Scilab

Scilab is a free open-source software that is used for data analysis and computation. Scilab is named as Scientific Laboratory which resolves the problem related to numeric data. It uses an approximation technique which is called as Scientific Computing. It is an alternative to MATLAB (Matrix Laboratory) which majorly deals with array and matrix problems.

Some features of Scilab:

- It is capable to solve different algebraic equations.
- It supports the development of certain complicated algorithms.
- Capable of the model the previous computations.
- Performs visualization in Bar Graphs, lines, Histograms, MathML annotation.
- Major functionality of scilab - XCOS, control, simulation, optimization and also signal processing.

S.No.	MATLAB	Scilab
1.	It is a high-level programming language that is used for performing mathematical computing.	It is a software that is used for performing scientific computations.
2.	MATLAB is short used for **Matrix laboratory.**	Scilab is short used for **Scientific Laboratory.**
3.	This language is written in C, C++, and Java.	This software is programmed with C, C++, and Fortran.
4.	The file saved is with extension **'geeksforgeeks.m'.**	The file saved is with extension **'geeksforgeeks.sci'.**
5.	The command line used begins with '%'.	The command line used beings with '//'.
6.	It is not an open-source language.	It is open-source software.
7.	MATLAB is used for solving high-level computation.	Scilab is used for solving low-level scientific computations.
8.	The syntax for declaring an empty matrix is [] in MATLAB.	The syntax for declaring an empty matrix is [] +1 in Scilab.

Need for Scilab

- Provides high speed computation
- Open-source software useful for modeling, computing and also simulation
- Analyze and also plot astronomical data easily

Scilab as a Platform

- Multiplatform support (GNU/Linux, MAC OS X, Windows, and also Unix)
- Numerous libraries wrapped in Scilab
- Interfaced with C,C++, FORTRAN

Scilab GUI Environment

- Use graphical objects like menus, windows and icons to interact with users. It makes the system more intuitive and easier for users to use.
- “uicontrol” is a function used to create graphical user interface object in Scilab.

Scilab Interface With XCOS

- Xcos is a graphical editor used to design hybrid dynamical systems models.
- Available blocks include thermo-hydraulic, signal processing, electrical, and also mathematics operations etc.
- We can also add user defined blocks easily.
- Contains:
    - Model building and also editing
    - Sub modeling for models reuse and also simplification
    - Model customization
    - Standard palettes and also blocks
    - Simulation using embedded Modelica, C-code generation also for high performance
    - Result visualization and also analysis

Open-Source Involvement

Used in all major scientific areas and services like automotive, electronics, energy, defense and also finance.

Major Areas Where SCILAB Can Be Used Are

- Developing Math and numerical computing applications
- Simulation using ODE solver and also DAE solver
- LMI optimization, classic and robust control
- Rational and polynomial functions
- Sparse matrices, optimization, linear algebra and also visualization
- Animations , 2 D and 3D graphics
- Differentiable and non-differentiable optimization]
- Image processing and signal processing

- Instrument modeling and control
- Parallel scilab
- Metanet-graphs and networks
- Remote access applications
- Aerospace blockset and also celestlab
- Real time simulation and also GUI builder
- Data analysis , statistics and also data handling
- Number theory and also numerical Maths
- Serial communication
- Instrument modeling and also control
- Interface with computer algebra: uses Maple package also for code generation
- Interface with languages like TCL/TK, C, C++, Java, and also LabVIEW , .NET

Workspaces

The useful workspace in Scilab consists of several windows:

- The console for making calculations
- The editor forwriting programs
- The graphics windows for displaying graphics
- The embedded help.

The general environment and the console

Scilab environment by default consists of the following docked windows – console, files and variables browsers, command history

In the console after the prompt " --> ", just type a command and press the Enter key

e.g.,

```
--> 57/4
 ans =
 14.25
--> (2+9)^5
 ans =
 161051.
```

Simple numerical calculations

All computations done with Scilab are numerical.

Operations are written with "+" for addition, "-" for subtraction, "*" for multiplication, "/" for division, "^" for exponents.
The case is sensitive. For example, with sqrt command (which calculates the square root):

```
sqrt(9)
ans =
3.

while:

-->SQRT(9)
!--error 4
Undefined variable: SQRT
```

Particular numbers

%e and %pi represent respectively e and pi

```
--> %e
%e =
2.7182818

--> %pi
%pi =
3.1415927
```

%i represents the i of complexes in input and is displayed i in output:

```
--> 2+3*%i
ans =
2. + 3.i
```

For not displaying the results

In adding a semi colon at the end of a command line, the calculation is done but the result is not displayed.

```
-->(1+sqrt(5))/2; --> (1+sqrt(5))/2
ans =
1.618034
```

To remind the name of a function

For example

```
--> exp(10)/factorial(10)
ans =
0.0060699
```

The tab key on the keyboard can be used to complete the name of a function or a variable by giving its first few letters. For example, after typing in the console the command: -->fact and then pressing the tab key, a window is displayed with all the functions and variables names beginning with fact, such as factorial and factor.

The menu bar

The menus listed below are particularly useful.

Applications

- The command history allows you to find all the commands from previous sessions to the current session.
- The variables browser allows you to find all variables previously used during the current session.

The editor

Typing directly into the console has two disadvantages: it is not possible to save the commands and it is not easy to edit multiple lines of instruction. The editor is the appropriate tool to run multiple instructions.

Opening the editor –

To open the editor from the console, click on the first icon in the toolbar or on Applications SciNotes in the menu bar. The editor opens with a default file named Untitled 1

Writing in the editor –

Typing in the editor is like as in any word processor. In the text editor, opening and closing parentheses, end loops, function and test commands are added automatically. However, these features can be disabled in Options Auto---completion on menu, in clicking on the two below entries enabled by default:

- (,[,…
- if,function,…

While in principle each instruction should be entered on a separate line, it is possible to type multiple statements on a same line separating each statement with a semicolon A space at the start of the line called indentation is automatic when a loop or a test is started.

The graphics window

Opening a graphics window

A graphics window opens automatically when making any plot. It is possible to plot curves, surfaces, sequences of points. To obtain an example of curve, type in the console: -->plot

Variables, assignment and display

Variables

Scilab is not a computer algebra system. It calculates only with numbers. All calculations are done with matrices, although this may go unnoticed. Even if the concept of matrices is unknown, vectors and sequences of numbers can explain it, as they are, in fact, matrices of dimension 1 x n or n x 1 and a number is itself a matrix of dimension 1 x 1.

Variables do not need to be declared in advance, but any variable must have a value. For example, obtaining the value of a variable which has not been given a value produces an error:

```
-->a
!--error 4
Undefined variable : a
```

If a value is assigned to the variable a, there is no longer an error:

```
--> a=%pi/4
a =
0.7853982
--> a
a =
0.7853982
```

Variables may take any name that is not already defined by the system:

```
--> a=%pi/4
a =
0.7853982
--> a
a =
0.7853982
```

Functions

Functions are the easiest and most natural way to make computations from variables and for obtaining results from variables. A function definition begins with function and ends with endfunction. For example, to convert euros (e) in dollars (d) with an exchange rate (t), the dollars function is defined. The variables are e and t and the image is d.

```
-->function d=dollars(e,t); d=e*t; endfunction
-->dollars(200,1.4)
ans =
280.
```

Display

To define a column vector and obtain a column display:

```
-->v=[3;-2;5]
v =
3.
- 2.
5.
```

To define a row vector and obtain a row display:

```
-->v=[3,-2,5]
v =
3. - 2. 5.
```

To define a matrix and obtain a tabular display:

```
-->m=[1 2 3;4 5 6;7 8 9]
m =
1. 2. 3.
4. 5. 6.
7. 8. 9.
```