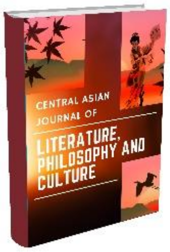

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The Place of Programming Language in Finding the Approximate Value of a Simple Differential Equality

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Abstract: The essence of this article is that in finding the approximate value of a given simple differential equation, the mathematical model of numerical solution of the problem and the structure of the software are considered.

Keywords: Differential, Cauchy problem, special product, approximate, model, program, algorithm.

Introduction

It is known that in solving many practical problems, its mathematical model is based on physical, mechanical, chemical and other laws. The mathematical model consists mainly of algebraic, differential, integral and other equations. Simple differential equations, on the other hand, can be used to solve many engineering problems. Therefore, it is important to find solutions of differential equations that satisfy certain conditions.

Differential equations are divided into two main classes: simple differential equations and special differential equations.

We will discuss the specific differential equations in more detail later.

Simple differential equations involve only one variable-dependent function and its derivatives, i.e. (1)

The order of the differential equations is called the highest order of the products participating in equation (1). If an equation is linear with respect to the function and its derivatives, it is called a linear differential equation.

The general solution of a differential equation is an arbitrary function that converts it to n and does not change in n. For example, the general solution of equation (1) consists of functions in the form. If certain values are given to the variables, a special solution is obtained from the general solution. To find a special solution, it is necessary to determine the corresponding values of the variables. To do this, we must have additional conditions that satisfy the solution. If the differential equation is n-order, then so many additional conditions are needed to find a single special solution.In particular, it is sufficient to give 1 additional condition to find the invariance in the general solution of the first-order equation ().

Given the additional conditions, there are two types of problems for differential equations:

1) The Cauchy issue;

2) Boundary issue.

If additional conditions are given at the point, the problem posed by solving the differential equation is called the Cauchy problem. The additional terms in the Koshi case are called the starting point and the point is the starting point. There are graphical, analytical, experimental, and final methods for solving simple differential equations.

In analytical methods, the solutions of differential equations are determined by definite formulas.

In the experimental methods, the differential equation and the additional conditions are simplified to this or that degree, and the problem is easily solved.

In the latter case, the solution is not analytical, but rather in the form of a table. Of course, in this case, differential equations can be replaced by discrete equations. As a result, the solution obtained through the latter methods is also experimental.

In general, since the possibility of finding solutions to simple differential equations using analytical methods is very limited, in practice most of them are considered practical with the help of finite methods.

Euler's method. Suppose the solution has a second-order continuous product, or the function has a first-order product. In that case, based on Taylor's formula

$$u(x+h)=u(x)+u'(x)h+u''(x+c_1)h^2/2, \quad 0<c_1<h$$

Also, $u'=f(x,u)$ given that this is the case

$$u(x+h)=u(x)+hf(x,u)+0(h^2)$$

we come to terms. $x=x_i, \quad x_{i+1}=x_i+h$ that is to say

$$u(x_{i+1})=u(x_i)+hf(x_i,u_i)+0(h^2), \quad i=0,1,....$$

There is an infinitely small amount of unknowns in this relationship $0(h^2)$.

We leave

$$u_{i+1}=u_i+hf(x_i,u_i), \quad i=0,1,....,n-1. \tag{2}$$

it and come to a relationship, here u_i the solution of the recurrent formula of numbers (2) is obviously $u_i \neq u(x_i)$, that is u_i are $u(x_i)$ their approximate values are found. Let us consider the problem of finding the approximate value of the application of the Euler method on the basis of the above-mentioned law on the basis of a clearly given example. The condition of the matter $f(x)=x^2+u^2, \ u(0)=0, \ n=10.$ we create a mathematical model and algorithm for solving the given simple differential equations on the basis of the above laws. On the basis of the constructed algorithm we create software.

C ++ Builder 6 programming language was used to create the program. When you start the program, the main form will appear on the screen and it will look like this:

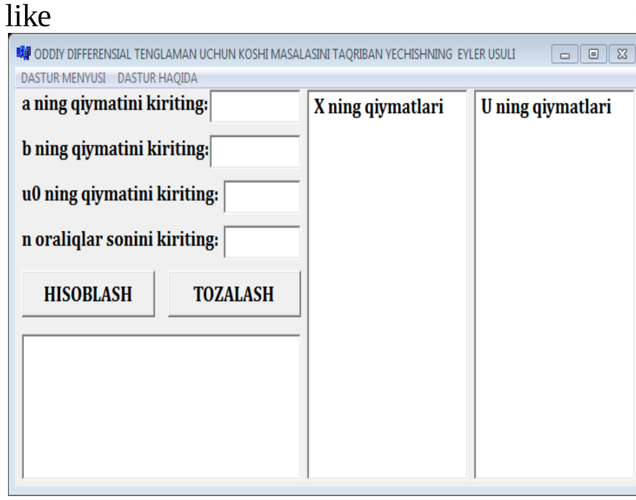

Figure 1. Software interface

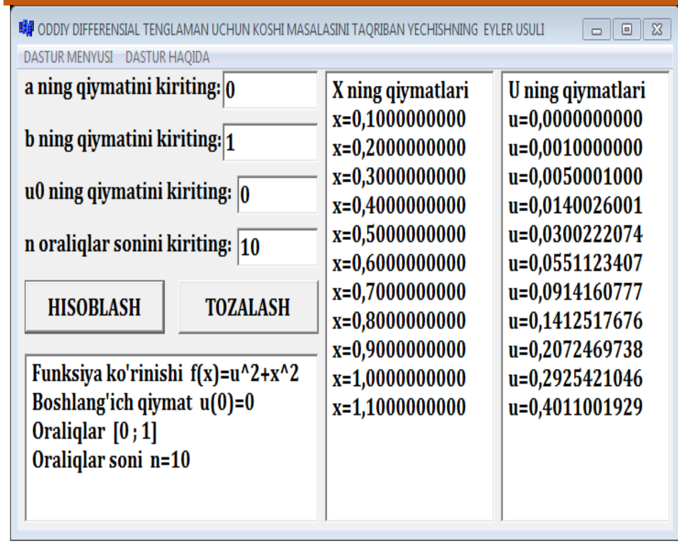

Figure 2. Approximate values of the function using the entered constants

In conclusion, it should be noted that a mathematical model was built on the basis of the given formulas. An algorithm was created based on the built mathematical model. Based on this algorithm, the Euler method of solving the Cauchy problem for simple differential equations was solved. Approximate results were obtained using constants given using software to solve the problem numerically. In general, since it is very rare to find solutions of simple differential equations using the analytical method, in practice it is often popular to approximate them using numerical methods. Using software designed to solve a problem numerically, an easy and quick approximate solution of similar simple differential equations can be found.

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