Title: Modelling and Simulation of Illini 42 bus system using OpenModelica and OpenIPSL

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Abstract:

The power system model consists of 8 generators, 42 buses, 55 loads, 65 lines, 11 transformers, 5 shunt capacitors. The submitted model implemented in OpenModelica language using OpenIPSL package. Model represents presents simulation scenario of line trip separate lines at specific interval of time. Simulation obtained shows voltage profiles at various buses for different cases.

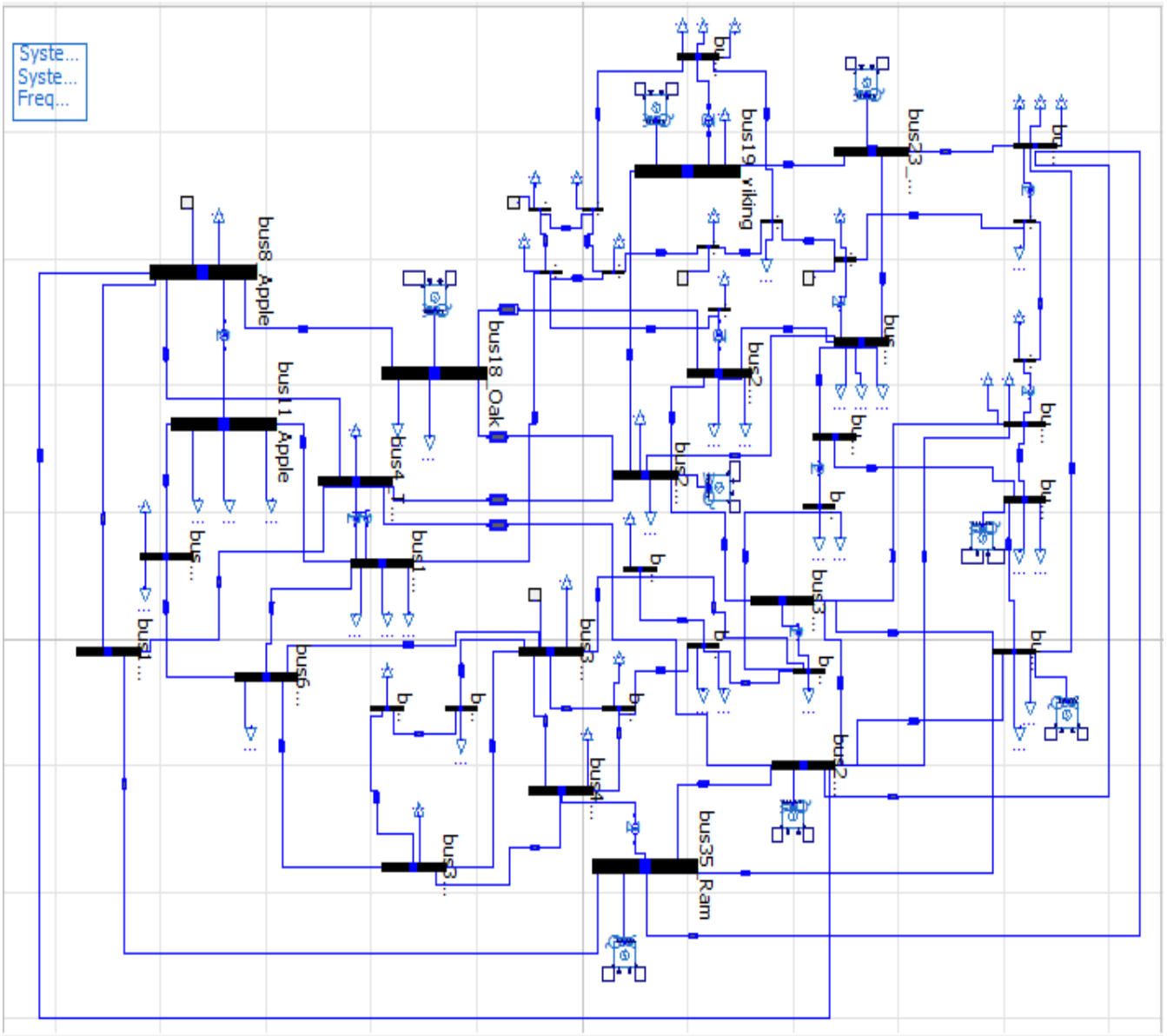

Figure 1: Implementation of Illini 42 bus system using Modelica and OpenIPSL.

Explanation:
This model uses the following components:

Component Name	Class Path	Number
Two Winding Transformer	OpenIPSL.Electrical.Branches.PSAT.TwoWindingTransformer	11
Constant PQ Load	OpenIPSL.Electrical.Loads.PSAT.LOADPQ	55
Generators	OpenIPSL.Electrical.Machines.PSAT.Order2	8
Buses	OpenIPSL.Electrical.Buses.Bus	42
Shunt	OpenIPSL.Electrical.Banks.PwShuntB	5
PwLine	OpenIPSL.Electrical.Branches.PwLine	65
Sysdata block	OpenIPSL.Electrical.SystemBase	1

Table 1: Components used in system

The Illini 42 bus system is a dynamic case study implemented in power-world simulator. The model is implemented in Modelica language using OpenIPSL package, is used to study the voltage stability at different buses by introducing similar events in original case study. The system is on a 100 MVA base. The type of generator used is a synchronous motor of order2. A series of line trips has been given at line between buses 21 & 22, 22 & 3, 22&4 for the time period from 6 to 6.4 seconds. During the line trip, we can observe from the bus voltage profiles, that the voltage dip is more and the severity decreased as we move away. After line trip is cleared some Oscillations are observed, after some oscillation voltages arrive at steady state. Due to mechanical start time disturbance at initial start of simulation is observed after some oscillation disturbance is cleared. If lower mechanical start time used then convergence is not being able to achieved. Simulation obtained shows profiles at various buses and waveforms obtained are observed.

The simulation result of all 42 Bus voltages shown below.

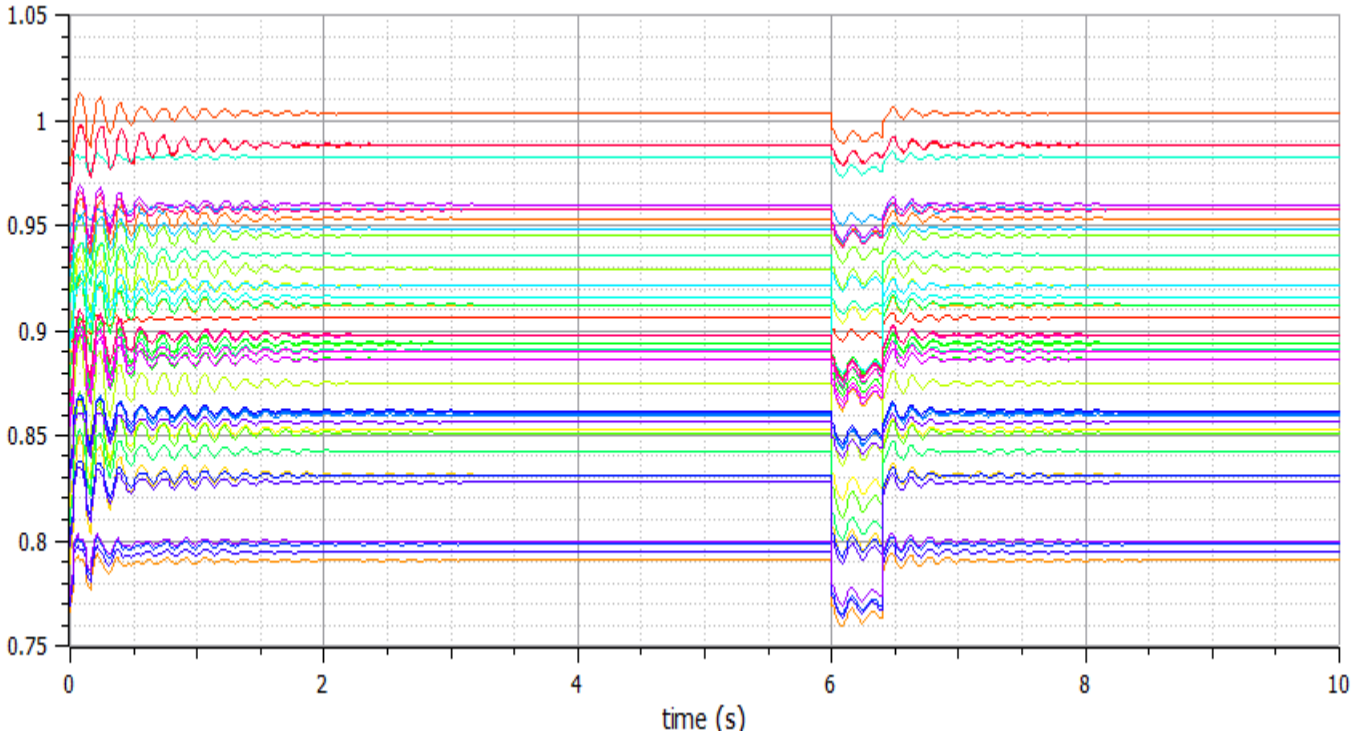

Figure 2: The voltage profiles of simulated Illini 42 bus system.

Conclusion:

The implemented Illini 42 bus model in Modelica represents the system behaviour before and after the line trip occurs at the different lines. Since no controller is used oscillations occur after line trip after some time oscillations are reduced. Due start time disturbance is observed at starting of simulation. At distribution voltage level buses voltage drop up to 0.11 P.U. is observed.