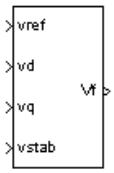
Excitation System

Provide excitation system for synchronous machine and regulate its terminal voltage in generating mode

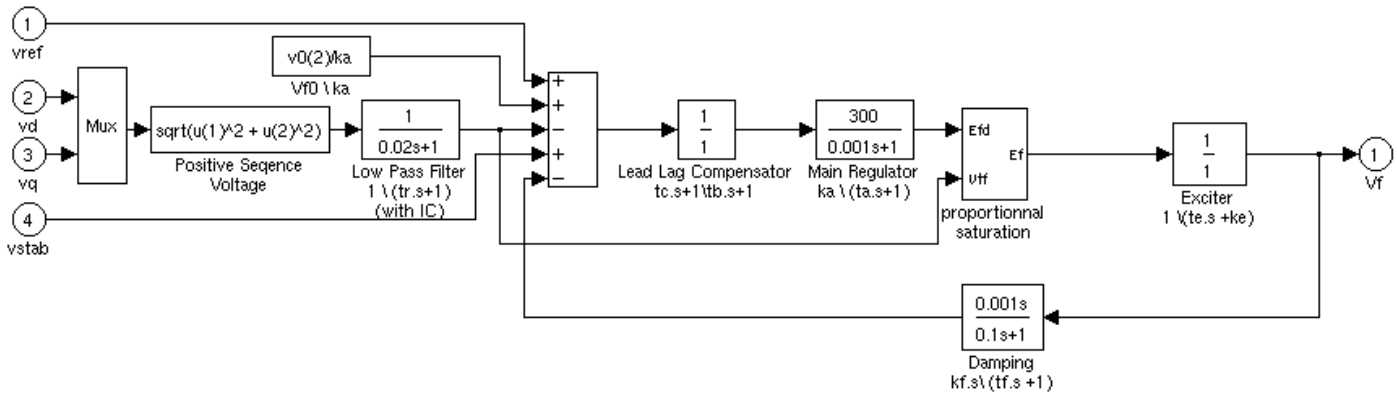
Library

Machines

Description



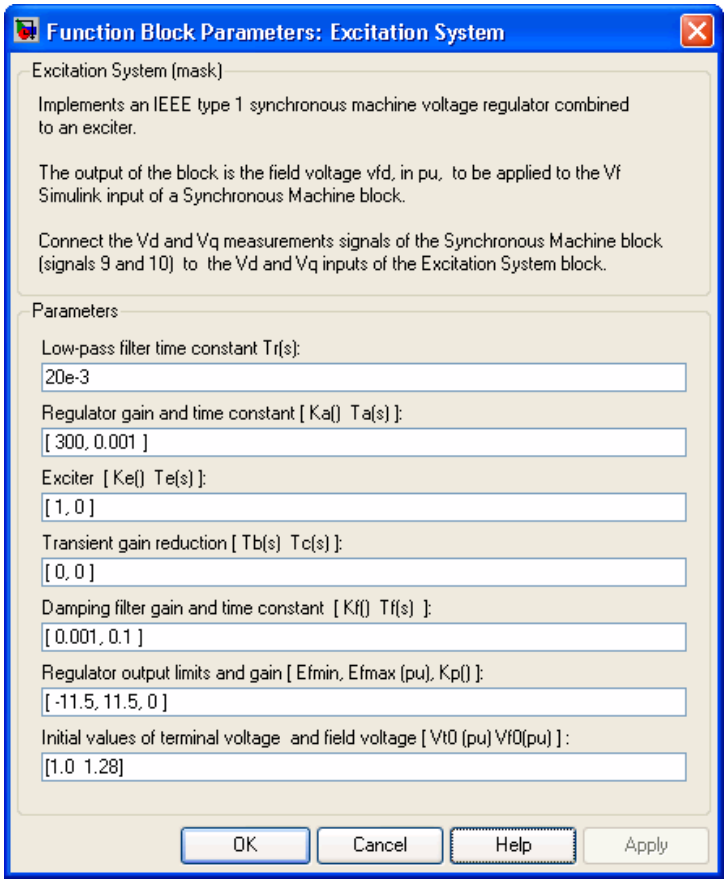
The Excitation System block is a Simulink system implementing a DC exciter described in [1], without the exciter's saturation function. The basic elements that form the Excitation System block are the voltage regulator and the exciter.



The exciter is represented by the following transfer function between the exciter voltage Vfd and the regulator's output ef:

$$\frac{V_{fd}}{ef} = \frac{1}{Ke + sTe}$$

Dialog Box and Parameters



Low-pass filter time constant

The time constant Tr, in seconds (s), of the first-order system that represents the stator terminal voltage transducer.

Regulator gain and time constant

The gain Ka and time constant Ta, in seconds (s), of the first-order system representing the main regulator.

Exciter

The gain Ke and time constant Te, in seconds (s), of the first-order system representing the exciter.

Transient gain reduction

The time constants Tb, in seconds (s), and Tc, in seconds (s), of the first-order system representing a lead-lag compensator.

Damping filter gain and time constant

The gain Kf and time constant Tf, in seconds (s), of the first-order system representing a derivative feedback.

Regulator output limits and gain

Limits Efmin and Efmax are imposed on the output of the voltage regulator. The upper limit can be constant and equal to Efmax, or variable and equal to the rectified stator terminal voltage Vtf times a proportional gain Kp. If Kp is set to 0, the former applies. If Kp is set to a positive value, the latter applies.

Initial values of terminal voltage and field voltage

The initial values of terminal voltage Vt0 (pu) and field voltage Vf0 (pu). When set correctly, they allow you to start the simulation in steady state. Initial terminal voltage should normally be set to 1 pu. Both Vt0 and Vf0 values are automatically updated by the load flow utility of the Powergui block.

Example

See the Hydraulic Turbine and Governor block.

Inputs and Outputs

`vref`

The desired value, in pu, of the stator terminal voltage.

`vd`

v_d component, in pu, of the terminal voltage.

`vq`

v_q component, in pu, of the terminal voltage.

`vstab`

Connect this input to a power system stabilizer to provide additional stabilization of power system oscillations.

`Vf`

The field voltage, in pu, for the Synchronous Machine block.

References

[1] "Recommended Practice for Excitation System Models for Power System Stability Studies,"*IEEE Standard 421.5-1992,* August, 1992.

See Also

Generic Power System Stabilizer, Hydraulic Turbine and Governor, Multiband Power System Stabilizer, Steam Turbine and Governor, Synchronous Machine