AN ADVANTAGE OF MATLAB PRODUCTION SOFTWARE

Turakhonova Shakhnozakhon
2nd-year student of the Ministry of Higher and Secondary Special Education of the Republic of Uzbekistan, Andijan State University, Faculty of "Information Technologies and Computer Engineering", Department of Computer Science and Programming Technologies, Master

Annotation
Currently, many mathematical packages have been created and are widely used. The most common of them are Maple, Matlab, Derive, Eureka, Mathematika, Maple packages. These packages are multi-functional packages. Today, the place and role of mathematical packages in the educational process is much more significant and effective. Formation of students' skills and competencies in using mathematical packages is one of the main components of computer science. By making it easy to solve complex math problems, it takes the stress out of learning math and makes it fun and very simple. "MATLAB" package has an important place among the automation systems of mathematical calculations.

Keywords. Simulink, matrix, modeling, m-file, dynamic systems.

Kirish.
MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. Typical uses include:

- Math and computation
- Algorithm development
- Modeling, simulation, and prototyping
- Data analysis, exploration, and visualization
- Scientific and engineering graphics
- Application development, including Graphical User Interface building

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar noninteractive language such as C or Fortran.
The name MATLAB stands for matrix laboratory. MATLAB was originally written to provide easy access to matrix software developed by the LINPACK and EISPACK projects, which together represent the state-of-the-art in software for matrix computation.
MATLAB has evolved over a period of years with input from many users. In university environments, it is the standard instructional tool for introductory and advanced courses in

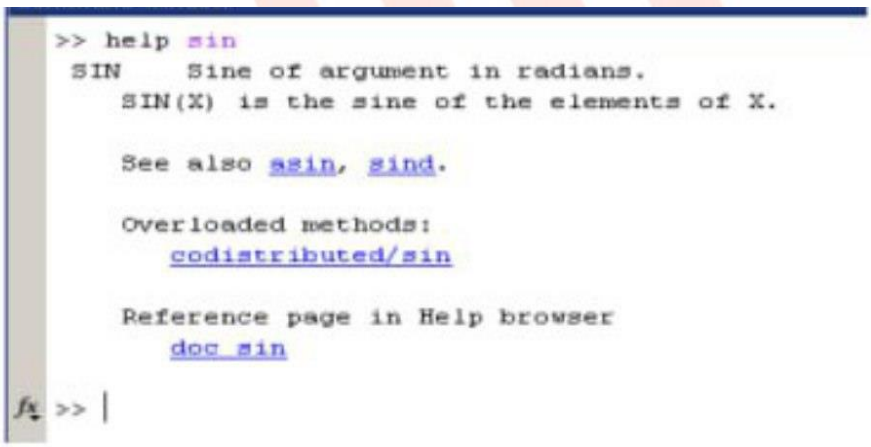
mathematics, engineering, and science. In industry, MATLAB is the tool of choice for high-productivity research, development, and analysis.

MATLAB features a family of application-specific solutions called toolboxes. Very important to most users of MATLAB, toolboxes allow you to learn and apply specialized technology. Toolboxes are comprehensive collections of MATLAB functions (M-files) that extend the MATLAB environment to solve particular classes of problems. Areas in which toolboxes are available include signal processing, control systems, neural networks, fuzzy logic, wavelets, simulation, and many others.

Materials and advantages. MatLab has several advantages. MATLAB has an open architecture, meaning that existing functions can be modified and custom functions can be added. Text files or files written in the C programming language are used to implement large-scale commands and functions. MATLAB is an extensible system that can be easily adapted to solve many different types of problems. Its biggest advantage is that it expands naturally, and this expansion takes place in the form of m-files. In other words, system extensions are stored on the computer's hard disk and called for use when needed, just like MATLAB's built-in (internal) functions and procedures.

Since the m-file has a text format, the user can enter any new command, operator or function into it and then use it as if it were an attached function or operator. Unlike Basic, Si, or Pascal programming languages, there is no need to declare new functions. In this respect, MATLAB is similar to Logo and Fort languages. But in MATLAB, the number of operators and functions is practically unlimited, since new definitions are stored on disk in the form of a file.

MATLAB is an extensible system. The basic functions of the system accelerate the achievement of results and are the outer core of the program. All functions are placed in m-file format. An m-file is a shell file that is an external program and is called by command. MATLAB has an interactive help system. The interactive reference can be invoked using a series of commands in command mode. One such command is: » help



This command outputs a complete list of folders containing m-files that contain descriptions of operators, functions, and other objects in the MATLAB system.

Research. The main tasks defined in this work: - development of a model reflecting the activity of the greenhouse climate control system; — modeling of behavior of the external environment; — test the model with the simplest control algorithm of climate control subsystems. Brief description of the model This model describes the conditions of the greenhouse and the environment in terms of three main parameters: temperature, air humidity and light. In the process of simulation, the operation and state of the following systems are simulated: outdoor environment, greenhouse (indoor state), greenhouse surface, air humidification system, heating system, lighting system, dimming system, ventilation system. all the main subsystems of the "smart" greenhouse and their interaction are shown. Each of the systems has a complex structure, for example, the structure of the control system is shown (Figure 1)

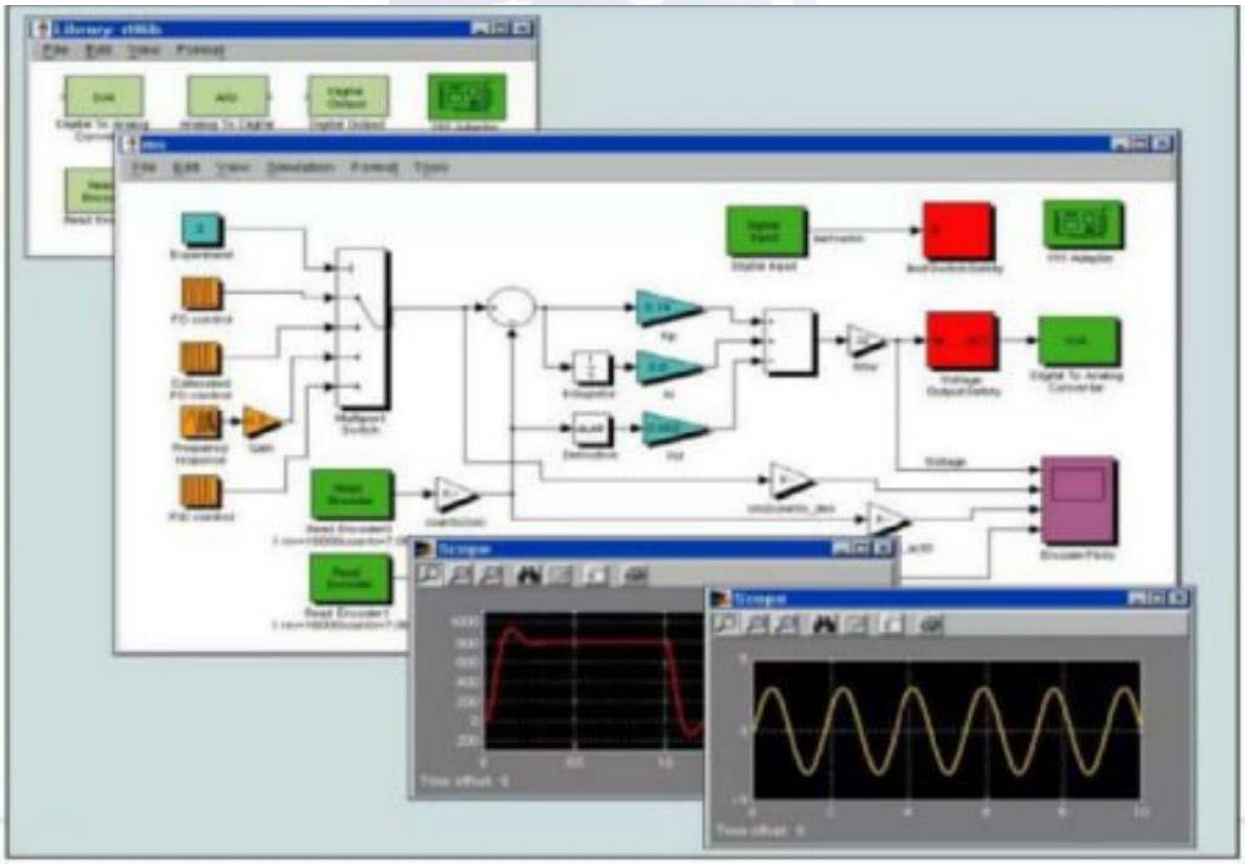


Figure 1. Structure of control system in MATLAB Simulink graphic simulation.

The greenhouse subsystem calculates the current state of the parameters inside the greenhouse according to the following formulas:

$t_i = Q_{i-1} + Q / \rho * V * c$ temperature

$\varphi i = (m_{i-1} - 1 + m) / (\rho 0(ti) * V)$ (relative humidity),

$E = E_{\text{Answer systems}} + E_{\text{daylight,variable}}$ (lighting),

Here ΔQ and Δr are the sum of interactions of other subsystems of "smart" heating; air density under normal conditions (to simplify the calculations, we assume that the density does not change); c - specific heat capacity of air and maximum absolute humidity of air - $\rho_0(t_i)$ - calculated according to the following formula:

$\rho_0(t) = (1.11e-0.7)t^5 - (2.09e-0.5)t^4 + (1.77e-3)t^3 - (1.9e-2)t^2 - (5.00e-2)t + 5.03$

This formula is the maximum absolute air humidity according to the fifth degree polynomial obtained by the method of least squares as a result of approximation of the table. The external environment generates the environmental state as follows: based on the current iteration, the position of the sun is calculated, the modulus and the sign of the change of the current state are random (some parameters affect each other). . The surface of the greenhouse includes the process of heat exchange. The external environment is adjusted according to the following formula:

$Q = t_{external} - t_{internal} * k * s$

where k is the thermal conductivity of the greenhouse and s is the area of the greenhouse. The ventilation system calculates the amount of heat and moisture entering / leaving the greenhouse based on the air mass changed in the greenhouse according to the following formulas:

$m_{H2O} = (\varphi_1 * \rho_0(t_1) - \varphi_2 * \rho_0(t_2))*V$

$Q = t_1 - t_2 * M * c$

where φ_1 and t_1 are relative humidity and outdoor temperature, and φ_2 and t_2 are relative humidity and temperature inside the greenhouse; V and M are the volume and mass of air ventilation Dimming and lighting systems are responsible for lighting. With a lack of natural light, the lighting system turns on and brings it to the optimal value. Similarly, with excessive light, the dimming system works. Humidification and heating systems calculate the amount of heat and water mass brought to the greenhouse as a product of maximum power and current efficiency. The control unit contains the control logic for all greenhouse systems, as well as the preparation of data for the operation of this logic.

Conclusion

MATLAB The Simulink simulation environment provides a wide range of In this case, we can see the control of the necessary parameters for our greenhouse in the form of graphs and accounts. SimEvents package for modeling discrete events, which allows not only to create static simulation models, but also to control their behavior using standard programming tools in MATLAB

References

1. Eshkavilov S. L. MATLAB & Simulink Essentials: MATLAB & Simulink for Engineering Problem Solving and Numerical Analysis. Lulu Publishing, 2017
2. Tyagi A. K. MATLAB and Simulink for Engineers. Oxford University Press,2012.

3. Klee H., Allen R. Simulation of Dynamic Systems with MATLAB and Simulink.CRC Press, 2018
4. Djon G. Metyuz, Kurtis D. Fink. Chislennыe metodы. Ispolzovanie MATLAB = Numerical Methods: Using MATLAB. — 3-ye izd. — M.: «Vilyams», 2001. — 720 s. — ISBN 0-13-270042-5.
5. Dyakonov V. P., Abramenkova I. V. MATLAB. Obrabotka signalov i izobrajeniy. Spesialnыy spravochnik. — SPb.: «Piter», 2002. — 608 s. — ISBN 5-318-00667-1.
6. Dyakonov V. P., Kruglov V. V. MATLAB. Analiz, identifikatsiya i modelirovanie sistem. Spesialnыy spravochnik. — SPb.: «Piter», 2002. — 448 s. — ISBN 5-318-00359-1.
7. Dyakonov V. P. Simulink 4. Spesialnыy spravochnik. — SPb.: «Piter», 2002. — 528 s. — ISBN 5-318-00551-9.
8. Dyakonov V. P. MATLAB 6/6.1/6.5 + Simulink 4/5. Osnovы primeneniya.Polnoe rukovodstvo polzovatelya. — M.: «SOLON-Press», 2002. — 768 s. — ISBN 5-98003-007-7.