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Кафедра «Энергетические установки и тепловые двигатели»
Дисциплина «Имитационное моделирование»

Тема: «Simulink и его использование для решения транспортных задач»

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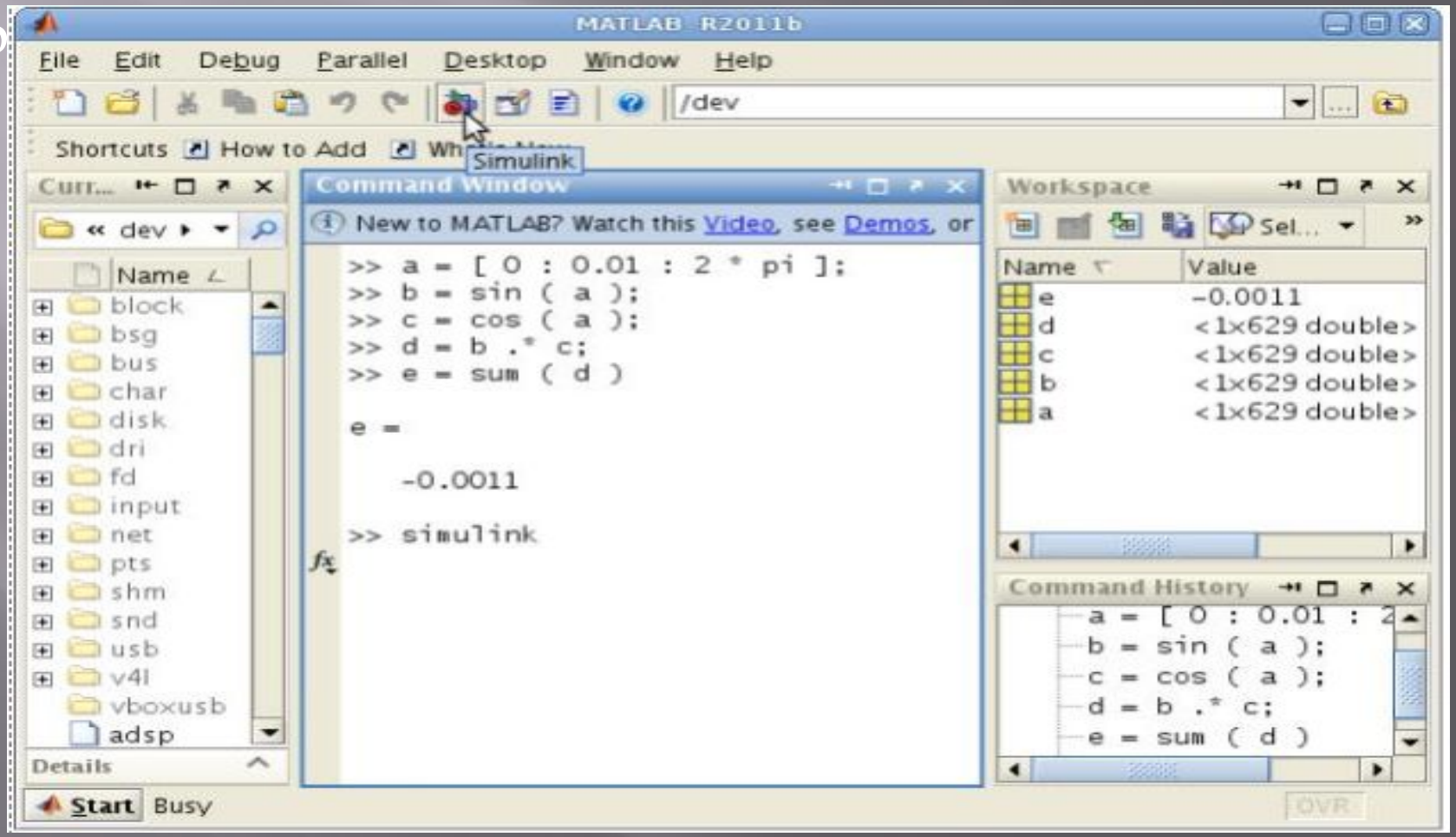
Что такое Simulink?

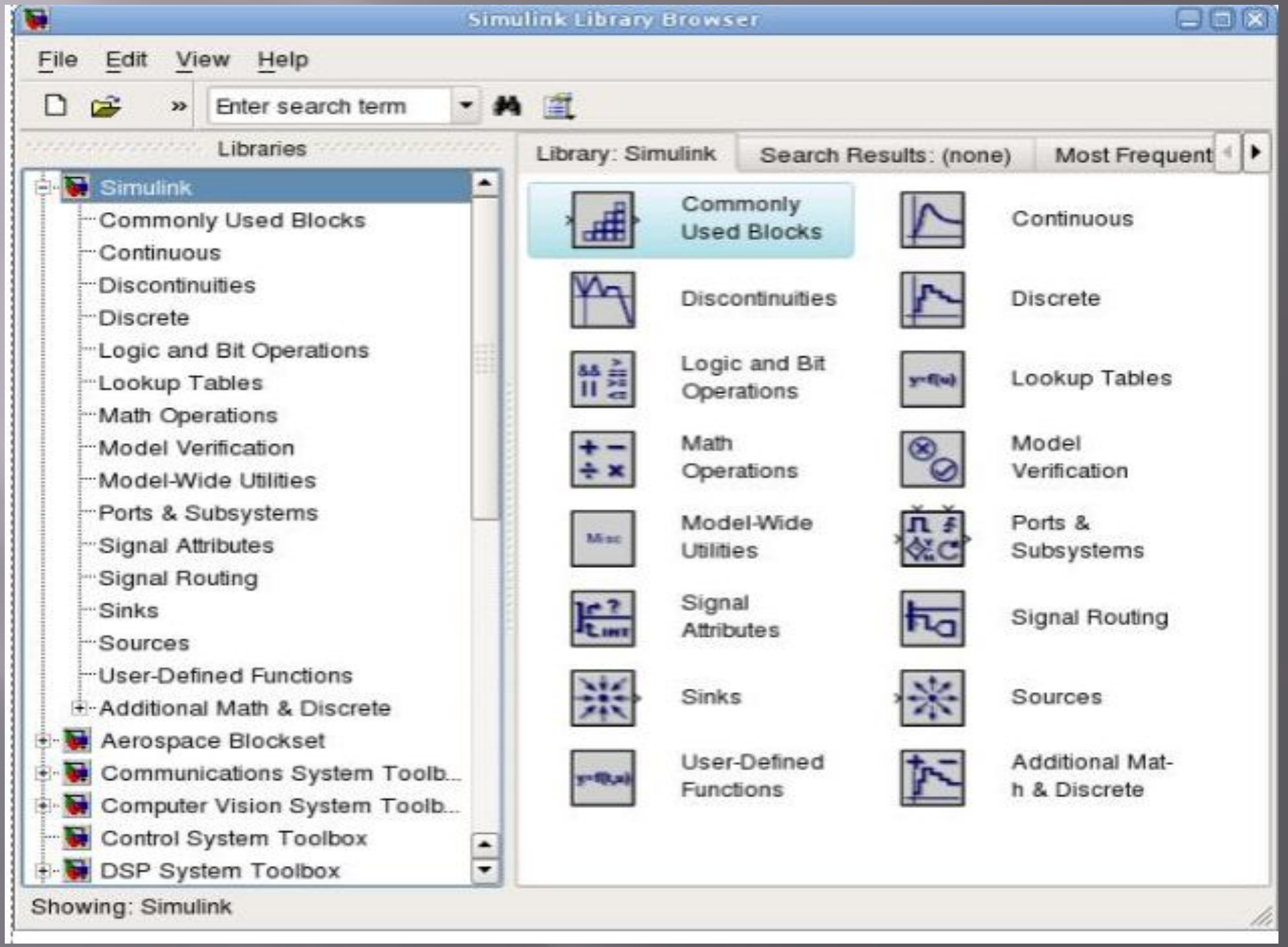
Simulink – это система имитационного блочного моделирования динамических систем, являющаяся подсистемой MATLAB.

MATLAB (Matrix Laboratory) – это пакет прикладных программ, предназначенный для решения задач технических вычислений.

Запуск Simulink

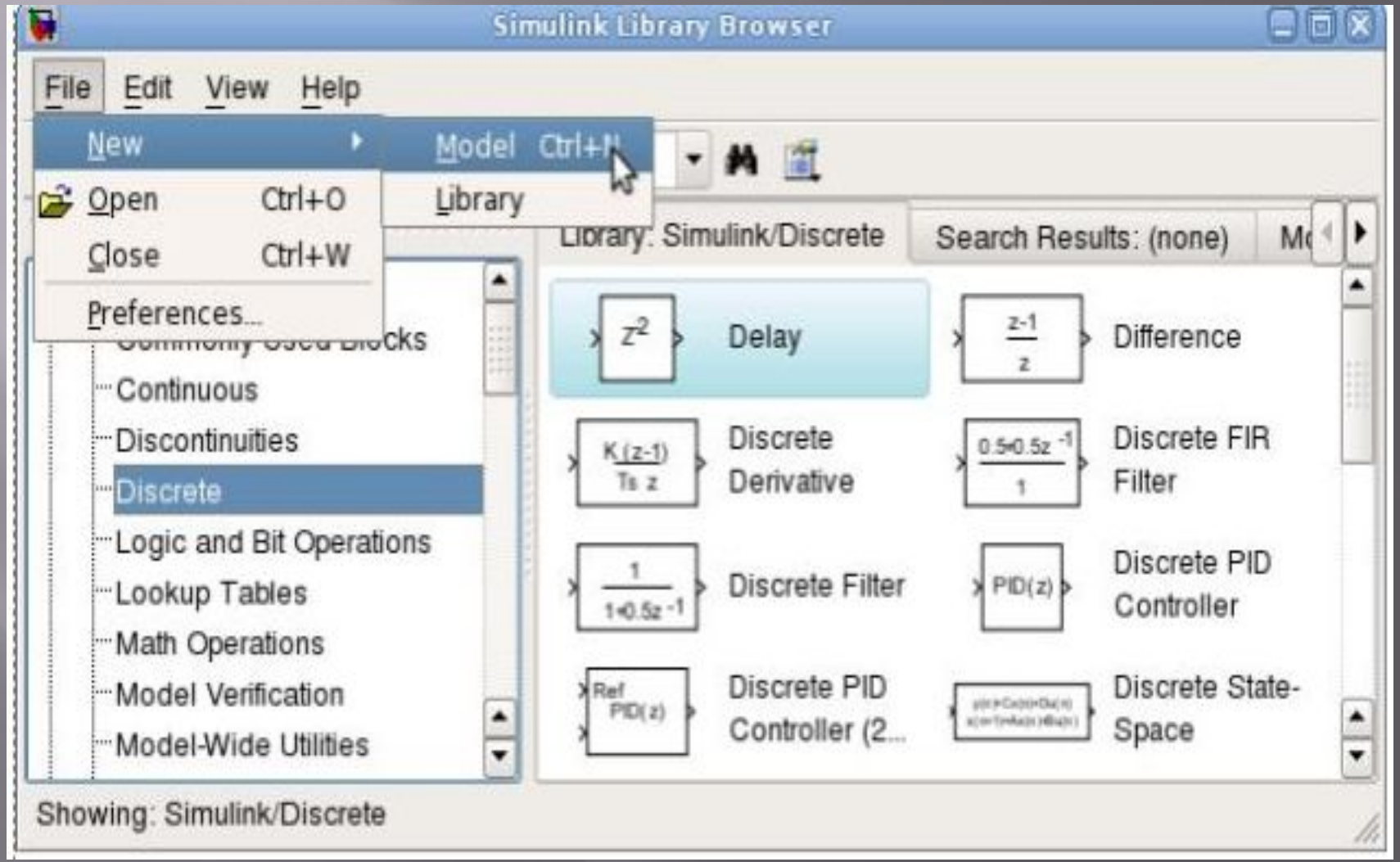
Запустив графический интерфейс MATLAB, выполняется команда *simulink* или запускается Simulink при помощи кнопки на верхней панели (р



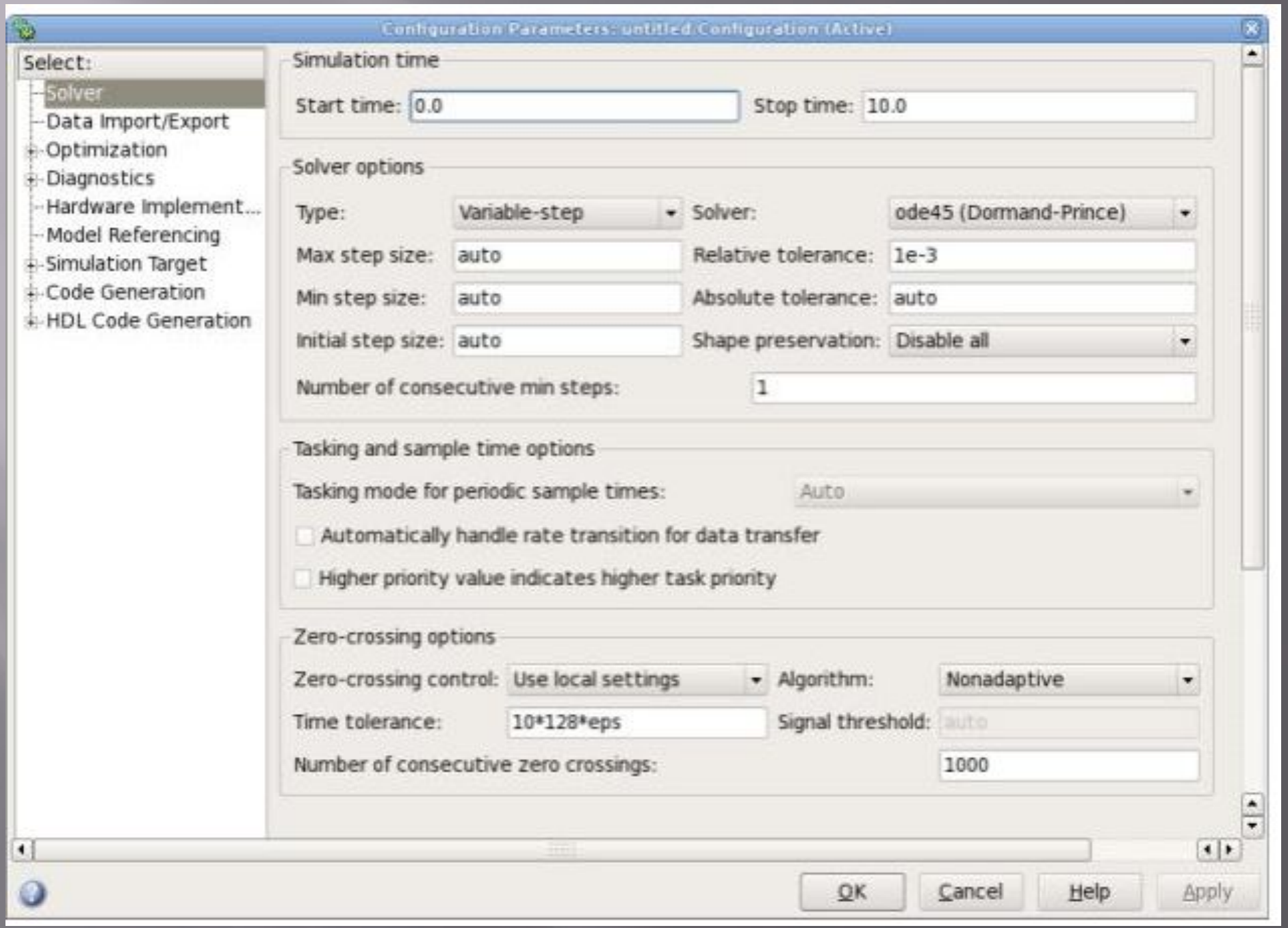

Simulink Library Browser
File Edit View Help
Enter search term
Libraries
Simulink
Commonly Used Blocks
Continuous
Discontinuities
Discrete
Logic and Bit Operations
Lookup Tables
Math Operations
Model Verification
Model-Wide Utilities
Ports & Subsystems
Signal Attributes
Signal Routing
Sinks
Sources
User-Defined Functions
Additional Math & Discrete
Aerospace Blockset
Communications System Toolb...
Computer Vision System Toolb...
Control System Toolbox
DSP System Toolbox
Library: Simulink
Search Results: (none)
Most Frequent
Commonly Used Blocks
Continuous
Discontinuities
Discrete
Logic and Bit Operations
Lookup Tables
Math Operations
Model Verification
Model-Wide Utilities
Ports & Subsystems
Signal Attributes
Signal Routing
Sinks
Sources
User-Defined Functions
Additional Math & Discrete
Showing: Simulink

Создание модели

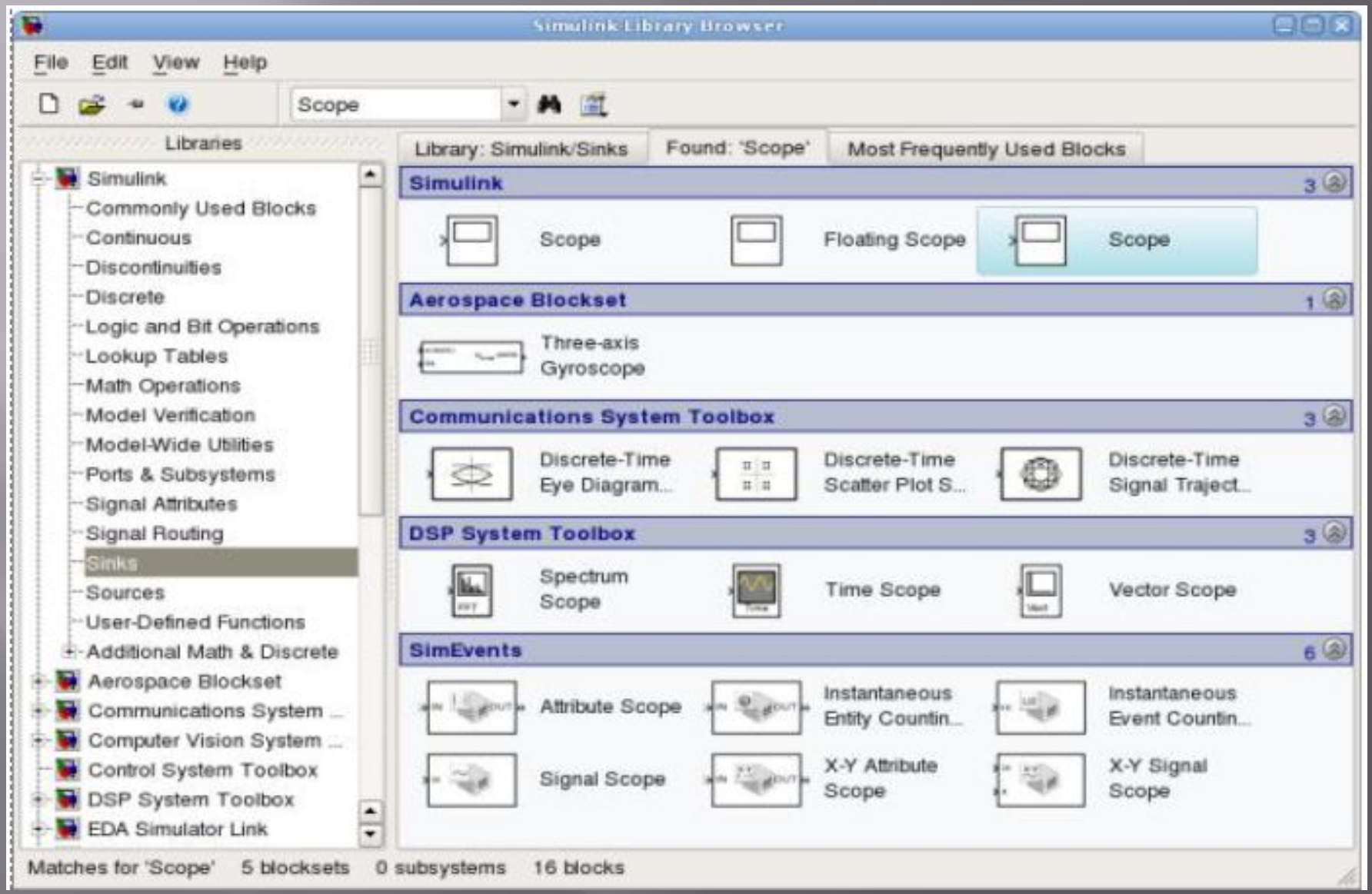
Для создания новой модели выполняется команда главного меню File,New, Model или

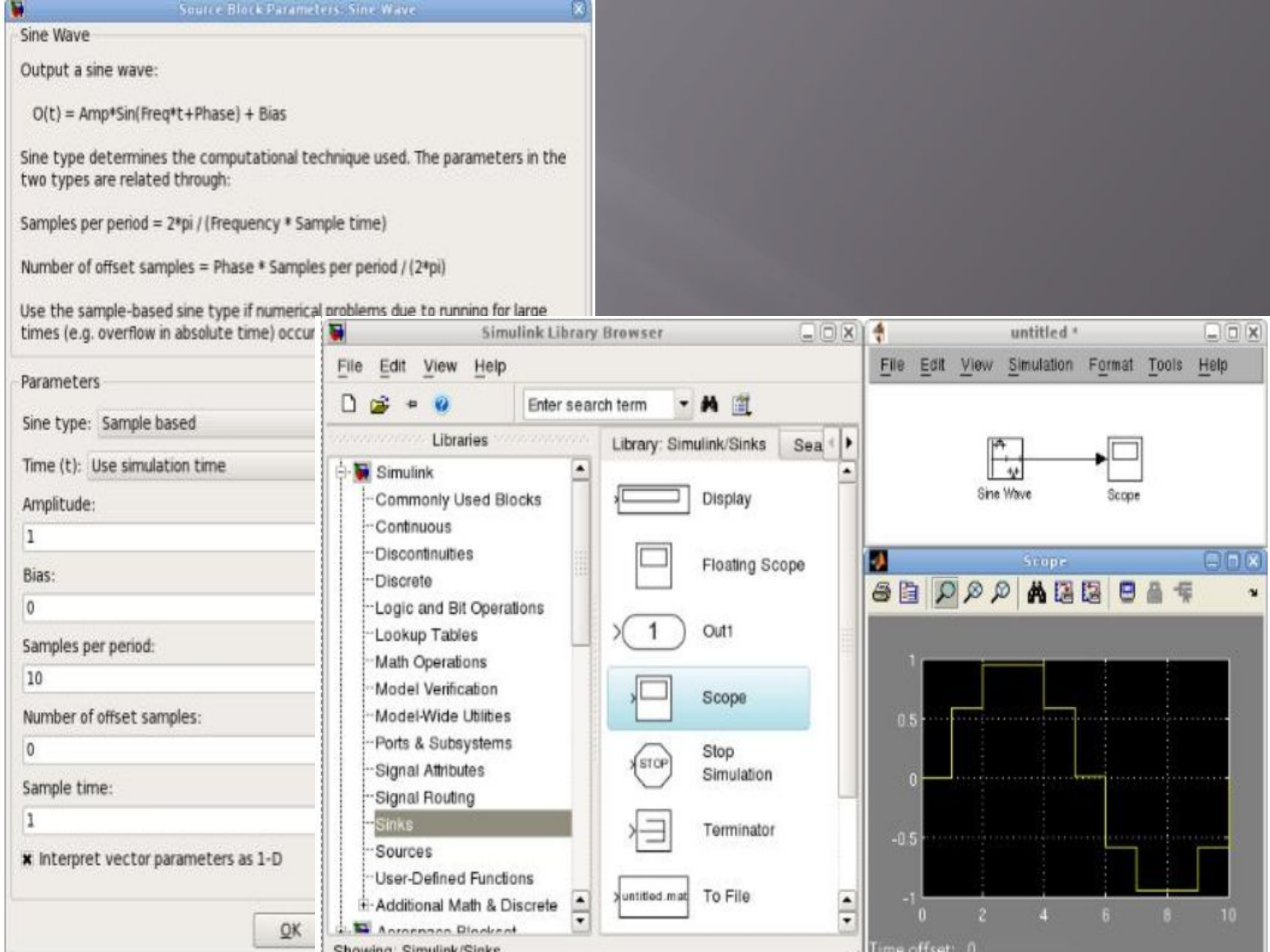


По команде откроется новое безымянное окно (*Untitled*) модели

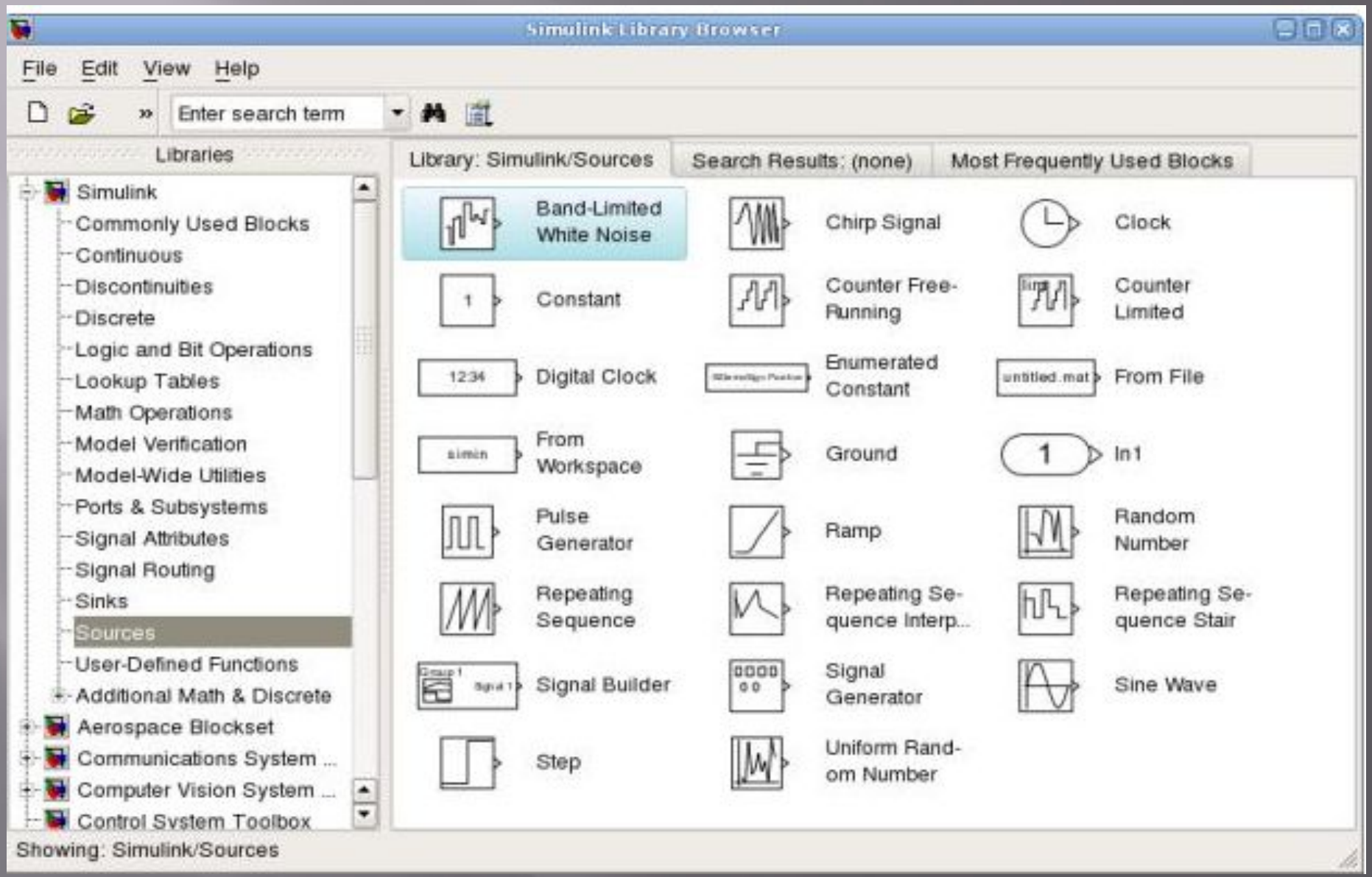

Configuration Parameters: untitled/Configuration (Active)
Select:
Solver
Data Import/Export
Optimization
Diagnostics
Hardware Implement...
Model Referencing
Simulation Target
Code Generation
HDL Code Generation
Simulation time
Start time: 0.0
Stop time: 10.0
Solver options
Type: Variable-step
Solver: ode45 (Dormand-Prince)
Max step size: auto
Relative tolerance: 1e-3
Min step size: auto
Absolute tolerance: auto
Initial step size: auto
Shape preservation: Disable all
Number of consecutive min steps: 1
Tasking and sample time options
Tasking mode for periodic sample times: Auto
Automatically handle rate transition for data transfer
Higher priority value indicates higher task priority
Zero-crossing options
Zero-crossing control: Use local settings
Algorithm: Nonadaptive
Time tolerance: 10*128*eps
Signal threshold: auto
Number of consecutive zero crossings: 1000
OK
Cancel
Help
Apply

Результаты поиска по слову «Scope»

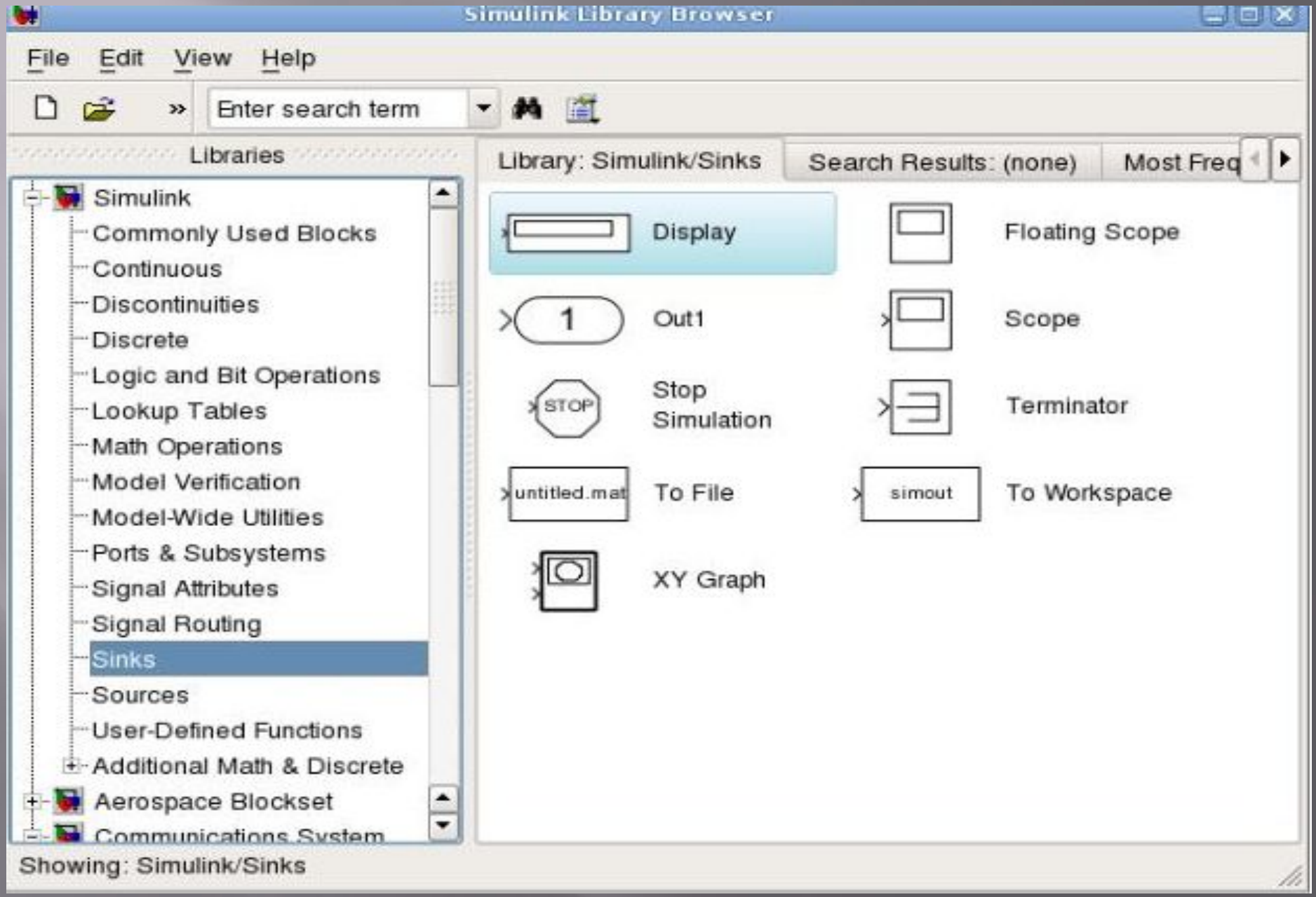



Source Block Parameters: Sine Wave
Sine Wave
Output a sine wave:
O(t) = Amp*Sin(Freq*t+Phase) + Bias
Sine type determines the computational technique used. The parameters in the two types are related through:
Samples per period = 2*pi / (Frequency * Sample time)
Number of offset samples = Phase * Samples per period / (2*pi)
Use the sample-based sine type if numerical problems due to running for large
times (e.g. overflow in absolute time) occur
Parameters
Sine type: Sample based
Time (t): Use simulation time
Amplitude:
1
Bias:
0
Samples per period:
10
Number of offset samples:
0
Sample time:
1
Interpret vector parameters as 1-D
OK
Simulink Library Browser
File Edit View Help
Enter search term
Libraries
Simulink
Commonly Used Blocks
Continuous
Discontinuities
Discrete
Logic and Bit Operations
Lookup Tables
Math Operations
Model Verification
Model-Wide Utilities
Ports & Subsystems
Signal Attributes
Signal Routing
Sinks
Sources
User-Defined Functions
Additional Math & Discrete
Library: Simulink/Sinks
Display
Floating Scope
1
Out1
Scope
STOP
Stop Simulation
Terminator
untitled.mat
To File
untitled *
File Edit View Simulation Format Tools Help
Sine Wave
Scope
Scope
1
0.5
0
-0.5
-1
0
2
4
6
8
10

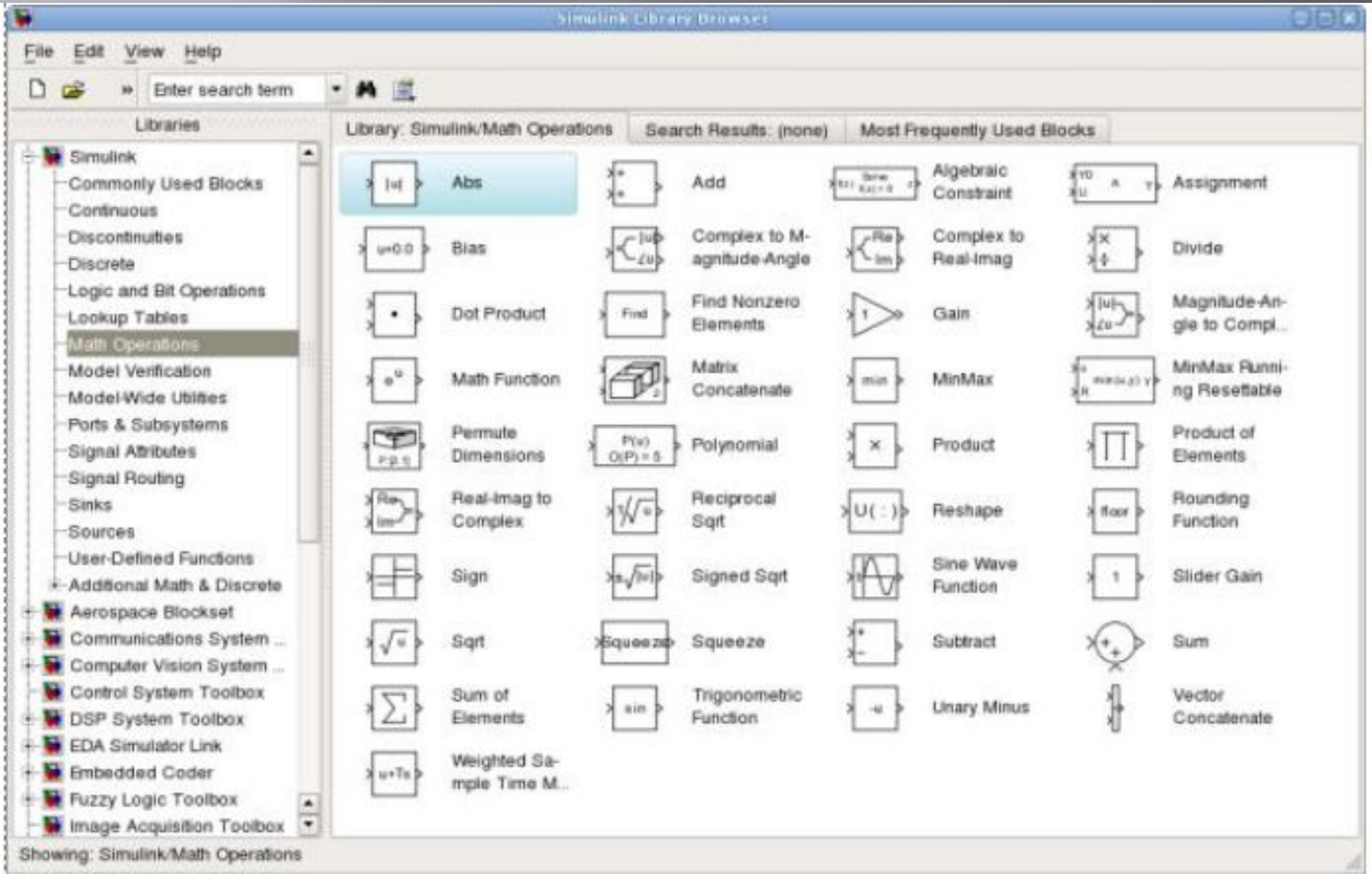
Библиотеки Simulink



Блок библиотеки *Sinks*

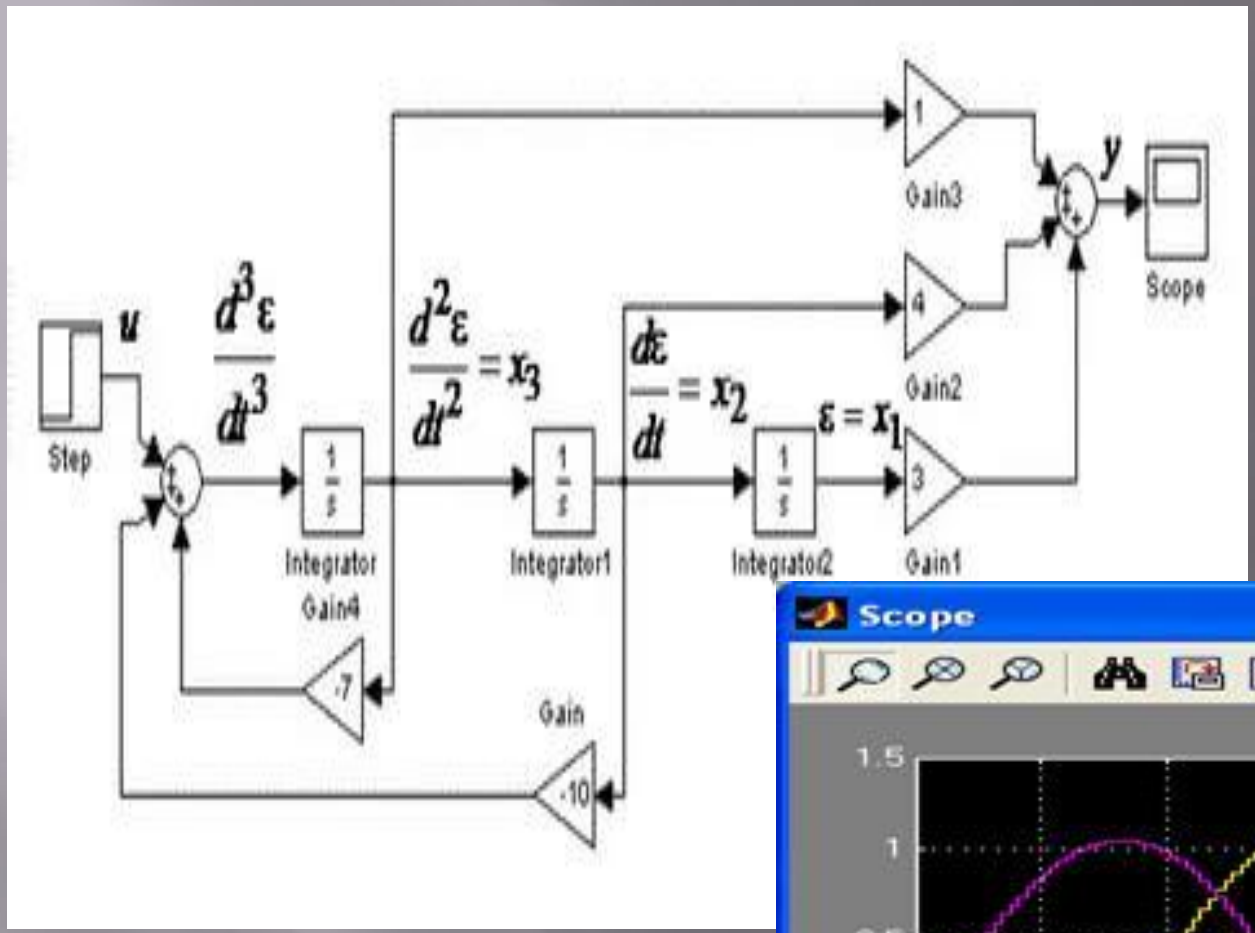


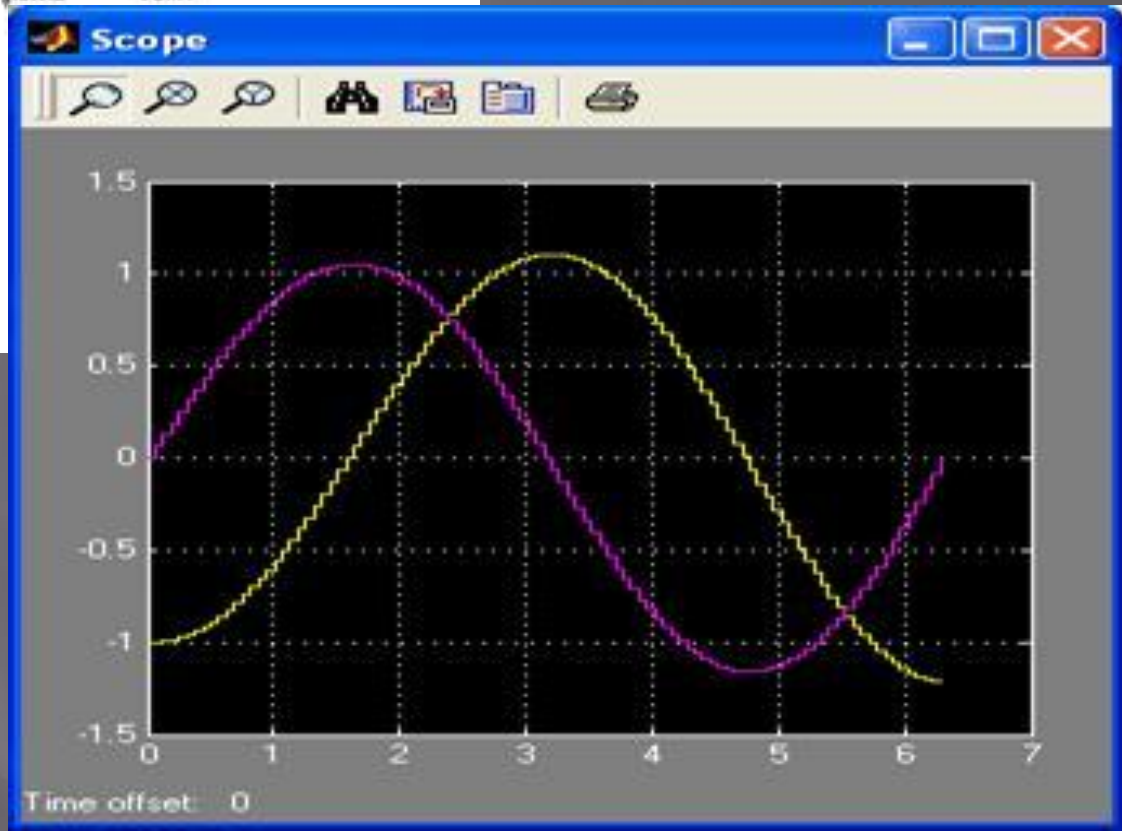
Элементы библиотеки математических преобразований – *Math Operations*.

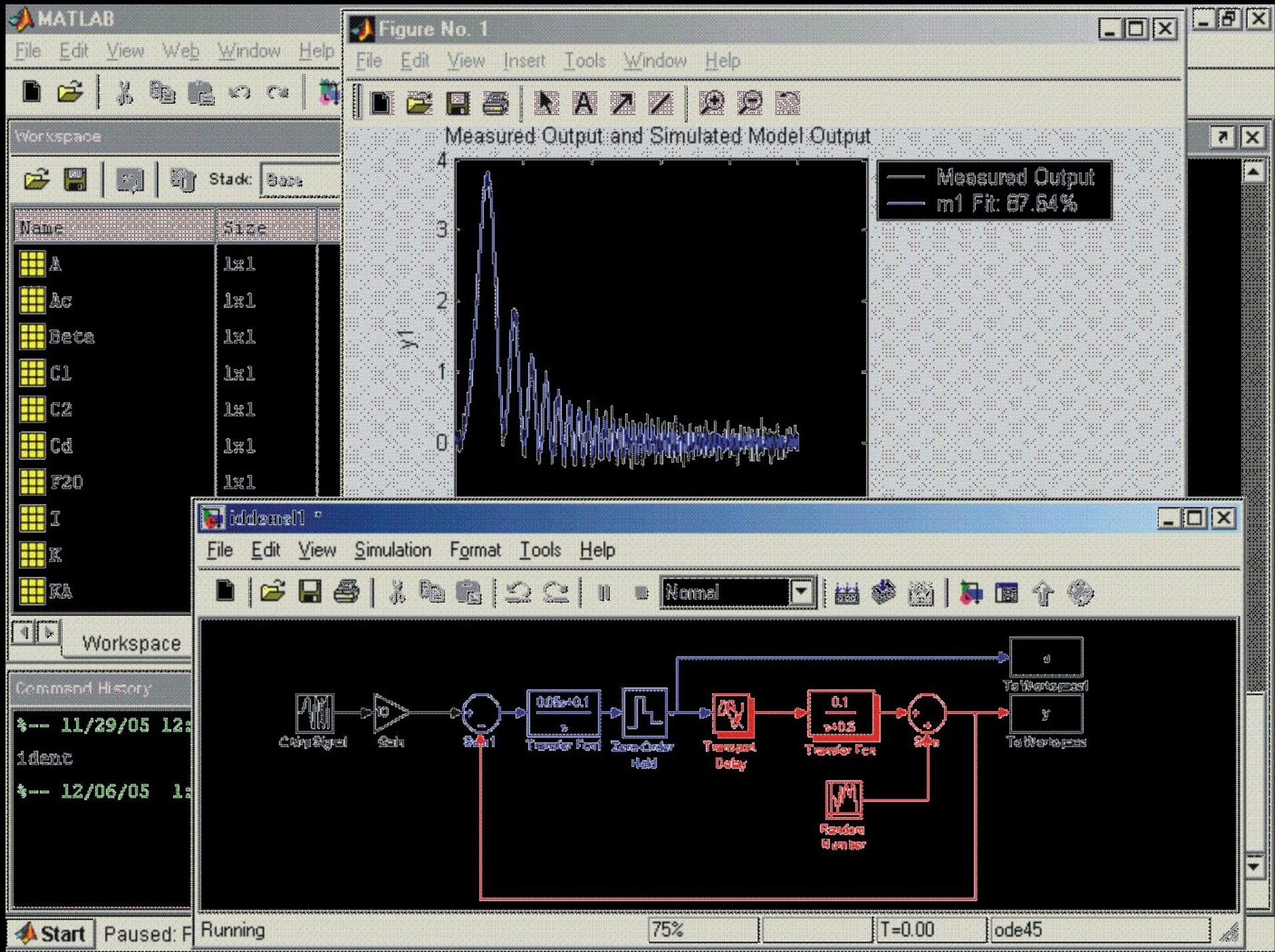


Транспортная задача.

Транспортная задача, это специальный вид задачи линейного программирования. Для решения транспортной задачи можно использовать методы решения задач линейного программирования, однако ввиду специфического вида задачи, были построены алгоритмы специально для решения этой задачи.


Step
u
$\frac{d^3\varepsilon}{dt^3}$
Integrator
Gain4
.7
$\frac{d^2\varepsilon}{dt^2} = x_3$
Integrator1
$\frac{d\varepsilon}{dt} = x_2$
Integrator2
$\varepsilon = x_1$
Gain
-10
Gain3
1
Gain2
4
Gain1
3
y
Scope


Scope
1.5
1
0.5
0
-0.5
-1
-1.5
0
1
2
3
4
5
6
7
Time offset: 0


MATLAB
File Edit View Web Window Help
Workspace
Stack: Base
Name Size
A 1x1
Ac 1x1
Beta 1x1
C1 1x1
C2 1x1
Cd 1x1
F20 1x1
I 1x1
K 1x1
KA 1x1
Workspace
Command History
%-- 11/29/05 12:
ident
%-- 12/06/05 1:
Figure No. 1
File Edit View Insert Tools Window Help
Measured Output and Simulated Model Output
Measured Output
m1 Fit: 87.64%
y1
iddemo1 *
File Edit View Simulation Format Tools Help
Normal
Step Signal
Gain
Sum1
Transfer Fcn1
Zero-Order Hold
Transport Delay
Transfer Fcn
Sum
To Workspace1
To Workspace
Random Number
Start
Paused: F
Running
75%
T=0.00
ode45

Пример оптимизационных