The Practical Significance of Mathematical Modeling in Computer Algebra

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Abstract: In recent years, it is very difficult to find areas where computer mathematics systems (Maple, Matlab, Matchad, etc.) are not used. Today, the construction of models of control systems of various kinds and their study in electronic computers is one of the main problems of the sciences in the field of "Automation and Control".

Keywords: MathCad, Maple, model, technology, mathematics.

INTRODUCTION

As you know. With the development of computer technology, the method of machine modeling is the most effective in the study of complex systems, and without the help of this method it became difficult to solve some problems of technique and technology. For this reason, one of the most pressing issues in the training of engineers and technologists is the mastery of the basics and methods of mathematical modeling theory. This problem allows not only to build models of the studied objects, analyze their dynamics and control the machine experiment with the model, but also to consider the similarity of the models created to the studied systems within a certain range of applications and to organize the modeling of systems correctly.

Engineers in developed countries these days. Technologists, experts in the exact sciences, effectively use the capabilities of modern software systems - Mathematica, Matchad, Maple, Matlab in their research. The world's leading universities have introduced these systems extensively into their teaching processes.

MATERIALS AND METHODS

In addition to Mathematics, Maple, Matchad, Matlab, Derive, Statistica and similar software systems are widely used today in the numerical and analytical solution of practical problems. The user, of course, is faced with the question: "Which of the existing systems should be used under what conditions?"

The answer to this question can be seen in the table below:

N	Software system	Tasks and options	Disadvantages
1	**Derive4.01 | 4.11**	Designed for high school students and elementary school students. 1) Learn functional programming availability of opportunities; 2) Ability to perform less complex analytical calculations; 3) All orders are translated into Russian.	1) Lack of operator programming capabilities; 2) Lack of ability to analytically calculate the values of special functions.

2	**Matchad 8 | 2000**	1) The ability to build graphics is amazing, and the user-friendly communication environment is exemplary; 2) Ability to enter data through palettes; 3) Appropriate selection of operator and functions; 4) Adequate availability of literature in this area.	1) Limited possibilities of analytical calculations; 2) Simplicity and feasibility of a programming language Limited; 3) Large resources on the computer to be required; 4) Russified data The absence of the system.
3	**Maple V R4 | R5 | R6I**	1) Designed for high-level university students and scientific and technical students; 2) has about 3,000 functions and commands designed to perform analytical calculations; 3) The information system is very conveniently organized; 4) It is possible to format documents at a high level.	1) Inability to synthesize sounds; 2) Requiring large amounts of computer resources; 3) Designed for highly qualified professionals and mathematicians.
4	**Mathematica -4 | 5**	1) Designed for senior students of universities and scientific and technical calculations; 2) Designed for computers on different platforms; 3) The ability to synthesize sound; 4) The data system is very conveniently configured; 5) It is possible to format documents at a high level.	1) Large-scale exposure re- demand for resources; 2) Highly qualified specialist intended for foggers and mathematicians.

RESULTS

MathematicaThe integrated system is one of the leading computer programs available today. Versions 4 (2000) and 5 (2003) of the Mathematica system differ sharply from their predecessors in their convenient and understandable interface (user communication environment) and the ability to apply to computational processes of various character. Over the next 20 years, the Mathematica system improved and made great strides. Engineers these days. economists. experts in the exact sciences are making effective use of the capabilities of the Mathematica software system in their research. The world's leading universities have introduced this system extensively into their teaching processes.

Mathematica systems and computer algebra systems

the place you hold between.

United States Tungsten Research. Ink. Although the Mathematica system created by the company was proposed by physicist Stephen Wolfram in 1987, in 1988 the l-dialect (version) of the Mathematica system was referred to public judgment. The Mathematica software system is listed by the American public this year as one of 10 great technical and mathematical discoveries made in 1988. Although the first version of Mathematica was mainly designed for Macintosh-type computers, soon (6 months later) a new version of Mathematica appeared, running in the MS-DOS operating system environment. In 1991, Mathematica 2 was introduced, and in 1996, Mathematica 3.0 was introduced. Since then, this software system has more than 20 operating systems, namely Microsoft Windows. Windows NT. OS / 2. Adapted to run in Linux, Unix and other operating system environments.

Currently, Mathematica 4 (2000) and Mathematica 5 (2003) systems are widely used. Mathematica 4.0 and Mathematica 5.0 systems differ significantly from their predecessors in that their user-friendly and understandable interface has the ability to be applied to computing processes of a variety of character. Engineers these days. economists, experts in the exact sciences are effectively using the capabilities of the software system Mathematica in their research. The world's leading universities have introduced this system extensively into their teaching processes.

A natural question arises: "What are the capabilities of this system, which has attracted so many scientists, engineers, as well as teachers, professors and students? In what ways is it different from existing systems and programming languages? "

Mathematica software system. is primarily a software system designed to perform numerical and analytical (symbolic) calculations at high speed and accuracy.

This system is intended for professionals who create application software (ADT) such as the systems listed above:

• mathematical operations: simplification of expressions, algebraic transformations on them, numerical and analytical solution of various equations and inequalities, differentiation, integration, algebraic operations on matrices, optimization problems, various forms (explicit, implicit, parametric, etc.) quick and accurate implementation of functions graphing tasks;

• text editors that allow you to create and select documents and programs;

• a multi-window interface that allows users to work in an interactive mode (based on direct communication);

• a highly organized reference system;

• a processor that performs operations on analytical and numerical expressions;

• diagnostic system showing uncertainties in the communication process;

• a library of ready-made programs and functions attached directly to the core of the system;

allows efficient use of tools.

The above-mentioned tools are the construction of a mathematical model of the problem studied in the process of creating practical software, the choice of calculation methods. Allows you to fully automate the process of conducting computational experiments and analyzing the results obtained. This leads to a radical change in the procedure for organizing ADT and the traditional sequence of solving problems on a computer.

Thus, in addition to the table above, it can be said. In Mathematica 5.0, all work is organized as a notebook (document). communication takes place in an interactive mode.

The following factors contribute to the popularity of the use of software systems described in the table above:

• computers are among the most common household appliances;

• modern student. the use of the Internet has become a daily necessity in the life of a researcher and a specialist;

• Increasing the use of software systems as a teaching tool in educating students:

• The main reason is the increase in the number of specialized publications on the use of software systems.

However, in developed countries, these systems have become an integral part of the learning process. For example, in the United States, China, Japan and Germany, these systems are used effectively not only in the teaching process, but also in scientific and technical calculations. Among the CIS countries, professors, teachers, engineers and scientists of the Republic of Belarus continue to lead in this regard.

CONCLUSIONS

In general, Matchad is a unique collection of applications of modern numerical methods of computer mathematics. It included experiments, rules, and mathematical calculation methods accumulated as a result of the development of mathematics over the years.

The Matchad package is a software tool for performing engineering calculations that is designed for professional mathematicians. It can be used to solve algebraic and differential equations with variable and invariant parameters, to analyze functions and search for their extremums, to construct tables and graphs for the analysis of found solutions. Matchad also has its own programming language for solving complex problems.

The Matchad interface is similar to the interface of all Windows programs. When Matchad starts, a main menu and three toolbars appear in its window: Standard (Format), Format (Formatting) and Math (Mathematics). is called. The default toolbar contains a set of commands for working with multiple files. Formatting (Formatting) Formula and contains several commands for formatting texts. Math contains mathematical tools that are used to place symbols and operators in a document file window. The picture below shows the Matchad window and its math panel tools.
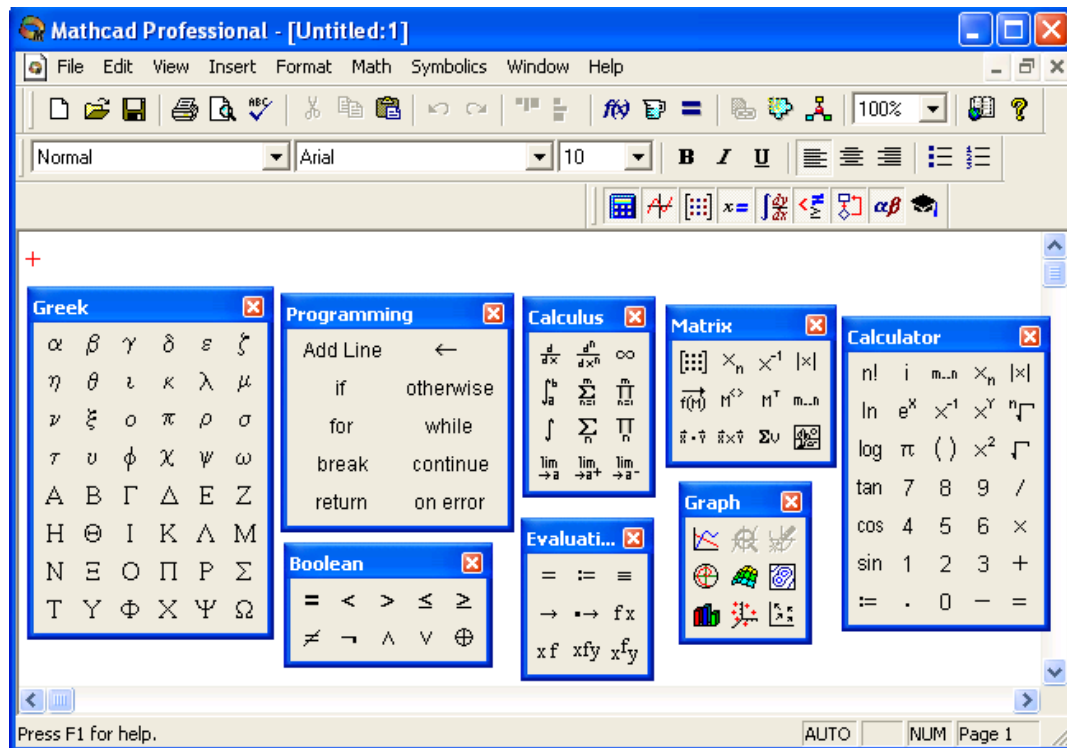
MAPLE system is a system designed to accurately, quickly and efficiently solve analytical and numerical solutions of computer problems in various areas: economics, mechanics, mathematics, physics, engineering. It contains more than 4,000 commands
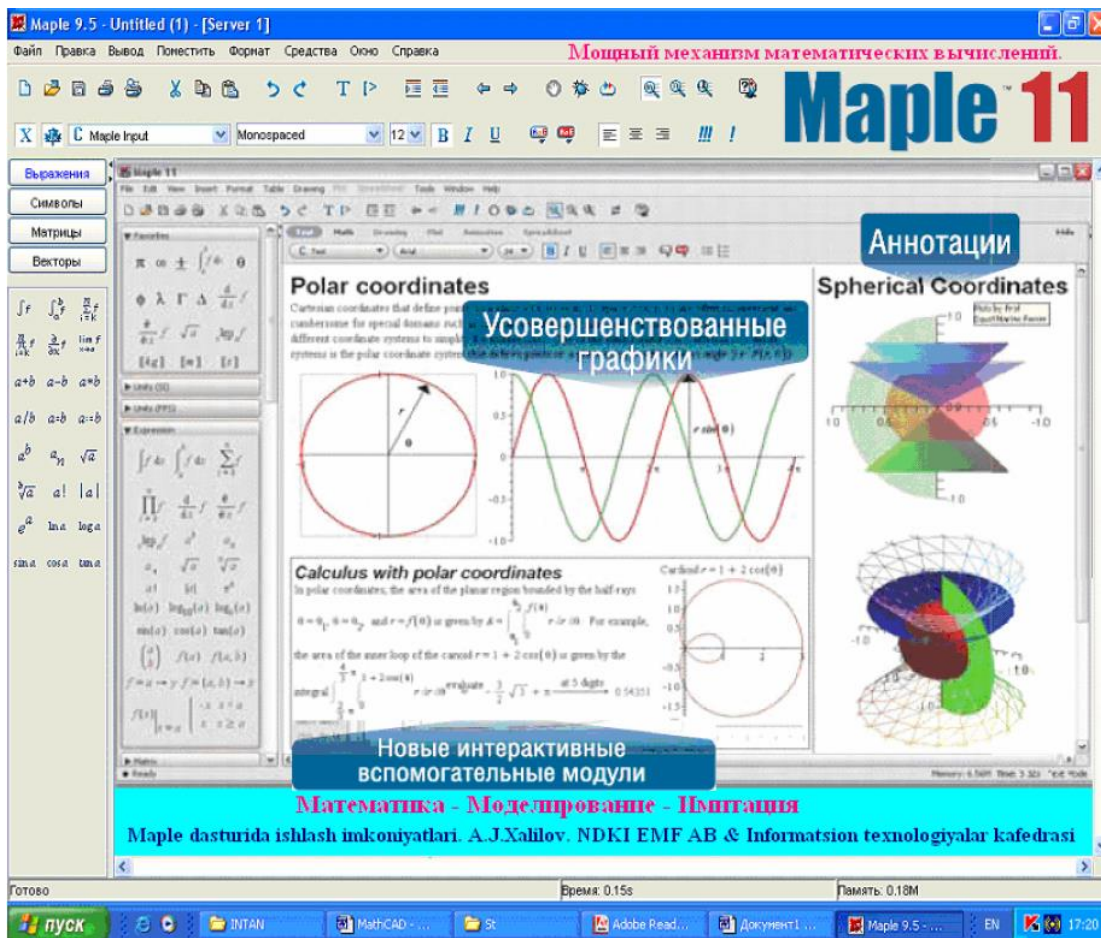
These commands are designed to solve problems in various fields of mathematical science, such as Algebra, Geometry, Mathematical Analysis, Mathematical Statistics.

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