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Aspects of teaching Visual Basic for Application for students of natural scientific specialties

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Abstract

The Department of Computer Sciences of the Kazan State Power Engineering University has a long-term experience in the successful teaching of computer science and programming fundamentals for first-year students of natural scientific, technical and humanitarian specialties on the basis of the Visual Basic for Application (VBA) language, which is part of the Microsoft Excel spreadsheet. VBA is a language that allows students concentrating their attention on the understanding of the principles of algorithmization, to form the basic programming skills of both simple and complex problems. Methodological justification of the effectiveness of teaching of VBA is presented in the report.

1. Introduction

In a course of laboratory works on the subjects "Computer sciences" and "Information Technologies" the teachers of the department, realize the tasks of developing skills for competent work with Windows Office applications. After mastering the work with standard tools of these applications, in the course of learning the transition to building macros is carried out, first of all, in the environment of the VBA editor [1] built into MS Excel. There are no other options for creating scripts (macros) for office programs. On the senior courses there is a transition to the study of C #, C ++, and high-level languages of technical calculations - Matlab, etc [2].

The development environment consisting of the Microsoft Excel spreadsheet processor and the built in VBA language proved to be successful for building your own applications and projects, mostly of a calculated nature. During the first year of teaching, students learn to program, first, in a frame of procedural approach, then of structural, and finally use elements of object-oriented programming, in particular, when building user forms for their own applications.

2. Possibilities of the VBA language, important in the learning process

A problem of many Russian universities is that students come to the first year of the university with different levels of computer science: the school curriculum at the computer science course is not standardized, therefore, someone paid more attention to the standard means of working with a computer, someone to programming, but herewith the languages are also different. Most students come with initial knowledge of Pascal. Our experience shows that VBA is the golden mean, which allows to teach strong students even greater, weaker - to pull up to the required level of knowledge. The VBA tools proved to be attractive for teachers of natural scientific departments - astronomy, physics, chemistry, geophysics, etc.: the students who know the tools of this language effectively perform laboratory works, where a software for processing data and graphical presentation of results are required. For sociologists and economists, an irreplaceable application is Excel, based on which it is possible to create simple databases, use built-in statistical and financial functions.

1.1 Why VBA, not Pascal?

Pascal has a complex syntax. Many students, confusing in the complicated punctuation of the language, do not have time to go to debug their programs and bring the skills of algorithmization to the required level. Some problem is the rigid requirements for the types of variables that are a definite obstacle to the first steps in programming:

students study the internal representation of numbers in a computer, as a rule, later than the basics of programming.

The next problems arise when passing to the structured programming, when it is necessary to break the algorithm into modules. The passing data from one program to another through a list of formal parameters cause difficulties for many students. In this situation, it is better do not distract student's attention to the compulsory correspondence of data types. It is more important to teach how to break the algorithm into modules and to establish correct communication channels between them. VBA with its Variant-type data by default makes it possible to focus the student's attention to the essence of the algorithm, and the interpretation mode allows correcting some logical errors during the program operating without interrupting it and without wasting valuable time to re-input the initial data. The syntax of VBA is extremely simple and the logic of writing operators is close to human logic.

1.2 Diagrams and Macro Recorder

Often a specialist needs to visualize the results to assess their quality. To do this, you need graphics applications where you can export the results to build charts and diagrams. Using MS Excel and VBA eliminate this defect. When the data of experiment and of corresponding theoretical calculations are output onto a WorkSheet, a user can immediately build a different kind of corresponding diagrams using standard tools for formatting axes, markers, etc. If these operations are the same type and are repeated many times, then they can be automated using the Macro Recorder.

Macro Recorder is a tool for automatically recording, for example, some manual operations in the form of a program on VBA. The principle of its operation is similar to the principle of a tape recorder. The result is a program written by VBA-operators that displays all your actions, for example, when formatting the chart. From this program, a student can make a flexible tool for optimizing his work.

3. Application VBA for scientific work

Using VBA, we, together with students, often carry out quite serious scientific work. So on EGU-2009,

our students presented the report on the creation of a database about the Moon and its geophysical properties [3]. As a result of our joint work, the software package was created to simulate the planned observations from the lunar surface. The package is based on the integration of several Excel WorkBooks, and the implementation of mathematical calculations by VBA codes.

4. Summary and Conclusions

VBA, on the other hand, has a set of convenient defaults and simplest syntax that allows focusing a student's attention on the features of the algorithm, and, on the other hand, the capabilities of VBA include all the necessary arsenal of tools for programming tasks of any level of complexity, including serious ones scientific projects. VBA is most effective in the Excel application; the presence of Macro Recorder allows making the automatic many time-consuming operations. VBA is the closest relative of VB.NET, which ranks 6th in popularity in 2018 by the TIOBE index.

Acknowledgements

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