Title : Fault analysis of 6-bus System implementation in *OpenModelica* using *OpenIPSL*

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Abstract :

Modelica implementation of the 6 bus power system under faulty condition. This model is implemented in OpenModelica using OpenIPSL library shown in figure 1. The power system consist 3 generators, 3 loads, 11 power lines. A three phase balanced fault is simulated at 5th Bus for the duration of 0.6 seconds (5 seconds to 5.6 seconds). The purpose of this power system is to fault analysis and the voltage stability at multiple buses.

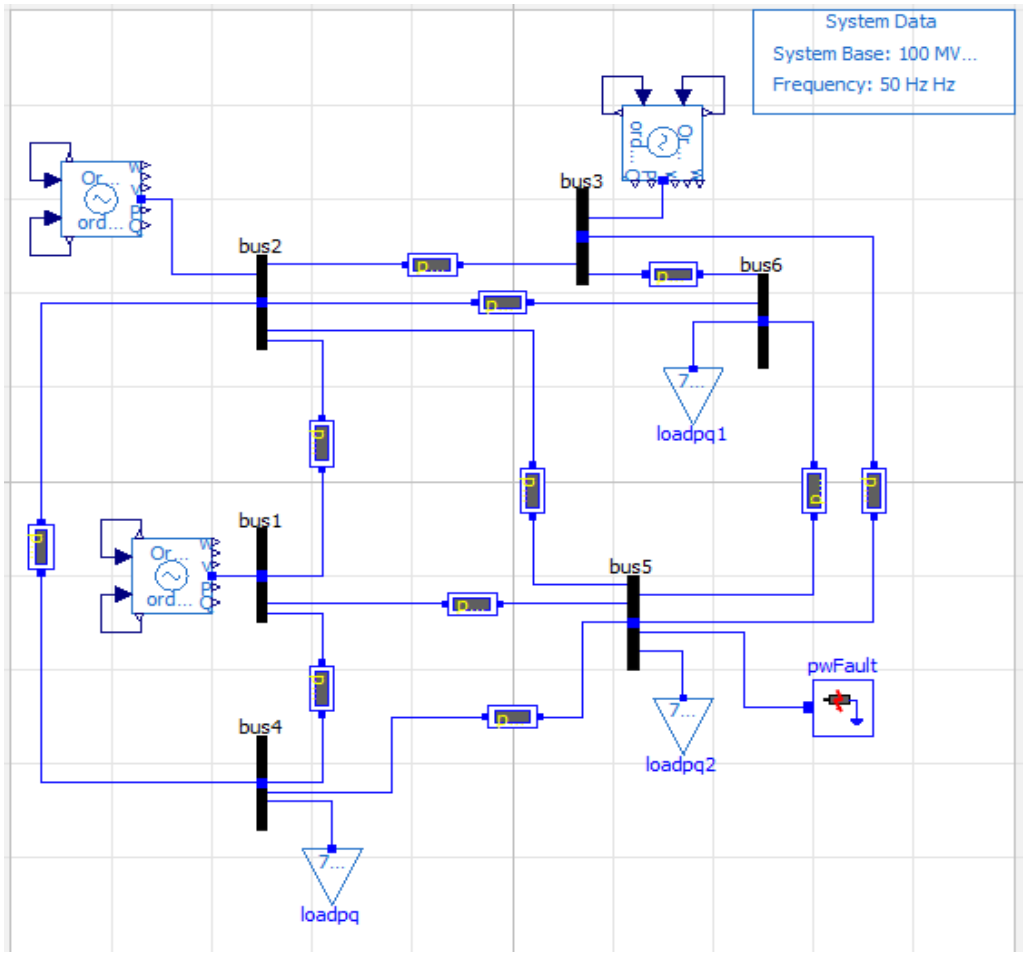

Figure 1. Implementation of 6 bus system using OpenModelica and OpenIPSL

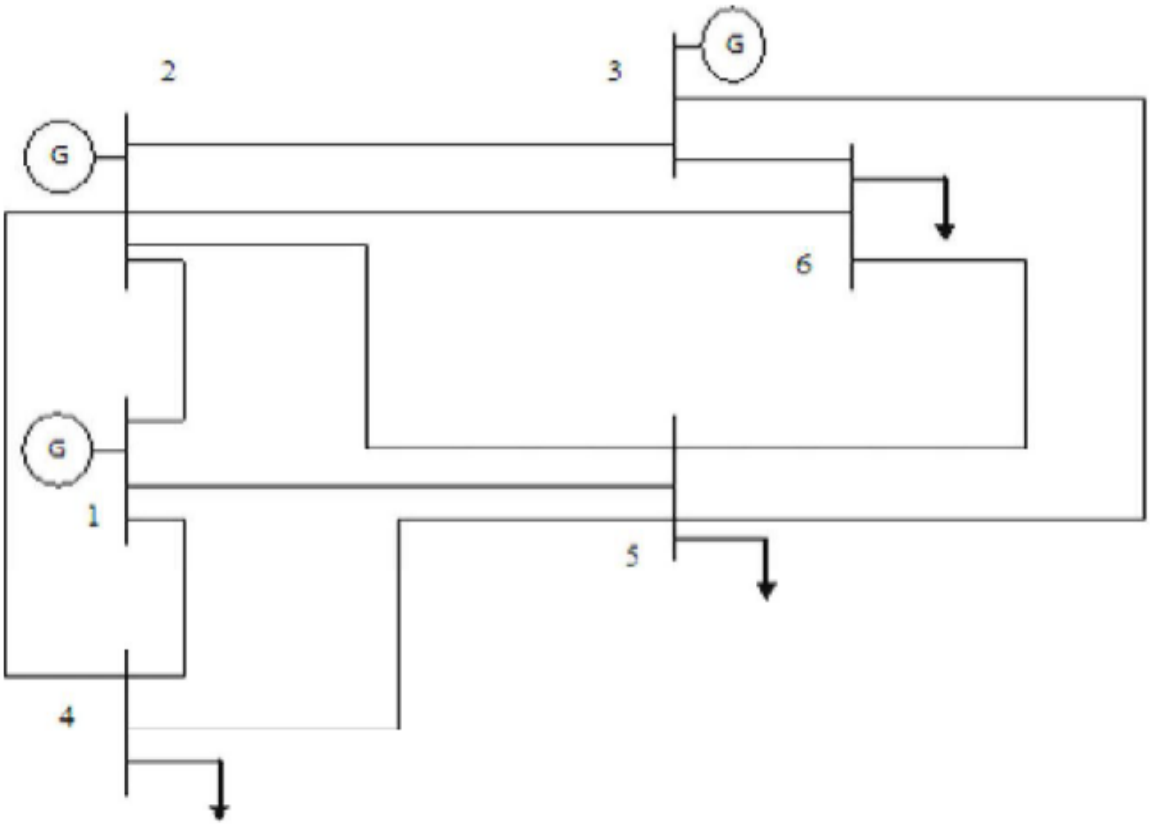

Figure 2. Single Line Diagaram of 6 bus system

Explanation :

This model uses the following components.

Component Name	Class Path	Quantity
Bus	**OpenIPSL.Electrical.Buses.Bus**	**6**
Transmission line	**OpenIPSL.Electrical.Branches.PwLine**	**11**
Load	**OpenIPSL.Electrical.Loads.PSAT.LoadPQ**	**3**
Generator	**OpenIPSL.Electrical.Machines.PSAT.Order2**	**3**
Three Phase Fault	**OpenIPSL.Electrical.Events.PWFault**	**1**
System	**OpenIPSL.Electrical.System Base**	**1**

Result :

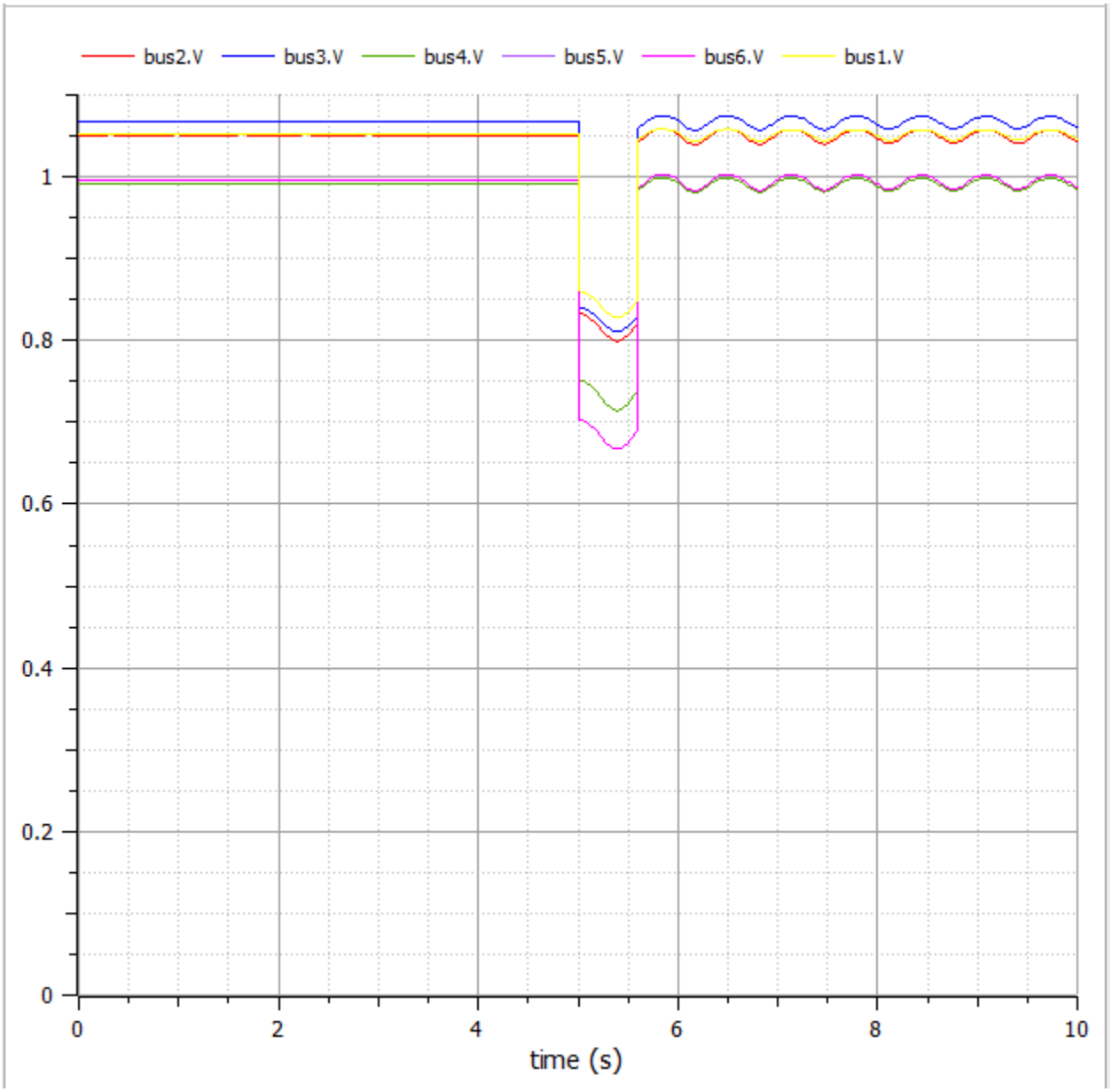

Figure 3. Voltage Profile of Buses during Three Phase Fault

From figure 3 we can see that three phase balanced fault is simulated at 5th Bus during 5 to 5.6 seconds. The simulation result (voltage profile) of all buses is plotted in figure 3 i.e. load bus, generator bus, fault bus. We can observe from voltage profile that as soon as the fault occurs the voltage dips and oscillating until the fault is cleared. When fault is cleared is cleared after 5.6 seconds system

bus voltages remains oscillating . If we use Automatic Voltage Regulators (AVR) models, it can stabilize the oscillation of the bus voltages.

Conclusion :

This implemented 6-bus model in OpenModelica represents the system behavior before and after the fault occurs at 5^{th} Bus. The voltage profile of the buses indicates that the system can be brought back to stable operating condition even faster by adding additional controls such as power system stabilizer (PSS) and automatic voltage regulator (AVR).