Title: IEEE 10-generator, 39-bus system

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Abstract:

This report summarizes a study of an IEEE 10-generator, 39-bus system. Two types of analysis were performed: load flow, small disturbance analysis. All analysis was carried out using OpenIPSL, and this report's objective is to demonstrate how to use OpenIPSL to obtain results that are comparable to benchmark results from other analysis methods

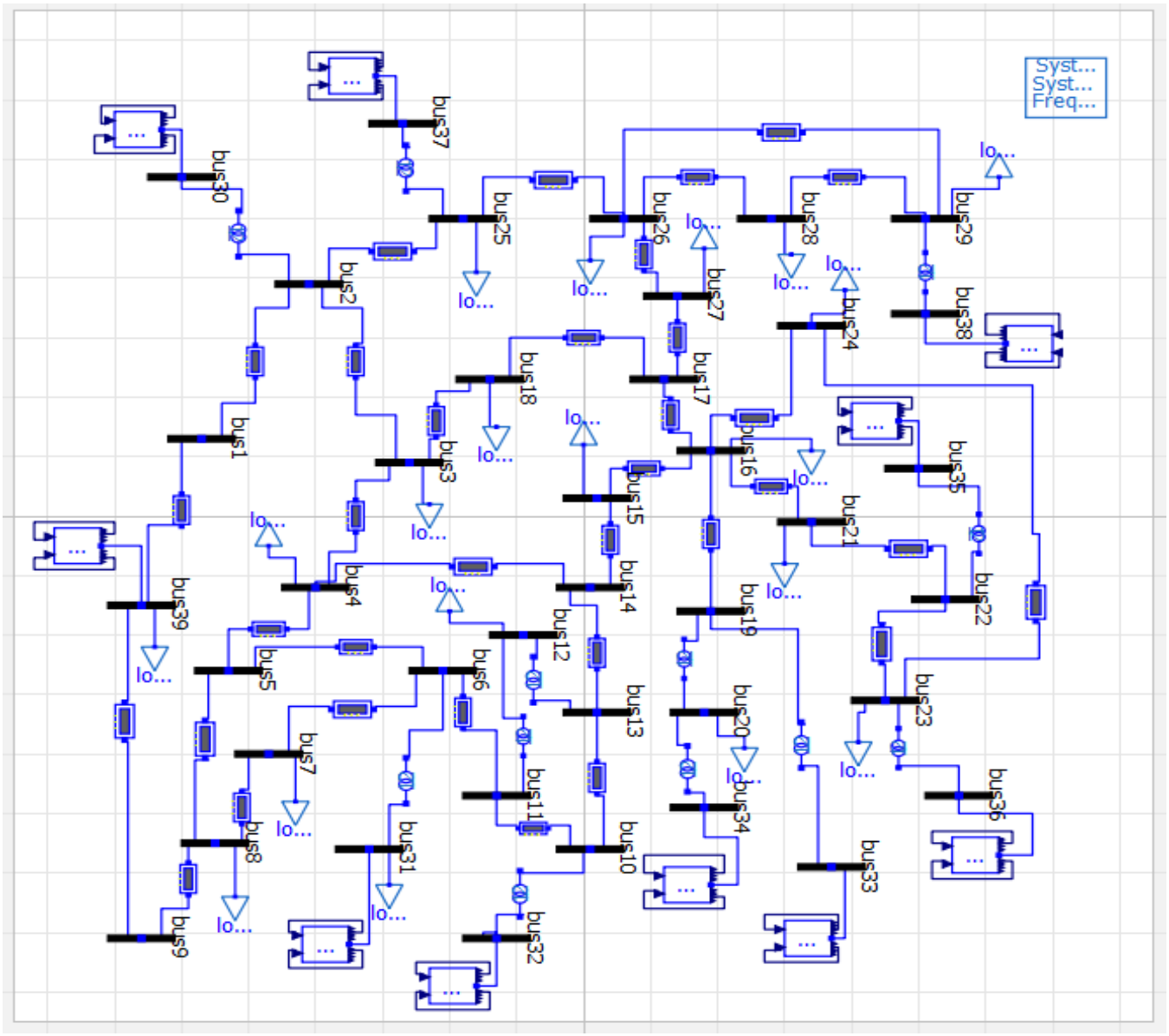

Figure 1. Implementation of IEEE 10-generator, 39-bus system

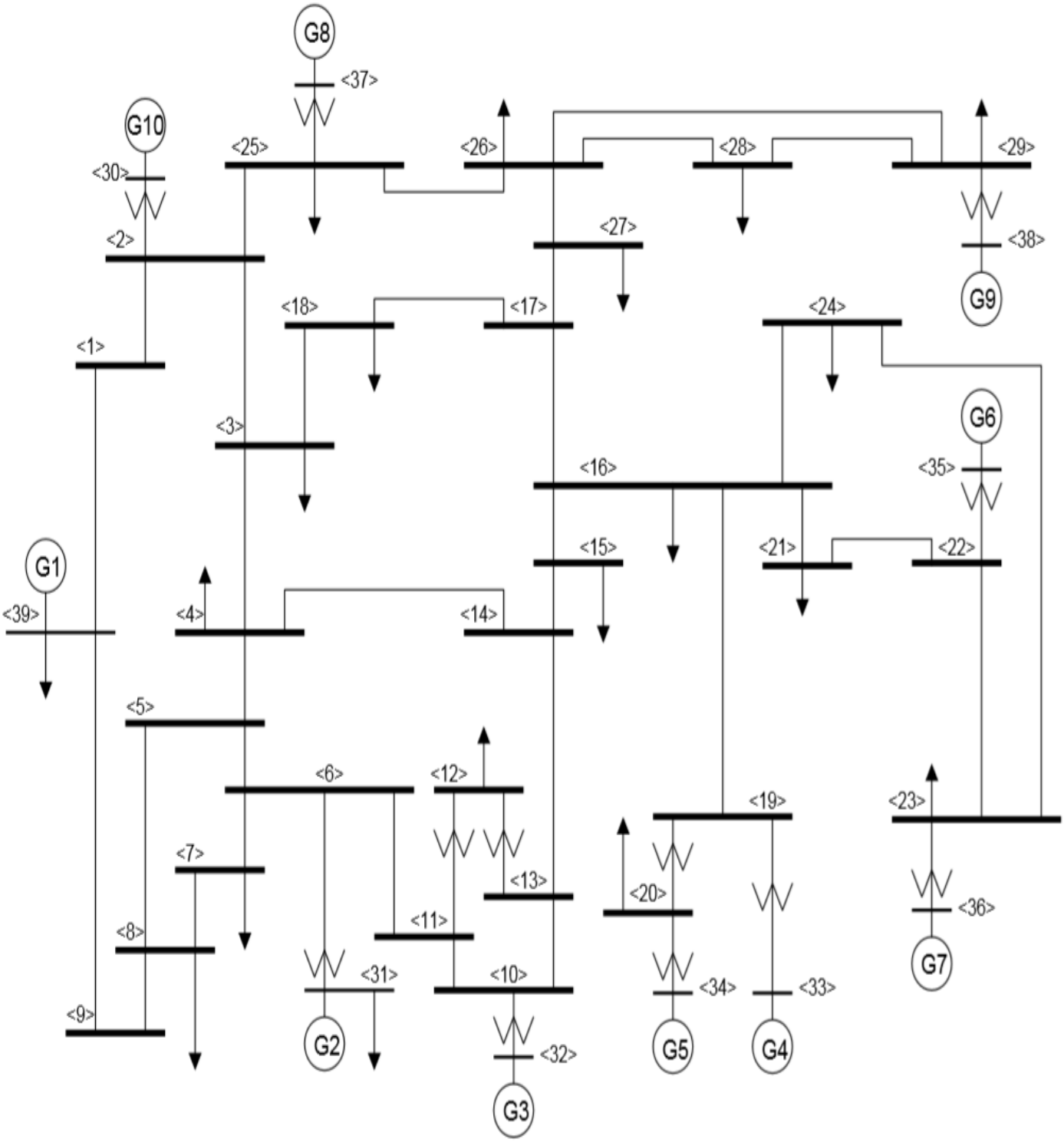

Figure 2. Single-line diagram of IEEE 10-generator, 39-bus system

Description of the simulation:

Table 1: Model components:

Componet Name	Path	Number
Buses	OpenIPSL.Electrical.Buses.Bus	39
Power Line	OpenIPSL.Electrical.Branches.PwLine	34
Generator	OpenIPSL.Electrical.Machines.PSE.GENROU	10
Transformer	OpenIPSL.Electrical.Branches.PSAT.TwoWindingTransformer	12
Constant PQ Load	OpenIPSL.Electrical.Loads.PSAT.LOADPQ	19
System Data Block	OpenIPSL.Electrical.SystemBase	1

The IEEE 10-generator, 39-bus system network model is implemented in OpenModelica language using OpenIPSL package is to study the voltage stability at different buses. The model is taken from a published paper "IEEE PES Task Force on Benchmark Systems for Stability Controls". The system is on a 100 MVA base, the system voltage level is 132-140KV, and Load Demand is 6149.5MW.

The simulation result of the Bus voltages of IEEE 10-generator, 39-bus system network shown below:

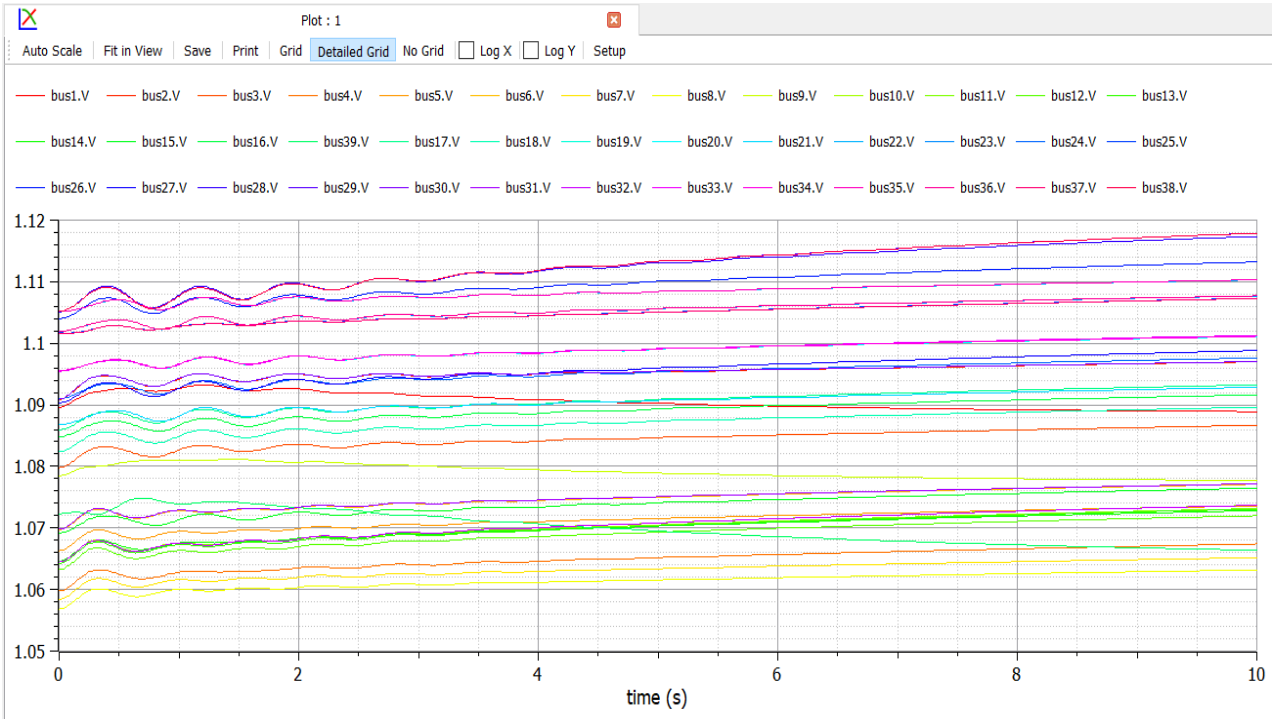

Figure 3. Voltage profiles of buses of IEEE 10-generator, 39-bus system

Table 2: Bus voltage magnitude (p.u.) of all buses obtained are tabulated below.

Bus Number	kV(p.u)
1	1.052
2	1.06
3	1.057
4	1.059
5	1.074
6	1.074
7	1.061
8	1.059
9	1.054
10	1.061
11	1.064
12	1.049
13	1.059
14	1.056
15	1.041
16	1.049
17	1.052
18	1.052
19	1.056
20	0.994
21	1.044
22	1.056
23	1.051
24	1.053
25	1.066
26	1.062
27	1.052
28	1.055
29	1.054
30	1.048
31	0.982
32	0.983
33	0.997
34	1.012
35	1.049
36	1.064
37	1.028
38	1.026
39	1.03

Conclusion:

The implemented IEEE 10-generator, 39-bus system network in OpenModelica represents the system voltage profiles at different buses.