Title: Power system modeling using a time varying load from OpenIPSL

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Abstract:

The simulation presents power system modeling using a time varying load. The time varying load is connected to the bus B2 in the power system model. The load variation starts at 5 seconds after the simulation starts. A three phase balanced fault is also simulated during 30 to 30.6 seconds. The power system model is shown in Figure 1. The bus (B2) voltage angle during the simulation execution is shown in Figure 2.

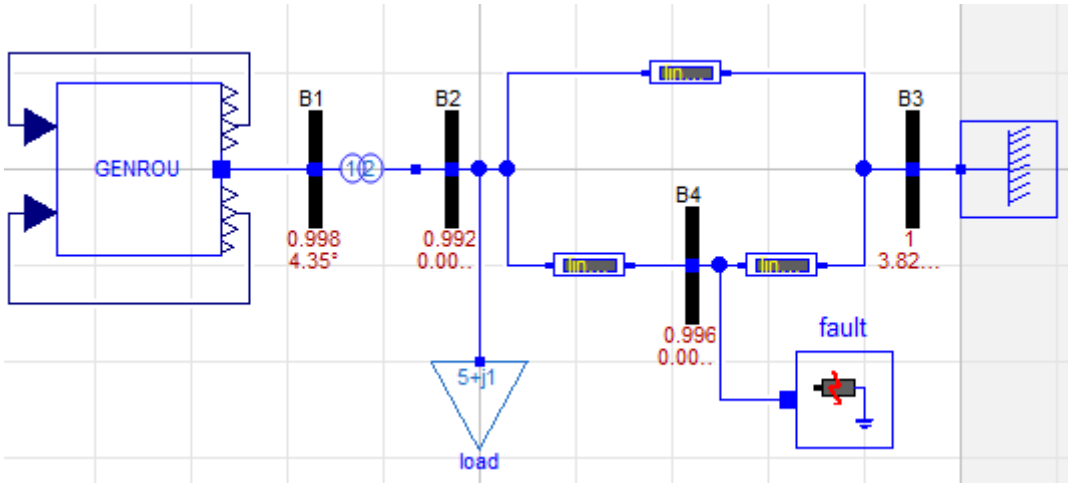

Figure 1: Power system model

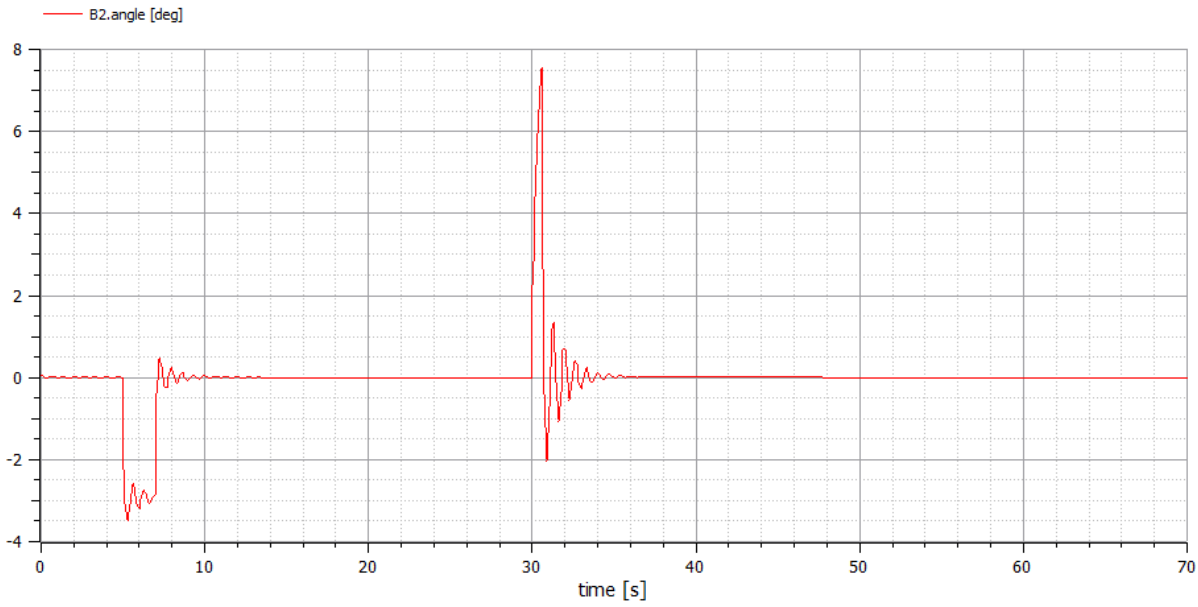

Figure 2: Plot of bus (B2) voltage angle.

Explanation: The above model consists of following components

Component Name	Path	Number
Three phase fault	OpenIPSL.Electrical.Events.PwFault	1
GENCLS	OpenIPSL.Electrical.Machines.PSSE.GENCLS	1
Two Winding Transformer	OpenIPSL.Electrical.Branches.PSAT.TwoWindingTransformer	1
Round rotor generator model(GENROU)	OpenIPSL.Electrical.Machines.PSSE.GENROU	1
Constant load	OpenIPSL.Electrical.Loads.PSSE.Load_variation	1
Bus	OpenIPSL.Electrical.Buses.Bus	4
PwLine	OpenIPSL.Electrical.Branches.PwLine	3
Sysdata block	OpenIPSL.Electrical.SystemBase	1

The above model is subjected to two different conditions at two different time periods in order to observe the voltage profiles at the buses. The two conditions which it is subjected to are:

1. The load(connected to bus 2) variation starts at 5 to 7 seconds
2. Three phase balanced fault is also simulated during 30 to 30.6 seconds

The voltage at the bus 2 is shown in the fig 3 and from this we can see that the voltage dips which decelerates the system. This can be clearly observed from the voltage angle plot of bus 2 in the fig 2. The system decelerates and when the load is cut off after 7 secs the voltage angle oscillates about its steady state value and settles after some time.

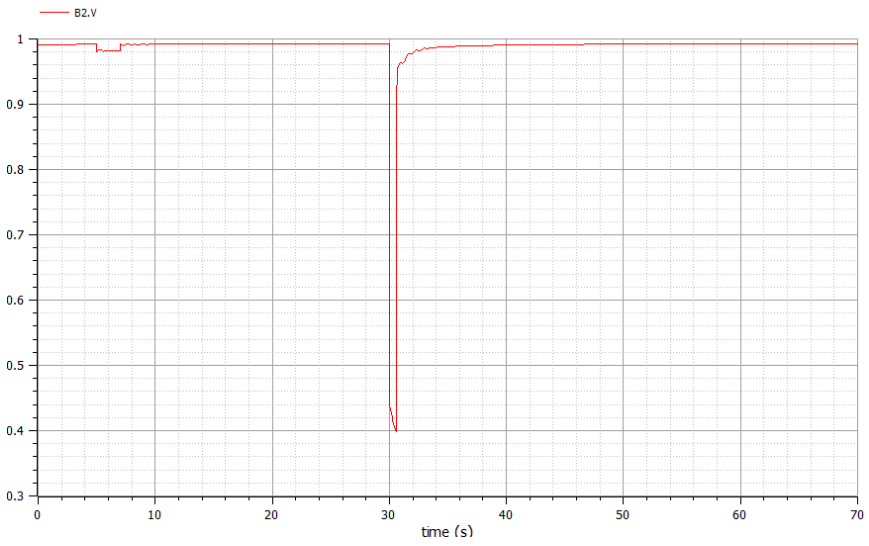

Figure 3: Voltage profile at bus 2

The voltage at the bus 2 drops rapidly when the fault is occurred at bus 4. The voltage profile is shown in the fig 3. From Fig 2 we can see that when there is fault occurred at 30 secs the voltage angle of the bus increases rapidly which indicates the system is accelerating and is unstable. Later when the fault is cleared the voltage angle oscillates about its steady state value and settles after some time. The system gets stable after the fault is cleared.

Conclusion:

In this model the effects of time varying load and the three phase balanced fault on Bus 2 load angle are shown in the plot. The active load is varied starting from 5 seconds and ending at 7 seconds. During this variation of load, the load angle at bus 2 decreases and after 7 seconds it comes back to nominal value and when the fault occurs the load angle at bus 2 increases as the whole system accelerates when the fault occurs. We can observe from the plot that the more severe effects are seen in case of a three phase balanced ground fault rather than the load variation. This comparison again depends on the balanced three phase fault parameters and the varied load parameters.