

The Support of the Applied Mathematics by Chosen Programming Languages

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Abstract

The paper deals with creation of the inter-subject relations between teaching of the Programming Languages at the first degree of study and the Applied Mathematics at second degree of study at the Faculty of Manufacturing Technologies.

The chosen example of the programmed application shows students basics of algorithms and, on the other hand, using in Applied Mathematics.

1 Introduction

Recently, there are more technical universities in Europe or in the world that possess or develop virtual laboratories. Thanks to web technologies these laboratories are accessible and they make the e-education and the simulation of a various actions online possible. Laboratories are also suitable for such subjects where either the simulation of control of real process in technical practise or the initialisation of physical models or the online connection with the laboratory equipment is required.

We can say the function and the magnitude in the natural science education are increasing with increasing information technologies and multimedia applications. Therefore the conditions for students should be improved so that acquired knowledge and the Applied Mathematics skills and the mathematics modelling of the technical processes could be applicable in practise. With respect to this modernisation of environment where teaching process is performed should be achieved. Generally, the main aim is to build the virtual laboratory for new compulsory subject Applied Mathematics at the second and the third degree at study program Manufacturing Technologies. [5]

By using of the blended learning support we will improve teaching process and will make the individual study more efficient. Blended learning is a custom approach that applies a mix of training delivery options to teach, support, and sustain the skills needed for top job performance. With blended learning, the tried-and-true traditional learning methods are combined with new technology to create a synergistic, dynamic learning structure that can propel learning to new heights. [2]

By implementation e-support into public sources we can make education accessible to all students, handicapped students and other interested person.

On the other hand the subject like the Applied Mathematics is benefits from practical skills on computers, laboratory equipments and mathematical models. For that reason, inter-subject relation with programming languages is very important.

2 The possibilities of using Delphi

The creation of algorithms by chosen programming language for subject Applied Mathematic is a part of the prepared blended learning support. These practical tasks are also included with aim to enhance interest of students in numerical problems. The representative problems deal with f. e. the bioservosystems (particularly, research of the pneumatic artificial muscles), the optimisation of the manufacturing process, acquiring of parameters for the machining process etc.

The problem presented bellow shows the possibilities of using The Delphi and, the same time, implements one of the elementary numerical algorithm – The Mean Square Methods. [3]

The other advantage is that students obtain one of the most essential skills. Becoming familiar with the problem student will be able to: designed correct declarations of variables (*private*, *public*, *local*), basic mathematical operation, conversions among variables. Secondly, there are sum of the finite number of values and condition *If.. then.. else*. Next, we can demonstrate *Val()* procedure, solving of the exceptions and fault, using *ApplicationMessageBox*, *ShowMessage* procedures, etc. And finally, it is relevant example of user-friendly application, *Forms* use, and other components (*Label*, *Edit*, *RichEdit*, *Button*, etc.) use. [1, 4]

3. The example of the relevant application

The predecessor of the application is a common notepad. The final results can be displayed on the text window or by *ShowMessage* window (Fig. 1)

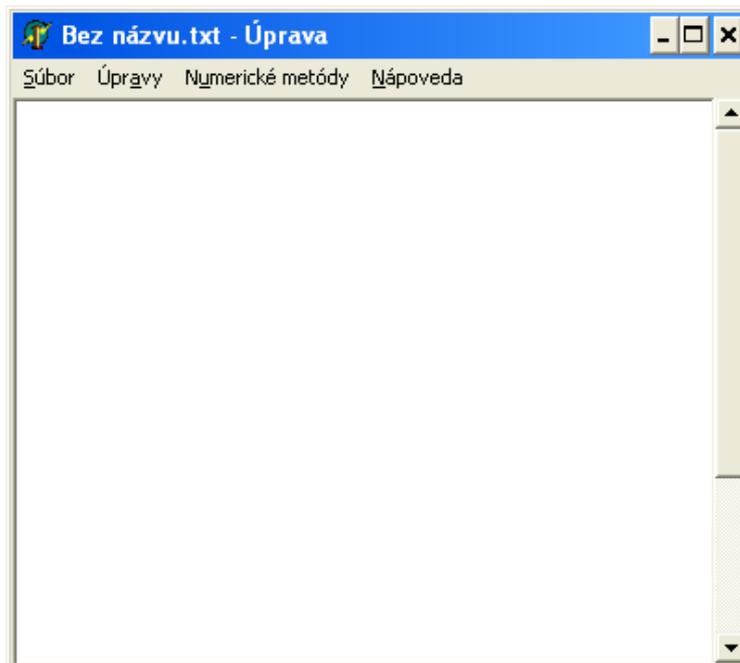


Figure 1. The main application window.

The main menu consists of the common items such as items File: *Nový*, *Otvoriť*, *Uložiť*, *Uložiť ako*, *Tlač*, *Koniec*. Moreover, there are also includes items that correspond to the numerical methods: *Aproximačné metódy*, *Nelineárne rovnice*, *Sústavy nelineárnych rovníc*, *Určitý integral*, *Diferenciálne rovnice*, which will be taught at the subject Applied Mathematics in the future. (Fig. 2)

The main part of the application window is text component RichEdit where results will be written. The file with results can be saved as *.rtf or *.txt file, or can be printed.

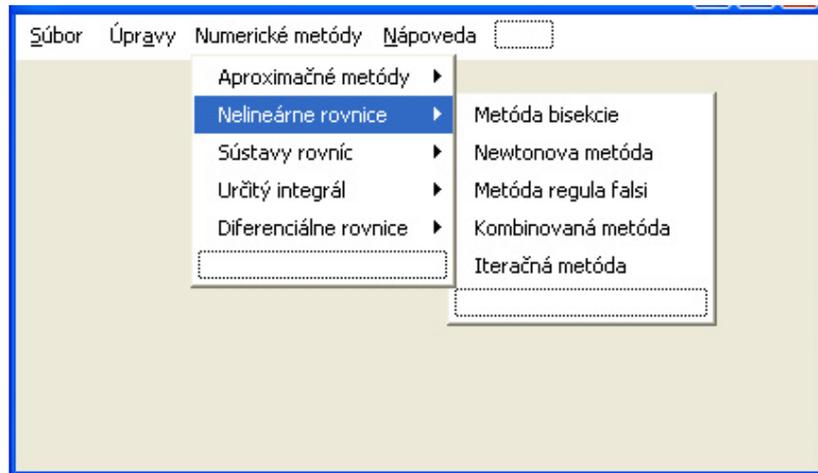


Figure 2. The application main menu created by the component MainMenu

Let me introduce working how the Least Square Method application operates. As you can see on figures, the initial values are number of nodal point n and vectors (x_i, y_i) . After clicking at the item *Metóda najmenších štvorcov* user inserts vectors (x_i, y_i) by the button *Next*. After inserting the last vector the user clicks at button *Count* (Fig. 3, Fig. 4).

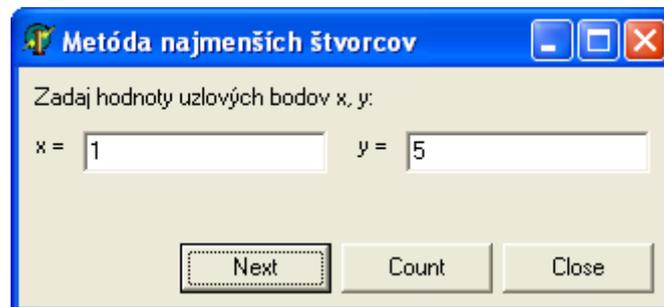


Figure 3. Inserting initial vectors (x_i, y_i) by component Edit.

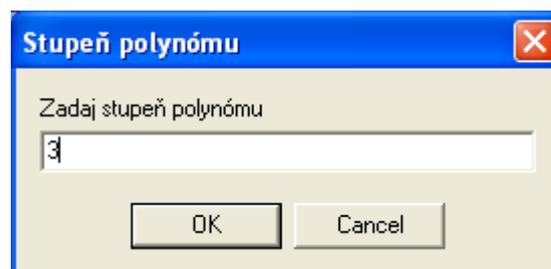


Figure 4. Inserting polynomial degree by procedure InputBox().

If the solution does exist, it will be written at the text window or by ShowMessage() procedure. The user environment can be designed various ways. (Fig. 5).

At the end, we can use this task to demonstrate the choice of exceptions and faults. Problem has solution for random vector (x_i, y_i) . To get the result these variables should be settled:

- a) the complete vectors (x_i, y_i) ,
- b) the real numbers (not char or string),
- c) the polynomial degree will be integer from interval $(0, 4)$.

In cases these condition a) – c) be not input, the program states relevant exceptions. (Fig. 6)

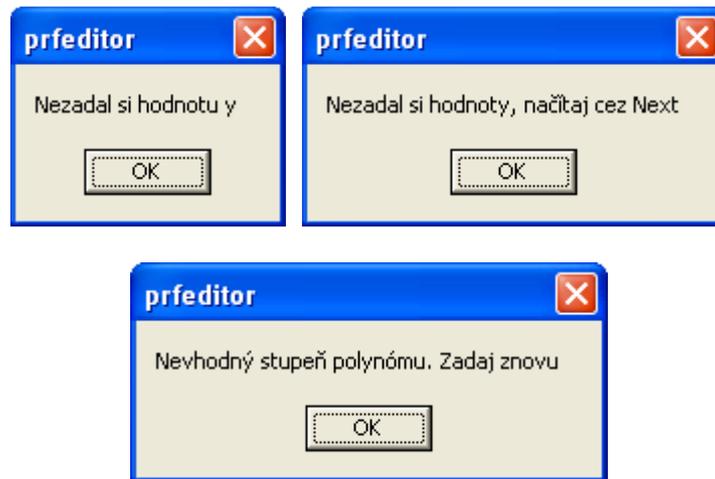


Figure 6. The exceptions for cases a) - c). There is used Val()procedure and ShowMessage().

4. Conclusions

The paper demonstrates the inter-subject relation between the subject Applied Mathematics and the subject Programming Languages. Firstly some algorithm can be prepared in Delphi either individual assignment or school project or web project. Later they can be used as support at the Applied Mathematics. The shown tasks deals with the Least Square Method because of there are used essential programming knowledge and skills. The Application can be implemented to public sources as the part of blended learning support of ne compulsory subject.

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