
DC Loadflow and Contingency Analysis Computations for the Power System Toolbox

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I. FUNCTIONS

A. *dloadflow*

I-A1 Purpose:

This function takes the bus and line data of a power system and performs a "DC", linear, non-iterative power flow.

I-A2 Usage:

[bus_sol, line_sol, line_flow, B] = dloadflow(bus, line, flag)

I-A3 Description:

[bus_sol, line_sol, line_flow, B] = **dloadflow**(bus, line, flag) performs a DC loadflow using the system bus and line data given in per-unit according to the data formats dictated in the PST manual.

I-A4 Inputs:

bus system bus data
line system line data set
flag decision to print results to MATLAB command window

I-A5 Outputs:

bus_sol solved loadflow bus data
line_sol system line data
line_flw solved line flow data
B susceptance matrix

B. *LODF*

I-B1 Purpose:

This function computes the line outage distribution factors for a given set of lines.

I-B2 Usage:

lodf_val = LODF(bus, line, trip_spec, line_spec)

I-B3 Description:

lodf_val = **LODF**(bus, line, trip_spec, line_spec) computes the LODF of the set of system lines supplied to it using the computed PTDFs.

I-B4 Inputs:

bus the system bus data
line the system line data
trip_spec the terminal buses of the tripped line
line_spec the terminal buses of the observed line

I-B5 Outputs:

lodf_val the line outage distribution factor

C. *PTDF*

I-C1 Purpose:

This function computes the power transfer distribution factors for a given set of lines and buses.

I-C2 Usage:

ptdf_val = PTDF(bus, line, bus_spec, line_spec)

I-C3 Description:

ptdf_val = **PTDF**(bus, line, bus_spec, line_spec) computes the PTDF of the set of system lines and buses supplied to it.

I-C4 Inputs:

bus the system bus data
line the system line data
bus_spec the bus number of a positive injection bus and a negative injection bus
line_spec the terminal buses of the observed line

I-C5 Outputs:

ptdf_val the power transfer distribution factor

II. USER INTERFACE***A. starting the User Interface***

The User Interface is located in the *PST_UI.m* script. To start the Interface simply run this script. Figure 1 shows an Overview of the interface.

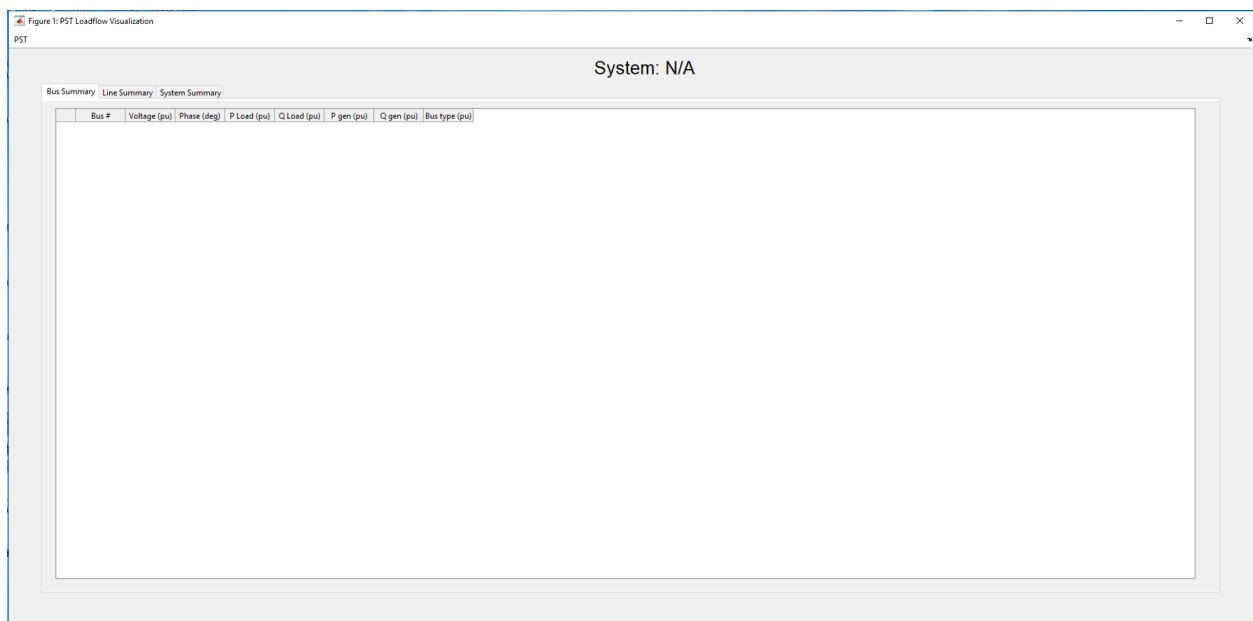


Figure 1. UI window Overview

B. PST Menu

The PST menu shown on Figure 2 contains the functions available in the PST UI.

II-B1 load system

This function opens a dialog box that allows the user to select a power system data file. These files are .m files that contain data in the same format as the regular PST.

II-B2 run AC powerflow

This function runs an AC powerflow on the selected system and displays the results in the Loadflow Tables.

II-B3 run DC powerflow

This function runs a DC powerflow on the selected system and displays the results in the Loadflow Tables.

II-B4 compute PTDF

This function opens a dialog box to compute the Power Transfer Distribution Factors of the system.

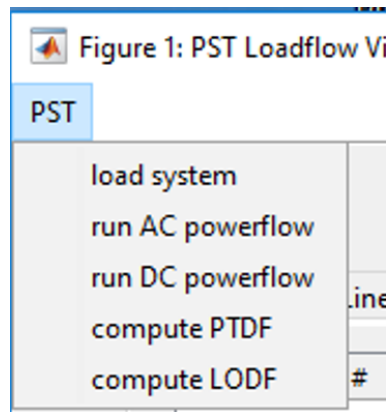


Figure 2. PST Menu

II-B5 compute LODF

This function opens a dialog box to compute the Line Outage Distribution Factors of the system.

C. Loadflow Tables

The Loadflow tables display the results of the AC or DC powerflow for the loaded system.

II-C1 Bus Summary

Figure 3 shows an example of the Bus Summary table for the WWS 6 Bus system. This table contains the Voltage magnitude and angle as well as the generation and load of each bus in the system.

<div> <div>Bus Summary</div> <div>Line Summary</div> <div>System Summary</div> </div>								
	Bus #	Voltage (pu)	Phase (deg)	P Load (pu)	Q Load (pu)	P gen (pu)	Q gen (pu)	Bus type (pu)
1	1	1.0000	0.00	0.00	0.00	2.16	-0.29	Swing Bus
2	2	1.0000	-8.75	0.00	0.00	0.50	0.47	Gen Bus
3	3	1.0000	-10.95	0.00	0.00	0.50	0.25	Gen Bus
4	4	0.9675	-9.90	1.00	0.15	0.00	0.00	Load Bus
5	5	0.9625	-12.28	1.00	0.15	0.00	0.00	Load Bus
6	6	0.9712	-13.80	1.00	0.15	0.00	0.00	Load Bus

Figure 3. PST Menu

II-C2 Line Summary

Figure 4 shows an example of the Line Summary table for the WWS 6 Bus system. This table contains the reactive and active Power flow and losses on each line in the system. By convention a positive sending value indicates power flowing into the line at the From Bus, and a positive receiving value indicates power flowing out of the line at the To Bus.

II-C3 System Summary

Figure 5 shows an example of the System Summary table for the WWS 6 Bus system. This table contains the reactive and active Power losses in the system as well as the total generation and load. In addition it also shows the computation time of the powerflow.

Bus Summary Line Summary System Summary								
	From Bus	To Bus	sending P (pu)	recieving P (pu)	sending Q (pu)	recieving Q (pu)	P loss (pu)	Q loss (pu)
1	1	2	0.63	0.58	-0.28	-0.33	0.05	0.05
2	1	4	0.84	0.80	0.01	-0.10	0.04	0.10
3	1	5	0.69	0.65	-0.01	-0.10	0.04	0.08
4	2	3	0.15	0.15	-0.06	-0.00	0.00	-0.05
5	2	4	0.29	0.28	0.17	0.18	0.01	-0.01
6	2	5	0.22	0.21	0.04	0.06	0.01	-0.02
7	2	6	0.43	0.42	-0.01	-0.00	0.01	-0.01
8	3	5	0.13	0.12	0.06	0.10	0.00	-0.04
9	3	6	0.52	0.52	0.19	0.17	0.01	0.01
10	4	5	0.08	0.08	-0.07	0.01	0.00	-0.07
11	5	6	0.07	0.07	-0.08	-0.02	0.00	-0.05

Figure 4. PST Menu

Bus Summary Line Summary System Summary		
	Description	value
1	Total P gener...	3.16
2	Total Q gene...	0.44
3	Total P Load	3.00
4	Total Q Load	0.45
5	Total P Losses	0.16
6	Total Q Loss...	-0.01
7	Run Time (ms)	46.76

Figure 5. PST Menu



Daniel Douglas received his BS degree in Electrical Engineering from Temple University, Philadelphia. He is currently pursuing a PhD degree in Electrical Engineering at Rensselaer Polytechnic Institute. His research interests include power generation control, power system control, power engineering computing, ferroresonance, and inductive power transmission.



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