CREATION OF SLOVAK USER INTERFACE FOR THE QTIPLOT SOFTWARE

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Summary. This article is aimed at creating a summary of selected commercial and freeware software, main task of which is to work with data, their processing and visualization. The article includes an explanation of the concept of visualization, defining basic types of software, description of programs, their main utilization possibilities and basic functions and options. Great attention is devoted especially to the open-source application QtiPlot and its detailed description.

Keywords: QtiPlot; graphs; visualization; open-source program

1. INTRODUCTION

At present more and more different programs for data processing and visualization have been used. These programs may be from the base aspect commercial and freely available. The main difference is in the price and in offer functions of the program.

Data visualization deals with digital processing and presentation of the abstract information that may be obtained by measurement, analysis or by statistical methods. The visual appearance of the processed information is for humans more natural and easier to understand than the numerical expression while a man bring closer to the problems of themes, helps to detect and understand the relationships between data and their properties

In the past visualization was an instrument which was used especially almost exclusively in the academic environment. Development of information technology has caused, that the visualization became interested also people from other areas of public life. [1]

For this reason, new programs for processing and visualization with ever better offer features and graphics have still arisen and developed. In the article are mentioned only selected programs, while most attention is paid to the QtiPot program.

2. NATURE OF VISUALIZATION

The main objective visualization is to process complete data and then display them in a visual form, which acts on humans more natural than the numerical expression. Also serves for better understanding.

Moreover, the high density information display representation allows to show a large amount of data in less space. It enables man to obtain an overview of the processing subject, recognize patterns, characteristics and relationships between data. The result of this activity is to understand the significance that abstract data represent. [1]

In information technology and creation of software from the beginning these programs have found their place for scientific purposes. Initially, on this purpose were used only programming languages but with the time, separate programs and later specialized programs started to be developed, which currently already exist in large quantities. They are primarily used for mathematical and statistical calculations, thereby greatly facilitating the processing, evaluation and visualization of data. As an alternative to the commercial financially demanding licensed programs, the freelly available

programs started to be developed, which in some cases reach a high level and are able on adequate level to replace paid programs. [2]

3. BASIC TYPES OF SOFTWARE LICENCES

There are different kinds of software liocences. Basic types include:

- commercial software,
- open source software,
- freeware,
- shareware,
- proprietary software. [3] [4]

Commercial software can be obtained corresponding license purchase. It entitles the user to use software certain way. Examples include the installation of a number of computers, etc. [5]

The term open source software explains the application, which is spread with the preservation of certain rights and freedoms for the end user. These include the right to run the program for any intention, to study the functioning of the program, to redistribute copies based on free will, improve the program and also to publish these improvements. [6]

Freeware is software that is provided free of charge, but here it is necessary to pay attention to a possible license agreement. The license contract can restrict use only for the purposes of a commercial nature. But this may be also a commercial software or shareware, where licenses allow touse programs in education for free. The difference against open source is that it's usually not longer available source code and the program is "closed".

Shareware is similar to classic commercial software, where is required for his use to pay. Usually it's a model, where it is possible to use software for certain time free. When this period expires, it is necessary to pay for another use. [5]

Another special kind of software is proprietary software. Proprietary software contains restrictions on its use and reproduction, usually enforced by the owner (Proprietary). Using, duplication or modification can be prevented with legal and technical means. [7]

4. OVERVIEW OF FREELY AVAILABLE AND COMMERCIAL SOTWARE FOR DATA VISUALISATION AND PROCESSING

4.1 Commercial programs

Origin is a software application. It includes powerful tools for complex data analysis, including peak analysis, signal processing and statistics. In order to analyze the data more efficient, Origin supports many ordinary formats for import data as well as export results. The application includes a workbook with multiple sheets and an integrated project explorer to facilitate the project organization. To streamline work procedures is the possibility of storing their workbooks as analysis templates for repeated use.

The program has available 70 types of different graphs. Application supports many popular types of 2D and 3D graphs and also special-graphs ((wind rose, ternary (including ternary-contour line), 2D vector and 3D vector and statistic graphs)). [8]

MATLAB is a programming language and interactive environment for data processing, data visualization, and numeric computation. It is used in signal processing and image processing, communications, control systems design, financial modeling and measurements, as well as analyzes, calculations for biological systems. [9]

It has enforcement in these areas: the mathematical calculations, option development of algorithms, data analysis, visualization, the use of science and engineering graphics, use in the

development of applications, including user interface, calculations in the field of engineering and engineering graphics, modeling, simulation and prototyping , supportive remedy in teaching technical subjects, mathematics, physics and etc. [10] [11]

GraphPad Prism application was originally designed for Experimental Biology in medical schools and pharmaceutical companies, .in currently is used in a much broader scale all sorts of biologists, as well as scientists from the department of social and physical sciences. The program is also widely used by undergraduate and graduate students.

The powerful combination of biostatistics, curves (nonlinear regression) and also scientific graphs- this is the main reason why the application GraphPad Prism is preferred choice many world universities, medical institutions, research institutes and pharmaceutical companies.

It combines scientific graphs, comprehensive compilation of curves (nonlinear regression), clear statistics and data organization. [12]

4.2 Non-commercial programs

Scidavis belongs to interactive programs intended mainly into the hands of scientists' research laboratories and people of similar professions or interests. The application allows you to analyze the measured data and portrays using them the related visualization.

Since this is a really professional instrument, offers a host of advanced features and capabilities, one example from others is expandability and the possibility of scripting.

SciDavis application is a free application that aims to analyze data and produce high quality graphs also adequate for publication. [13]

The **LabPlot** program is designed exclusively for KDE surroundings in Linux. It is a means to the implementation of various mathematical, physical calculations and simulations too. There is also support image processing, analysis of continuous data or, for example, also export data to SQL.

LabPlot is primarily intended for visualization, so graphs of functions, 2D and 3D applications mainly provides much more, for example reading multiple graphic formats and associated operations with image processing, analysis options, continuous data (noise reduction signal (de) convolution, Fourier transform , etc.), statistical functions, interpolation, regression analysis, etc. [14]

GnuPlot is a cross platform means of allowing easily create professional-looking graphs (2D, 3D and vector field). GnuPlot program is controlled by text commands. It will allow us to easily define your own functions. The same easy you can define a function and generate for example their graphs and graphs their share in one picture. Program can also load data from external files, and it ensures clarity and purity code. [15]

KaPiGraf is interesting project of Czech origin, in principle, provides the creation and visualization charts in a small (program has 1.3 MB), transparent and graphic simple environment, is focused on maximum efficiency work in creation demanding graphs with a huge amount of data, which is able process very quickly.

The advantage of the program is a free license of non-commercial use, and also to have a program always with you, because there is no need to install the application, it is sufficient to completely unpack the compressed package. [16]

The **SigmaPlot** software help you quickly create very accurate graphs most often columnar, line, and histograms.

SigmaPlot is a tool for simple and highly effective method for imaging, scientific data analysis and too creation of graphs with an intuitive interface and wizard technology, which is designed such that it allows the user to perform activities connected with the analysis and creation of graphs. It offers over 50 of the most common used statistical tests for scientific research, including guide "step by step". [17]

R Program is a free software tool for statistical computing and graphics visualization. This single letter is called environment and programming language simultaneously.

The options of program R includes hypothesis testing, calculation analysis of scatter (ANOVA), Weibull, Student and another divide, is too possible write your own scripts. Scripts can be loaded from a local disk or for example FTP. Furthermore, the program allows for rendering 2D and 3D graphing, determine descriptions of the graphs, to change colors, etc. [18]

Freely distributed application **Veusz** is a scientific tool for data processing and creation of graphs.The program provides a clear graphical interface, allowing data import, editing and creation a different types of graphs. Among the positive features includes the possibility of export creation of graphs to PostScript or PDF format. The program supports export graphics in SVG, EMF, as well as bitmap formats. [19]

5. UTILIZATION POSSIBILITIES OF THE QTIPLOT PROGRAM

QtiPlot is a program that runs under the operating systems of Linux, Mac OS and Windows. Only under Linux operating system are free all program options, and therefore it can be fully exploited. The program is distributed under the GNU GPL. The application is available in multiple languages. They are the following: English, Chinese, Czech, French, German, Greek, Italian, Japanese, Portuguese, Russian, Spanish, Romanian and Swedish. [20] The non-existence of the Slovak user interface lead to the idea to start to translate the original English interface to Slovak (see Fig. 1).

The program performs a two-dimensional graphical presentation of data sets and also serves to analyze these data. Application to a graphical representation of data stored in tables or also by means of analytic functions. This project has created Ion Vasilief in 2000 and just in the years 2000- 2005 he was the sole programmer of the program. Since 2006, other programmers joined the project and project hosted became BerliOS Developper. [21]

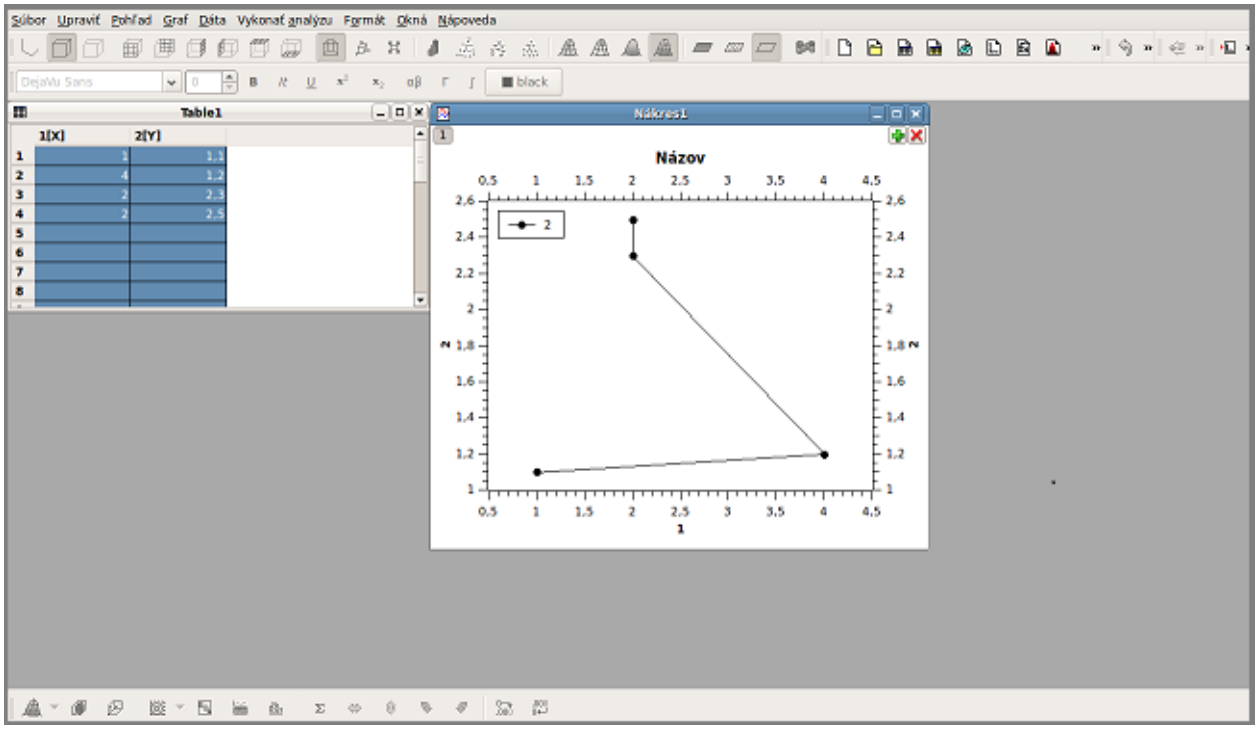

Figure 1 Translated program interface QtiPlot
Source: Own processing

Basic utilization possibilities of the QtiPlot software include:

- possibility to quantify the basic statistical data,
- creating of basic types 2D and 3D graphs,
- LaTeX writes support,
- export of the graphic into TeX,
- exportation into vector formats .svg .ps and .eps and also export to common bitmap formats,
- image analysis,
- testing of hypothesis using the ANOVA model, Student's t-test and the Shapiro-Wilk test,
- direct and backward Fourier transformation, further reduction of high frequencies (low pass filter) and also low frequencies (high pass filter), Savitzky-Golay method for performing smoothing noise,
- numerical integration, convolution and deconvolution, as well as differentiation,
- pre-defined functions (e.g. a linear relationship, normal distribution, Boltzmann distribution, Lorentz transformation ...) or user-defined dependencies, contains more senior transfer (multi-peak fitting), [22]

In applications there are also group functions for deduction values, deleting specific items, insert arrows, images or timestamp. An interesting feature is the option to set a transfer range - it is also possible to have it translated data in a given section or the possibility to extrapolate. [23]

From the analysis instruments is possible to state except polynomials of degree in the ninth degree, the exponential dependence, Lorentz distribution or Gaussian distribution, numerical integration, Boltzmann distribution, working with data with multiple peaks, or also for example gamma function. It is possible to define your own tools. There is also the basic range of filters. [2] [24]

The basic working objects in QtiPlot are: the project, project viewer, matrix, chart, recording box, note, graphs. Qtiplot allows the implementation of simple but, also much more complex functions mentioned above.

Examples of visualisation:

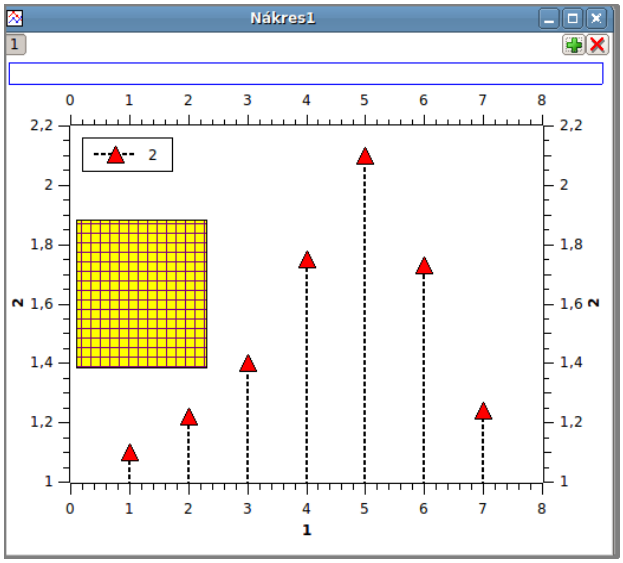

Figure 2 The vertical lines and square
Source: Own processing

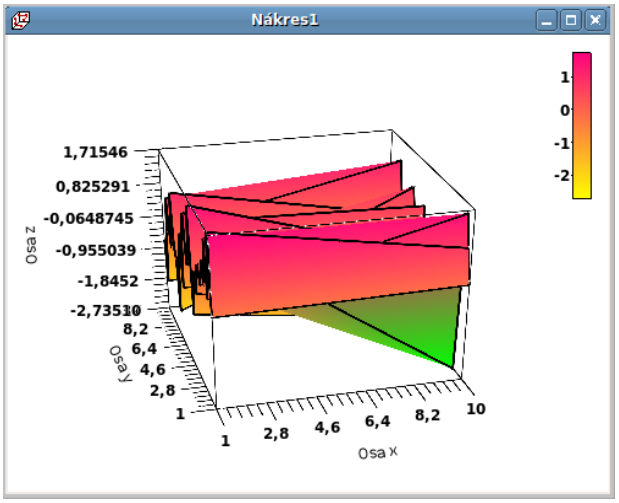

Figure 3 Polygon
Source: Own processing

In the field of signal processing it is often also used convolution, correlation and deconvolution or two selected signals, possibly autocorrelation signal, which is stored in one column. [2]

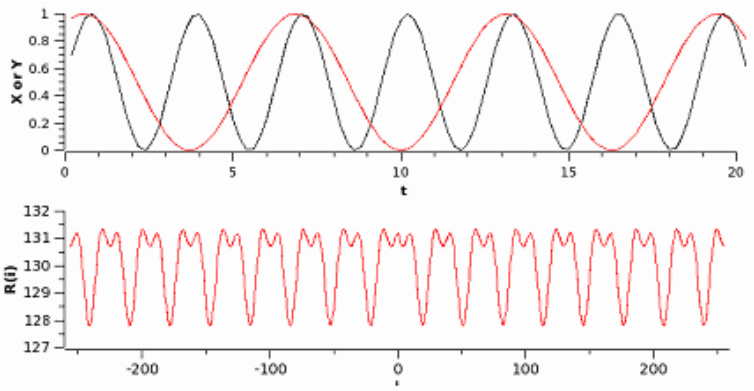

Figure 4 Correlation of two sinusoidal functions [2]

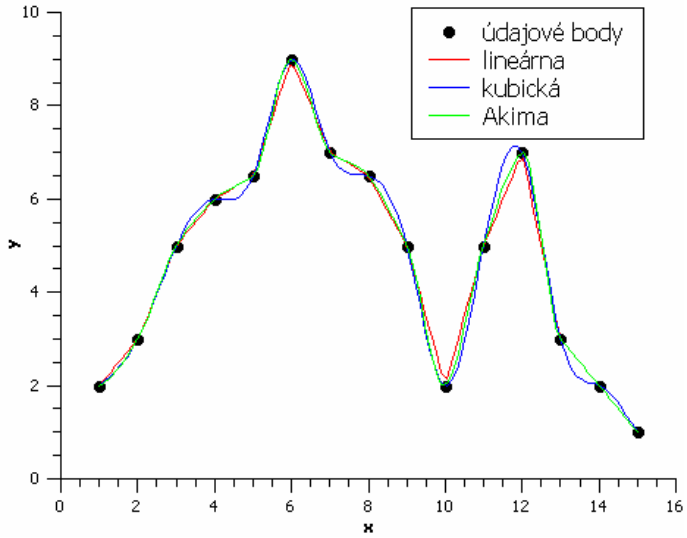

Figure 5 Comparison of interpolation methods [2]

Statistics, graphs and education

QtiPlot used to draw graphs, entering and editing statistical data, analysis and data processing. QtiPlot tend to focus on the area of science. [22]

In physical, chemical and other laboratories we obtain measured values, from which we need to evaluate for example statistical characteristics, to perform regression analysis with different functions, and we want to represent the results as lines in the graph. We can use QtiPlot exactly to graphical display of measurements and its evaluation. [24]

QtiPlot can be used in the framework of teaching at secondary schools and universities, in particular in wide range of praxis.

Also students of Avionic Systems and Sensorics and Avionic Systems at the Faculty of Aeronautics of the Technical university of Košice use QtiPlot program during their study.

6. CONCLUSION

The article gives an overview of the software aimed at data processing and visualization. The basic functions of selected programs are overviewed. The concept of visualization and description of basic types of software was described. Options and features QtiPlot program are summarized in detailed, because it is one of the most frequently used open-source programs freely available for data visualization.

The program provides a really extensive graphics capabilities, such as creation of 2D and 3D graphs where it is possible to use various options for formatting the objects from changes of colour, size, line thickness, reshaping objects to more complex functions like rendering of basic trigonometric functions, or even, for example, interpolation and approximation of curves. It is also possible to display more functions or graphs in one picture, or also add to graphs different objects like, ellipse, arrows and so on. Program has a potential for a really wide use in various fields of working life. It is also popular tool, which is used in educational process on secondary schools and especially on universities. That was the main reason and motivation why to translate the English interface of QtiPlot program to the Slovak language. The main contribution of this work is creating of Slovak interface of this program, which can be used as a basis of teaching students from different departments at the Faculty of Aeronautics of the Technical University of Košice, but it will be in the near future also accessible for other users.

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