

LAB # 01

Familiarization with SIM Power system toolbox and its use for Renewable Energy system

Objectives:

The objective of this lab is to understand the Simulink basic primary functions and implementation of circuits in Simulink.

Theory:

Simulink:

Simulink is a graphical simulation tool of MATLAB that allows us to represent dynamic systems using block diagrams and model components both in the time domain (using differential and algebraic equations) and the frequency domain (using transfer functions). Given inputs and a desired time interval, Simulink numerically integrates the equations and, when told, loads the outputs into the MATLAB workspace and available them for plotting and further data analysis.

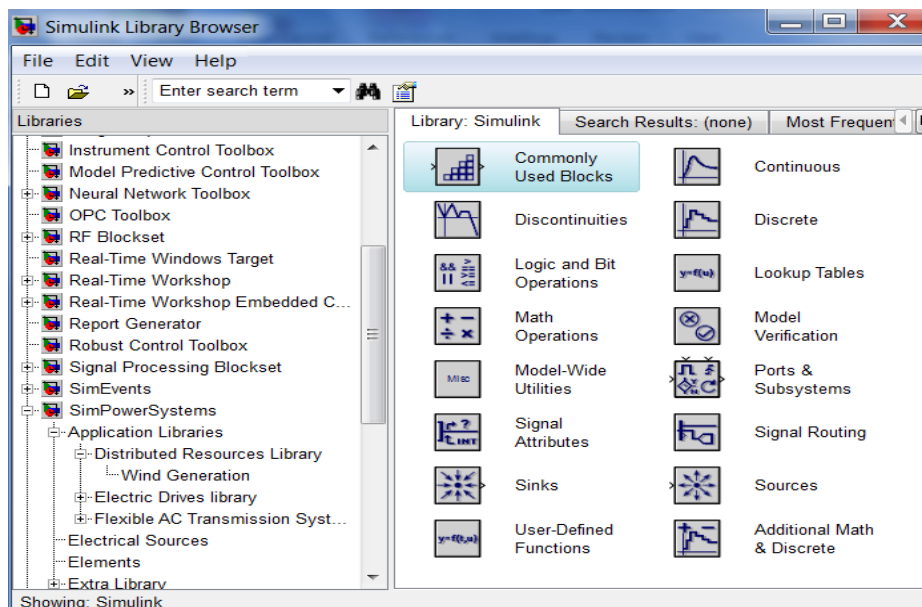
Starting Up Simulink

In order to use Simulink, you must first start MATLAB.

Click the Simulink icon  on the MATLAB toolbar.

Type 'Simulink' at the MATLAB prompt followed by a carriage return (press the Enter key). In response, MATLAB displays the Simulink Library Browser.

Simulink Library Browser



Basics Elements

There are two major categories of elements in Simulink:

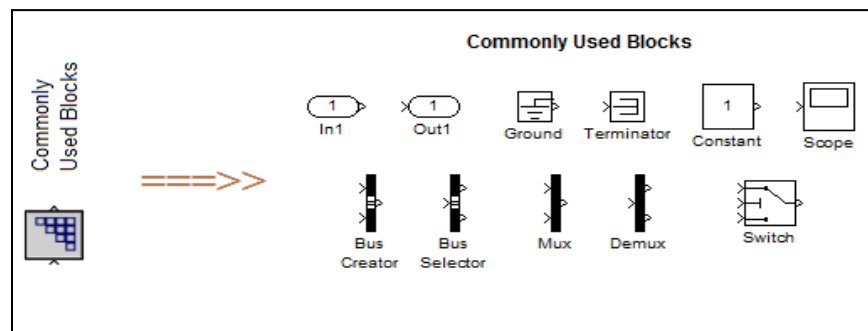
- Blocks
- Lines

Blocks are used to generate, modify, combine, output, and display signals. Lines, on the other hand, are used to transfer signals from one block to another

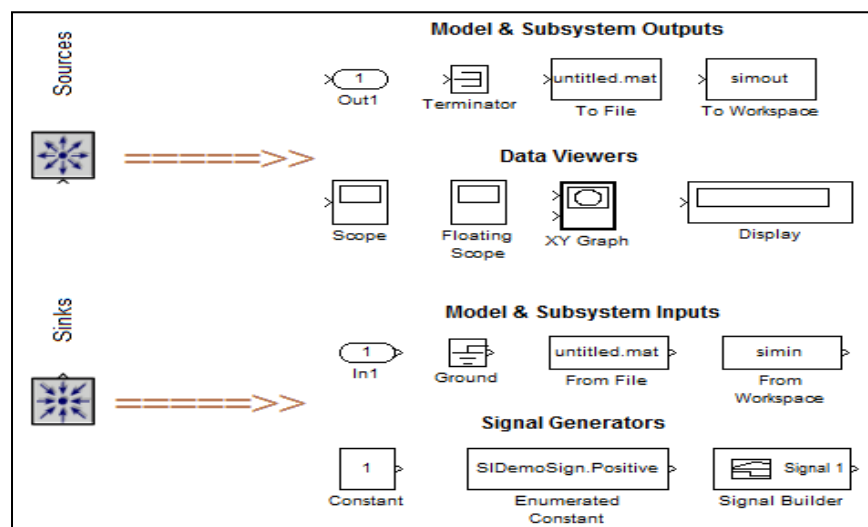
Blocks

There are several general classes of blocks, some of which are:

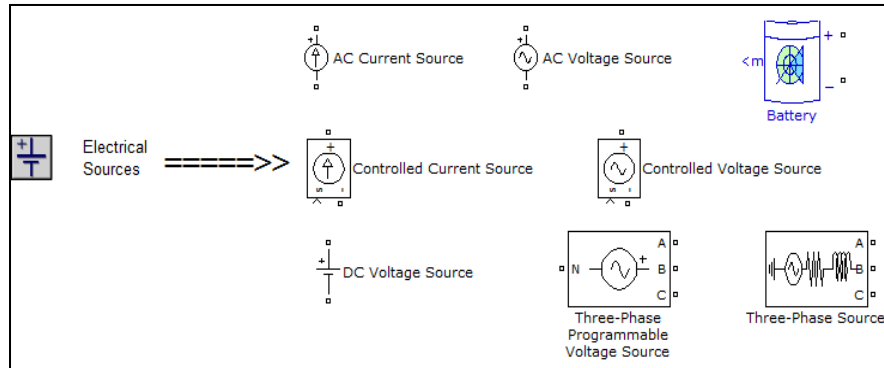
Commonly used blocks



Source and Sink



Electrical Sources



Lines

Lines transmit signals in the direction indicated by the arrow. Lines must always transmit signals from the output terminal of one block to the input terminal of another block. One exception to this is that a line can tap off of another line. This sends the original signal to two (or more) destination blocks.

Model Creation

Creating a working model with Simulink is straightforward. The process involves four (4) basic steps as depicted in the following flowchart:



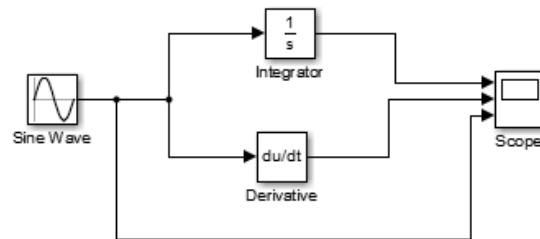
Building a Simulink model

Building a Simulink model of a system consists of selecting the appropriate blocks and connecting them in a way that represents the mathematical models. Since the best way to learn a simulation tool is to work with it, this first tutorial will guide you through a simple example.

Steps to simulate an electrical circuit

- Explore the powerlib library of the Power System Block set
- Learn how to build a simple circuit from the powerlib library
- Interconnect Simulink blocks with your circuit

We will build the block diagram for a simple model consisting of a sinusoidal input with integrator and derivative, which is depicted below.



Run Simulation

Double-click the Scope block, Scope window will pop-up. Then click Simulation→Start, you will see the simulation result is plotted in the Scope. Click Auto scale (an icon of Telescope), the Scope will rescale the plot and make it fit the window. You can also zoom in/out the plot. You can also rescale the axes; by right click on the axes.

Output:

Exercise: Build a block diagram of a simple half wave controlled and semi-controlled rectifier using Sim Power Systems library. Values for Sinusoidal voltages are 220 V_P with 100Ω resistive load.

Output:

Conclusion & Comments:
