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ALGORITHM OF LINEAR, BRANCHING AND ITERATIVE PROCESSES FOR THE PROBLEM

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Abstract:
Algorithms for solving problems and their processing in a linear, branching and iterative way are presented in the article.

Keywords: Algorithm, linear, branching and iterative.

Introduction

Any complex algorithm can be described using three basic structures. These are sequence, branch and repeat structures. Algorithms of linear, branching and repetitive calculation processes can be created based on these structures. In general, algorithms can be conditionally divided into the following types:chiziqli algoritmlar:
branching algorithms;
iterative or cyclic algorithms;
nested cyclic algorithms;
recurrent algorithms;
Algorithms with unknown number of iterations;
successive approximation algorithms.
Algorithms consisting of only sequential operations are called linear algorithms. A sequence structure is used to represent such an algorithm. The action performed in the structure is indicated by the corresponding form. The general structure of the block diagram of linear algorithms can be expressed as follows:

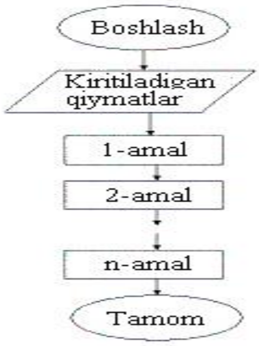

Figure 1. The general structure of the block diagram of linear algorithms

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Branching algorithms. If the calculation process is continued on different branches depending on the fulfillment of a given condition, and each branch is executed only once during the calculation process, such calculation processes are called branching algorithms. A fork structure is used for branching algorithms. A branching structure ensures that only one of the specified branches is fulfilled depending on the fulfillment of the given condition.

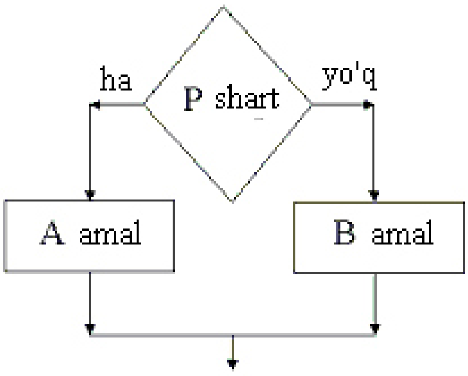

Figure 2. Overview of networking.

Given condition is represented by rhombus, r-given condition. If the condition is met, action a is performed on the "yes" network, if the condition is not met, action b is performed on the "no" network.
As a typical example of a branching algorithm, consider the following simple example.
1- Example: Depending on the value of the given x, if it is positive, then the value of the function $y=x^2$ on the network, otherwise
$y=-x^2$ is the value of the function

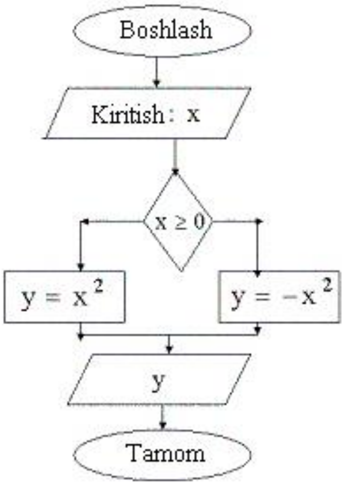

Figure 3. Algorithm for calculating the value of a function in the form of an interval

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Iterative algorithms. If a certain part of the sequence of actions necessary to solve a problem is repeated many times depending on a parameter, such an algorithm is called an iterative algorithm or cyclic algorithms. As a typical example of iterative algorithms, we can usually consider the processes of calculating the sum or multiplication of rows. Let's create the algorithm for calculating the sum below.

$$S = 1 + 2 + 3 + \ldots\ldots\ldots + N = \sum_{i=1}^{N} i$$

To calculate this sum, we take S=0 at i=0 and calculate S=S+i at i=i+1. Here, the sum for the first and second steps is calculated, and in the next step, the parameter i is increased by one again, and the next number is added above the previous sum S, and this process is continued in this order until the condition i<N is satisfied, and the result is the sought sum we will have now. These ideas can be expressed as the following algorithm:

Let N be given,
let i=0,
Let S=0,
let i=i+1,
Let S=S+i be calculated,
check i<N and if this condition is met, return to line 4, otherwise go to the next line,
Print the value of C.

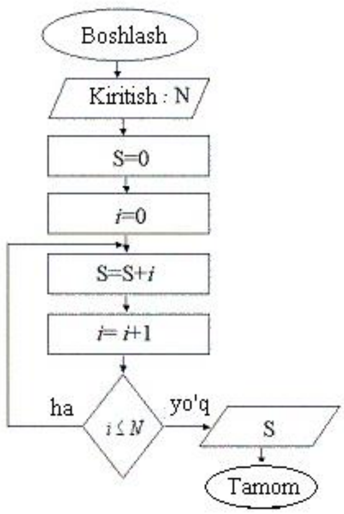

Figure 4. Algorithm for calculating the sum of numbers from 1 to n Suppose n is an arbitrary number

$$S = x_1 + x_2 + \cdots + x_n = \sum_{i=1}^{n} x_i \quad (1)$$

Let the sum be given. The generality of the sum given by formula (1) is that if we replace n with 100 and x_i with i from (1),

$$S = 1 + 2 + \cdots + 100 = \sum_{i=1}^{100} i \quad (2)$$

Sum in the form, or if we replace x_i with i^2,

$$S = 1 + 2 + \cdots + n = \sum_{i=1}^{n} i^2 \quad (3)$$

If we replace n with m and x_i with i/(i+1) in the form of

$$S = \frac{1}{2} + \frac{1}{3} + \cdots + \frac{m}{m+1} = \sum_{i=1}^{m} \frac{i}{i+1} \quad (4)$$

In the form, or if we replace x_i with $[(z_i + y_i)]^2$,

$$S = (z_1 + y_1)^2 + (z_2 + y_2)^2 + \cdots + (z_n + y_n)^2 = \sum_{i=1}^{n} (z_i + y_i)_2 \quad (5)$$

A sum of the form is formed.

So, the sum given by the formula (1) is in general form, and it is possible to create different sums by changing n and x_i in it. Also, if we know how to create the algorithm of sum (1), then we can make the algorithm of the sum in a different form by making appropriate changes in the algorithm. We create the algorithm of the sum given by the formula (1). For this purpose, we determine the values that we need to enter into the computer's memory. To calculate the given sum, it is enough that we are given the value of (i=1,2,3,...,n).

Multiplication calculation algorithm. One of the most common examples in the programming process is the creation of multiplication algorithms.

Let's assume

$$S = x_1 * x_2 * \ldots * x_n = \sum_{j=1}^{n} x_j \quad (6)$$

Let the multiplication be given. As in the calculation of sums, by choosing n and x_i , we can create multiplications of different forms. For example, let n be 10 and x_i be i,

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$$S = x_1 * x_2 * \dots * x_n = \sum_{j=1}^{n} x_j \quad (7)$$

We can create multiplications of the form. If we know how to create the algorithm of multiplication (6), then we can create algorithms of multiplications of other forms by making appropriate changes in the algorithm.

Iterative cyclic algorithms. Sometimes, iterative algorithms depend on multiple parameters. Such algorithms are usually called nested algorithms.

As an example, let's consider the problem of calculating the sum of the elements of the nxm-dimensional a_{ij} -matrix

$$\boldsymbol{S = \sum_{i=1}^{n} \sum_{j=1}^{n} (i + j)^2}$$

To calculate this sum, it is necessary to calculate the product of j at each value of i and then successively add to the sum. This process is shown in the following block diagram. Here the i-outer loop is used for addition, and the j-inner loop is used for multiplication.

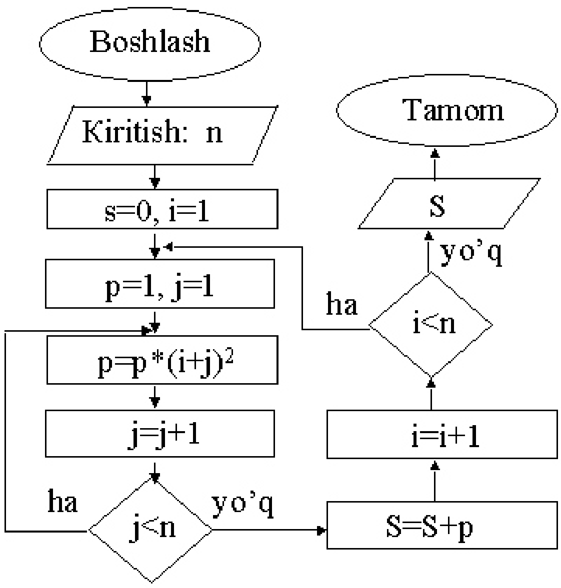

Figure 5. Block diagram of nested loop algorithm.

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