Laboratory Work №1

Introduction to the mathematical system (MS) MatLab.

Objective: installation of MS MatLab and acquaintance with its general functionality.

Introduction.

The system MATLAB (MATrix LABoratory) was developed by The MathWorks, Inc. (Naitik, state Massachusetts, USA) company about forty years ago. At the moment, the system is a powerful and universal tool for solving various engineering and scientific problems and has become widespread all around the world. The range of problems that can be studied based on the MATLAB package includes matrix analysis, signal and image processing, mathematical physics problems, optimization problems, data processing, and visualization, etc.

The history of the MATLAB package is associated with the name of Professor Cleve B. Mouler. Before joining MathWorks, he taught and did scientific researches in the departments of mathematics and computer centers at several US universities (New Mexico, Michigan, Stanford). In 1980, at the AFIPS international conference, he presented a report "Design of an interactive matrix calculator" in which he, apparently, used the name MATLAB for the first time.

The second birth of the MATLAB package is associated with Jack Little, the current president of MathWorks. In the early 80s of the last century, he moved the MATLAB program to more modern computing platforms VAX, Macintosh, and IBM PC. Further development of the package took place under the guidance of MathWorks. However, they involved teams of highly qualified mathematicians and engineers of the Old and New World in expanding the composition of the package and its applications.

Since the founding of the company (1984), K. Mouler is its permanent supervisor. More than 1000 MathWorks employees provide upgrades and software support for the MATLAB package.

One of the most important features of the MATLAB package is its openness. The delivery set contains a lot of source code for software modules, functions, test cases. This allows users to understand the algorithms, modify them for their applications, and expand the scope of the package.

The main object of MATLAB is a rectangular numerical array that allows complex elements and the input of matrices, which does not require the explicit indication of their size. Furthermore, the system perceives any variable as a vector or matrix by default. Even ordinary numbers and variables (scalars) in MATLAB are considered as one-element matrices (about 1×1), which gives the same forms and methods of operations on ordinary numbers and arrays.

MATLAB implements classical numerical algorithms for solving equations, linear algebra problems, solving nonlinear equations and optimization problems, finding the values of definite integrals, interpolation, solving ordinary differential equations and partial differential equations, and other algorithms.

Work in the MATLAB environment can be carried out in two modes. In direct calculation mode, work is done without any programming. This is the so-called mode of interpretation of commands and operators when the last are entered during the session in the command line, and MATLAB performs their immediate processing and outputs the calculated result. Another mode of work is the ability to process a sequence of commands and operators in MATLAB in the form of a prepared m-file. Calling the corresponding m-file provides data input, organization of calculations, and output to the screen, which results in the implementation of the program mode.

In both modes, almost all computing capabilities of the system are implemented, including the output of information in graphical form. The program mode allows us to save the developed computational algorithms and to repeat calculations if necessary.

The MATLAB system has its own programming language that reminds of Basic and C. The recording of programs in the system is traditional and, therefore, familiar to most personal computer users. Besides, the system allows you to edit programs using any text editor.

Working with such a powerful mathematical system as MATLAB requires proper theoretical training from the user. Otherwise, it is impossible to accurately use the methods used in the system and get the correct results. Applying basic computing capabilities requires knowledge of mathematical tools and basic numerical methods within the framework of technical specialties universities. Also, the information contained in the help is valuable for those who want to understand the great features of the MATLAB package.

Tasks for laboratory work:
1. Install the MATLAB package.
2. Get acquainted with the interface and general functionality of the following packages:
     1) Fuzzy Logic Toolbox;
     2) Genetic Algorithm Toolbox / Optimization ToolBox;
     3) Neural Network Toolbox.
Present the results of the work in a report.