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Using Of The Differental Progonka Method In Solving Engineering Problems In Technical Universities

Eshmurodov Azamat Guzorovich,
Kholiqulov Bekzod Jovlievich,
Teachers of Karshi engineering economic institute

Abstract: Finding a clear and distinctive solution to differential equations using an object-oriented programming language in this article.

Key phrases: Delphi 7 programming language, mathematical model, optimal solution, clear solution, approximate solution;

Different types of differential equations of mathematical models are usually used to model engineering problems in technical universities. Mathematical models constructed from modeling engineering problems are often expressed in the form of different types of differential equations. According to the character of the compiled model, the solution of these models is solved by means of solving differential equations. In the process of solving these equations, a series of actions are performed, such as approximate calculations or analytical substitution. As mentioned earlier, this process can be simple or complex depending on the structure and nature of the model. If the process is complex, in this case it is advisable to program and leave it to the computer after selecting the method of solution. It is well known that the solution of many engineering problems leads to the solution of various boundary conditions of a differential equation with variable coefficients. The solution of boundary value problems is much more complicated than the original conditional problem. Because it is much more difficult to build algorithms for solving boundary value problems with a given accuracy. A number of algorithms have been developed to solve the initial conditions with a given accuracy, which are expressed in the form of standard programs. Therefore, this is one of the easiest ways to bring border issues to the starting point. The solution of a boundary value problem using the differential progonka method is used to solve initial conditional problems that are equally strong. Another advantage of this method is that each algorithmic language has its own standard program for solving the Kashi problem with a given accuracy. The algorithm of the differential progonga method is presented in the following example. This

$$y''(x)+A(x)y'(x)+B(x)y'(x)=F(x) \qquad 1.1$$

of the differential equation

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$$\begin{cases} a_{11}y'(0) + a_{12}y(0) = b_1 \\ a_{21}y'(0) + a_{22}y(0) = b_2 \end{cases} \qquad 1.2$$

find a solution satisfying the boundary conditions. Here

$A(x), B(x), F(x) - [0,1]$

$a_{11}, a_{12}, a_{21}, a_{22}, b, b_2$- constants continuous functions defined in the interval. $y(x) -$ unknown function. Solution of the boundary value problem (1.1), (1.2) by the differential progonka method $\alpha(x)y'(x) + \beta(x)y(x) - \gamma(x)$ we will describe.

These are functions $\alpha(x),\ \beta(x),\ \gamma(x)$ that are currently unknown. We take (1.3) to (1.1) with respect to $\alpha(x),\ \beta(x),\ \gamma(x)$ the following

$$\begin{cases} \alpha'(x) = \alpha(x)A(x) - \beta(x) \\ \beta'(x) = \alpha(x)B(x) \\ \gamma'(x) = -\alpha(x)F(x) \end{cases} \qquad 1.4$$

Let's make firstsystem of differential equations.

$a_{11}y'(0) + a_{12}y(0) = b_1$ ва $\alpha(0)y'(0) + \beta(0)y(0) = \gamma(0)$ from the equations

$\alpha(0) = a_{11},\ \beta(0) = a_{12},\ \gamma(0) = b_1$ 1.5 (1.4), (1.5) Solving the Koshi problem at [0, 1] $\alpha(1),\ \beta(1),\ \gamma(1)$ we will find out. This method is usually called theright progone. $a_{21}y'(1) + a_{22}y(2) = b_2$ ва $\alpha(1)y'(1) + \beta(1)y(1) = \gamma(1)$ from the equations

$$y(1) = \frac{b_2\alpha(1) - a_{21}\gamma(1)}{a_{22}\alpha(1) - a_{21}\beta(1)}$$

$$y'(1) = \frac{b_2\beta(1) - a_{21}\gamma(1)}{a_{22}\beta(1) - a_{21}\alpha(1)} \qquad 1.6$$

we will have.

(1.1), (1.6) Solve the problem of Kosh in the interval [0, 1] and generate the numerical values of the function. This method is called the inverse progone.

The accuracy of the differential sweep method is similar to solving Kasha's problems, which are equally powerful. If the Kashi problem is found using the fourth-order Runge-Kutga method, then the differential sweep method will have

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the same accuracy. This allows us to solve the boundary problem with the help of a differential rod with high accuracy.

Example 1.

$$y''(x) + (x+1)y'(x) + (x+3)y(x) = x^4 + 7 \cdot x^3 + 7 \cdot x^2 + 5 \cdot x + 4 \qquad 1.7$$

of the differential equation $\begin{cases} y'(0) + y(0) = 0 \\ y'(1) + y(1) = 2 \end{cases}$ 1.8

search for a solution that satisfies the conditions using the differential run method. Using the Delphi7 programming environment, the program text is generated based on the algorithm described above, and we create the following dialog in the Delphi7 programming environment:

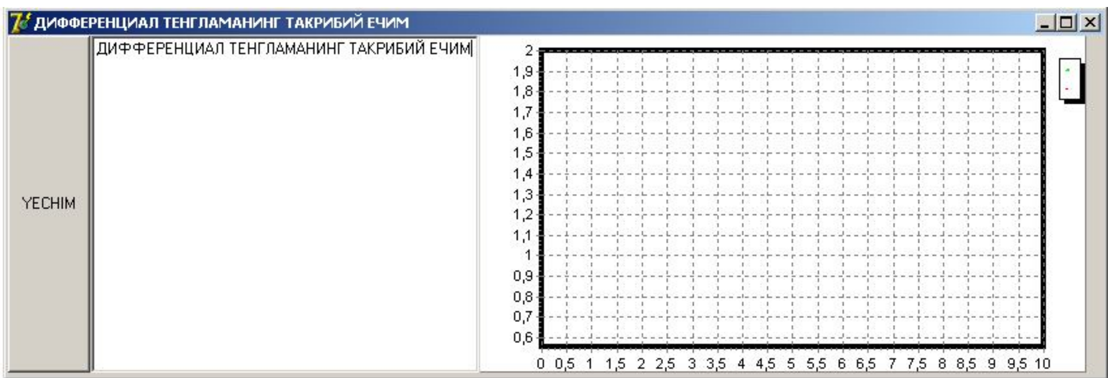

Figure 1

Using this program, you can solve arbitrary differential equations on the conditions that give them. The Delphi 7 programming language in solving the differential boundary value method:

It is possible to check that the boundary issue is clearly understood

$$y(x) = x^3 + x^2 \quad x + 1$$

have a solution. The following table gives the exact solution of the boundary problem in (1.7), (1.8).

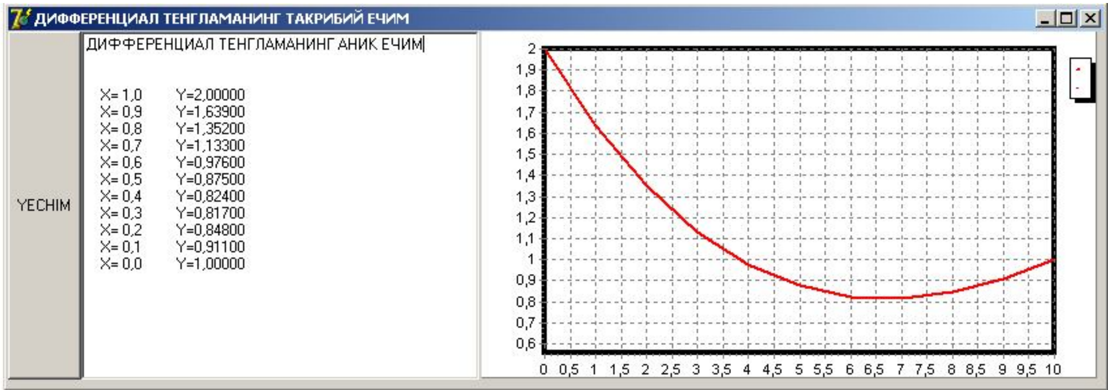

Figure 2

The following table presents an approximate solution to the boundary value problem (1.7), (1.8) using the differential sweep method.

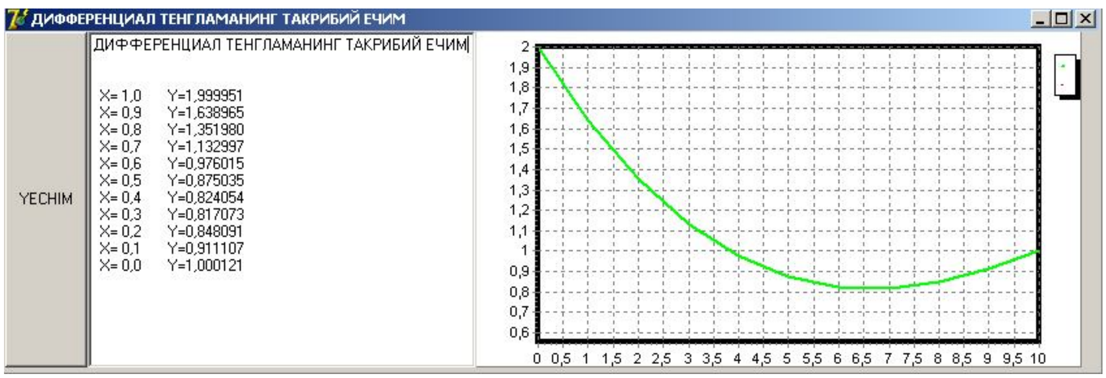

Figure 3

As shown in Figure 3, the solution to this problem using the Delphi7 programming environment is not only a differential process method, but also takes into account boundary conditions. If the actual process in the question under consideration can be expressed with sufficient accuracy through a mathematical relationship, this problem can be solved by constructing a mathematical model. The solution to this problem in this method is called the process of mathematical modeling. The implementation of these tasks using the Delphi7 programming environment allows you to control the modeling process directly in the visual environment.

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