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Simulation modeling in the study of the content line "Algorithmic and Programming" in the subject "Informatics and ICT" educational institutions

The main purpose of studying the subject „Informatics and ICT" in educational institutions is to develop the Information Culture of the trainees. Under the information culture of students, we understand the level of personality development, the development of algorithmic, operating modes of thought, the ability of the individual to the system analysis and synthesis. These skills are common cultural, educational value, they are necessary in today's information society, every person, regardless of their professional activities. Further development of the school subject „Informatics and ICT", we see a stronger focus on general education function of the course, its capabilities to address common problems of education, upbringing and Development students. When considering the methodological aspects of studying the training material content line, „Algorithmic and Programming" for achieving the objectives of the study of the subject „Informatics and ICT", it is desirable to consider the students, along with obschepedagogicheskih technology training, the subject of technology education, such as, for example, simulation computer program execution , executor of the programs.

Simulation modeling of computer program execution

The basis of this technology is a simulation or simulation and gaming simulation, ie reproduction in terms of training with some measure of the adequacy of the processes occurring in the real system. The purpose of the use of simulation technology at this stage of the study of science: to develop a representation of learners about the nature of the formal execution of algorithms, fixed in the minds of students an understanding of the principle of single-step execution of a formal program for its computer records, building techniques of mental activity and cognitive development of students. The method: set fixed values of the arguments, and the program is executed subject to the directives prescribed by its commands, and the values of all variables derived from the performance of the team are committed.

We propose in this line of content to consider two types of simulation, depending on the method of fixing the values of variables derived from the execu-

tion of a command: Modeling of computer memory, modeling with the use of visual protocols. Each method, in our opinion, deserves to use in the process of learning science.

Simulation of computer memory. Process modeling using computer simulation of recording in memory the values of variables used in the program after the execution of each step of the program is as follows: computer memory is represented as a blackboard or a sheet of paper on which you can write to, read, erase, write again. Students should be reminded that the value of each variable in a computer is stored in a single cell, and each value retains its value until it is assigned a new value. Location to be allowed in the computer memory for the values used in the program, represented by a rectangle, from top to write the values for which the algorithm is given this area. Location to be allowed in the computer memory for each value, as represented by a rectangle. Type the name of the values indicated above the rectangles selected, and the values, if defined, is written inside the rectangle. If the value is not defined, then the rectangle is not necessary to write anything. If when you run the program changes the value of a quantity of the algorithm, then in the box that corresponds to this value, new value is entered. Sequentially executed commands are written between the figures, instead of variable names in expressions indicating their value for verifiably condition in parentheses is written the value of this condition (true/false or yes/no).

The process simulation computer program execution using the illustrative protocol is as follows: to log the execution of the program is the right of entry program, so students must leave at least half a page to the right of a free (for manual versions). Test conditions in the composite results of the commands and command assignments should be marked in those rows where the commands are written. Crawling out of the team and the algorithm should be celebrating the arrows for clarity. The relevant lines of the protocol should be written: $d1 = 0$, $x1 = 1$, since it is a statement of fact, the result of command execution, not a command for execution. In terms of test lines instead of variable names are written to the value of verifiable condition in parentheses is written the value of this condition (true/false or yes/no), for example, it checks the condition $D > 0$, the performance of this line write $a > 0$? (Yes) instead of D is substituted its value. In the performance of loops in the program, if the number repetition cycle is large, 2.3 is recommended that you repeat, including the last turn of the cycle.

Example 1. Write a program to sort an array of integers by a simple exchange. Execute the procedure (sort) Sort the array a simple exchange, using the method of modeling the execution of the program the computer in the form of visual protocols, for $n = 3$ and a [1] = 45, a [2] = 32, a [3] = 5.

Enforcement procedures sorting an array of method-radiative transfer

Procedure sort							
Procedure *sort* (var a:tmass); **Var** i,j,b:byte; **begin** for i:=2 to n do	n=3, a[1]=45, a[2]=32, a[3]=5 i=2, 2≤3 (yes)			i=3, 3≤3 (yes)		i=4, 4≤3 (no)	
begin for j:=n **downto** i **do**	j=3, 3≥2 (yes)	j=2, 2≥2 (yes)	j=1, 1≥2 (no)	j=3, 3≥3 (yes)	j=2, 2≥3 (no)		
if a[j]<a[j-1] **then**	5<32 (yes)	5<45 (yes)		32<45 (yes)			
begin b:=a[j]; a[j]:=a[j-1]; a[j-1]:=b **end**;	b=5 a[3]=32 a[2]=5	b=5 a[2]=45 a[1]=5		b=32 a[3]=45 a[2]=32			
end;							
end;							

When using simulation used a computer program complements intellectual development occurs learners, building techniques of mental activity, in particular, the methods of the imagination. Students intensify knowledge of functional assignment of components that make up the computer, under the direction of master teachers way to simulate the execution of the program PC – a PC simulation of memory, then execute the program using visual protocols, representing mental scheme of passing of information to the PC in the execution of commands of the program. At first, students master a clear reception of the execution of the program, then they gradually learn the transfer of visual techniques in the mental sphere.

Simulate the process of program a computer, students can both manually and using the software. In studying the educational material content line, „Algorithmic and programming", it is desirable to offer students do projects on „Simulation", using the program to simulate the performance of the PC software: graphics and text editors, spreadsheets, system programming system for creating presentations etc.

Using simulation to explain the ideas upon which the algorithms for solving practical problems.

Example 2. Write a program to streamline elements of the array a [1: n] of integers in ascending order using the Sort by simple inclusions.

To clarify the idea of constructing an algorithm for solving the problem, representations, we propose to use the simulation process of sorting array elements, for example, in VBA for Microsoft Excel.

A fragment of the program (a procedure of determining the number k – the position of the array element a [i] in the ordered sequence of elements) and the appearance of the screen at a fixed time of execution of the program the computer are given below.
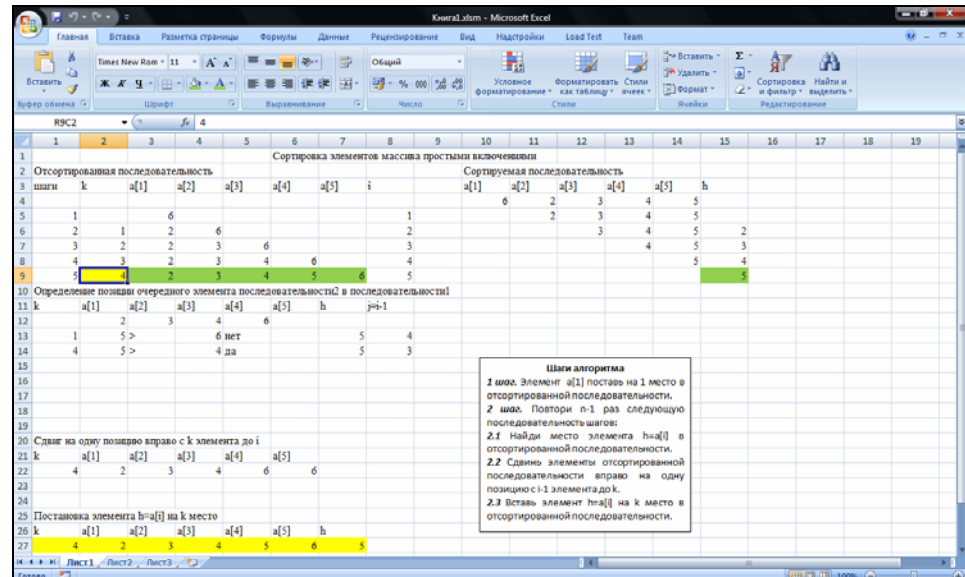
The screen at a fixed time of execution of the program the computer
The procedure for determining the number of k – the position of the array element a [i] in the ordered sequence of elements

```
Sub Place (i)
Dim z As Integer
Range („A13: H17”). Delete (1)
z = 13
Cells (z, 1) =
Cells (z, 8) = i – 1
For q = 1 To i
  Cells (12, q + 1) = Cells (i + 3, q + 2)
Next
While Cells (z, 1) = 1 And Cells (z, 8)> = 1
  Cells (i + 3, 2). Interior.Color = xlNone
  MsgBox („We are looking for a place element h = a [„ & i & „] =” & Cells (i + 4, 15))
  Rows („10:30”). Interior.Pattern = xlNone
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 Cells (z, 7) = Cells (i + 4, 15)
 Cells (z, 7). Interior.Color = 65 535
 Cells (z, 2) = Cells (z, 7)
 Cells (z, 2). Interior.Color = 65 535
 Cells (z, 3) = „>”
 Cells (z, 3). Interior.Color = 65 535
 Cells (z, 4) = Cells (12, Cells (z, 8) + 1) 'a [i]
 Cells (z, 4). Interior.Color = 65 535
 If Cells (z, 2) <= Cells (z, 4) Then
  Cells (z, 5) = „no” Cells (z, 5). Interior.Color = 65 535
  z = z + 1
  If Cells (z – 1, 8) – 1> 0 Then
   Cells (z, 1) = Cells (z – 1, 1)
   Cells (z, 1). Interior.Color = 65 535
   Cells (z, 8) = Cells (z – 1, 8) – 1
   Cells (z, 8). Interior.Color = 65 535
                    Else
   MsgBox („Found the place of an element”)
   Cells (i + 4, 2) = Cells (z – 1, 1)
   Cells (i + 4, 2). Interior.Color = 65 535
  End If
                  Else
  Cells (z, 5) = „yes”
  Cells (z, 5). Interior.Color = 65 535
  Cells (z, 1) = Cells (z, 8) + 1
  Cells (z, 1). Interior.Color = 65 535
  MsgBox („Found a place that element”)
  Cells (i + 4, 2) = Cells (z, 1)
  Cells (i + 4, 2). Interior.Color = 65 535
 End If
Wend
End Sub
```

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Abstract

The article describes the experience in the use of simulation computer programs for the implementation of information culture of students in the study of the content line, „Algorithmic and programming". The aims and objectives of the use of simulation at the present stage of studying computer science. Examples of the use of information technology in the study of the content of this line.

Key words: information culture, simulation modeling, algorithmic thinking, operational thinking, modeling, computer memory, visual modeling using the protocols, methods of mental activity.

Имитационное моделирование при изучении содержательной линии «Алгоритмизация и программирование» в предмете «Информатика и ИКТ» общеобразовательных учреждений

Резюме

В статье изложен опыт использования имитационного моделирования исполнения программ компьютером для формирования информационной культуры учащихся при изучении содержательной линии «Алгоритмизация и программирование». Определены цели и задачи использования имитационного моделирования на рассматриваемом этапе изучения информатики. Приведены примеры использования информационных технологий при изучении данной содержательной линии.

Ключевые слова: информационная культура, имитационное моделирование, алгоритмическое мышление, операционное мышление, моделирование памяти компьютера, моделирование с использованием наглядных протоколов, приёмы умственной деятельности.

Modelowanie symulacyjne w badaniu zawartości poleceń algorytmicznych i programowych w ramach przedmiotu „Informatyka i technologie informatyczne" w placówkach oświatowych prowadzących edukację w zakresie Informatyki i technologii informacyjno-komputerowych

Streszczenie

W artykule opisane zostały doświadczenia autorów w wykorzystaniu komputerowych programów symulacyjnych do rozwijania kultury informacyjnej studentów z wykorzystaniem badania zawartości poleceń algorytmicznych i programistycznych.