

9/7/2018

## 1. Using Matlab and Simulink

MATLAB (matrix laboratory) is a multi-paradigm numerical computing environment and proprietary programming language developed by MathWorks. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, C#, Java, Fortran and Python.

Simulink, developed by MathWorks, is a graphical programming environment for modeling, simulating and analyzing multi-domain dynamical systems. Its primary interface is a graphical block diagramming tool and a customizable set of block libraries. It offers tight integration with the rest of the MATLAB environment and can either drive MATLAB or be scripted from it. Simulink is widely used in automatic control and digital signal processing for multi-domain simulation and Model-Based Design.

## 2. Open Simulink Library to find different blocks and create a Simulink model

Click on the new Simulink model button that can be found under the “new” menu. Shown below.



The workspace (canvas) will show up in a new window where you can create a Simulink model.

A Simulink model consists of different blocks with different functions. The blocks can be found in the Simulink library. Shown below.



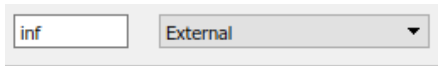
To add a new block on the canvas, open the library and find the blocks you need according to their names or functions you need, then drag the block right onto the canvas. The function description for each block can be found by double-clicking on it.

3. Use Simulink and the Quanser interface to control the electrical mechanical system with motors.

Quanser is the global standard in engineering lab equipment for teaching and research, specializing in Controls, Robotics, and Mechatronics.

There are two major blocks used to send and receive signals to and from the system. One is the Read Encoder which transfers analog signals from the physical system to digital signals and the signal signals will be processed by existing programs in Simulink. The other block is the Write Analog block which converts digital signals to analog signals so that the physical system can understand and response to the input from Simulink.

In the main tool bar on the canvas window, select external so that the Simulink model can be interacting with the external signals.



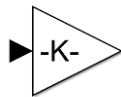
When a model is set up, hit the build button to build it.



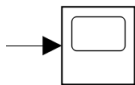
Then hit connect and run to get the physical system and the Simulink connected and run the Simulink model.



4. Some basic and useful blocks



- a. gain block: used to provide a gain factor for a signal



- b. scope block: used to plot the signal



- c. signal generator block: used to generate different functions of signals as the input signal



- d. **Saturation** saturation block: used to limit the signal value within specific threshold values