DOE/OE Transmission Reliability Program

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Dynamic System Identification (DSI) Toolbox Capabilities Update

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Project Objective

Objective

Update the Dynamic System Identification (DSI) toolbox to be more portable, incorporate modern data types, and offer flexibility for further phasor measurement unit analysis

Motivation

Support the multiyear DOE investment in the DSI toolbox capabilities, as well as incorporate flexibility for future DOE or third-party development/usage

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DSI Toolbox

- MATLAB-based collection of phasor measurement-oriented tools
- Data import/export functions
- Data processing
- Data Analysis
  - Fourier-based techniques
  - Prony Ringdown GUI
  - Mode Meter tools – UWyo/MT Tech research
  - Custom user functions

Interactions with Commercial Tools

- Basic analysis methods deployed commercially
  - Prony (EPG, Alstom, V&R Energy)
  - Yule-Walker (EPG, Alstom, V&R Energy)
  - R3LS (Alstom)
- Serve as prototyping environment prior to commercialization
  - Read PMU data in variety of formats
  - Simple incorporation into toolbox menus
  - MATLAB-based
- More researcher/off-line analysis oriented

PNNL Vision

- Open-source software to help prototype and explore PMU-data algorithms
- Greater detail and flexibility of algorithms
- Intermediate step between idea and commercial software
- Learning tool for phasor data analysis
- Never an operational tool

Typical Interface

Command Window

```
In Case Script PSMbrowser:
caseID = PSMbrowser
Select processing type: Options are
    1  Batch Plots
    2  Angle/Freq Refs
    3  Filter/Decimate
    4  Backload Filtered
    5  Fourier
    6  Histograms
    7  Ringdown GUI
    8  Ringdown Utilities
    9  AutoCorrelations
   20  ModeMeter GUI
   21  ModeMeter
   22  EventScan
   41  Phasor Utilities
   42  Backload Phasor Results
   51  Special Displays
   90  Macro (R)ecord
   91  Macro (P)lay (G)o
   92  Macro (S)top
   94  DownSelect Signals
   95  Load new data
   96  save results
   97  keyboard
   98  Defaults on/off
   99  end case

fx  Indicate processing type - enter number from list above [1]:
```

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Prony Graphical User Interface

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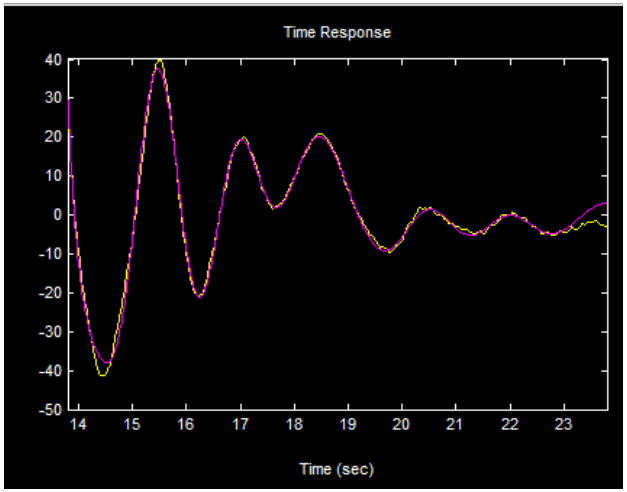
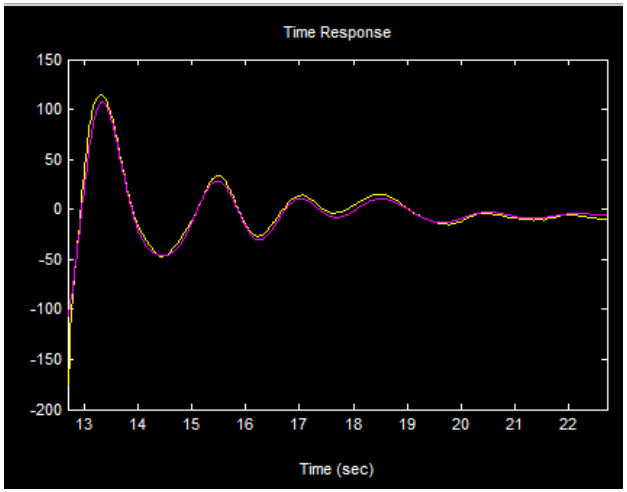
Benefits of Interactive Prony GUI





Freq (Hz)	Damping (%)
0.132369	33.7709
0.344902	15.2627
0.591195	8.3236
0.784412	10.5146

Freq (Hz)	Damping (%)
0.200904	15.9499
0.388646	15.0857
0.586760	10.8866
0.800341	12.3654

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Major Technical Accomplishments for FY14

- Completed conversion of Prony GUI from FORTRAN/C into native MATLAB
- Completed interpreter for COMTRADE single-file format (CFF)
- Completed interpreter for SQL database interface
- Completed generic user function interface for easily integrating new analysis capabilities
- Released DSI Toolbox as open-source on the NASPI website

Deliverables and Schedule for FY14

- AOP deliverables completed
- Provide fixes for any errors or bugs encountered with the software

Follow-on Work for FY14/15

- Address any data interpretation issues
  - CFF testing
  - SQL testing
- Provide bug fixes for any items encountered
- Expand the generic interface to data types

Questions?