disorders are manifested by disorders of carbohydrate and lipid metabolism, abdominal obesity, hypertension, followed by the development of type 2 diabetes mellitus and cardiovascular diseases.

**Keywords:** metabolic disorders, polycystic ovary syndrome, insulin resistance, hyperinsulinemia, dyslipidemia