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Current Research Interests

My research focuses on improving the reliability of the power grid by leveraging new metering and processor technologies. Some specific research ideas I am currently investigating are:

- Using advanced power metering technologies to enhance the situational awareness of grid operators (keywords: smart grid, phasor measurement units, situational awareness, visualization, wide area monitoring and control, outage detection)
- Incorporating wind forecasts, load forecasts, generator reserves, and outage information to quantify the impact of wind variability on system reliability (keywords: wind power integration, forecasting, reliability)
- Improving online power system simulation tools by utilizing advanced processors and architectures (keywords: transient simulation, high performance computing, graphical processing units, stream processing)

Research Experience

Doctoral Research: Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, 2005-2008 (research advisor: Dr. Thomas Overbye)

- Adaptation of edge detection techniques to extract quasi-steady state information from phasor measurement unit (PMU) data
- Line and generator outage detection using a combination of topology information, system parameters, and PMU data
- Development and evaluation of new visualization techniques for power system data using programmable graphics processing units
- Coordination of power system and communications network simulations to investigate the impact of man-in-the-middle attacks on operator awareness of grid conditions
- Collaboration with researchers from the College of Education to develop pre-university materials for power system education (available online at http://tcip.mste.uiuc.edu/)

Masters Research: Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, 2003-2005 (research advisor: Dr. Thomas Overbye)

- Evaluation of Newton-Raphson power flow performance based on the choice of rectangular or polar phasor representation
- Determination of the benefits and problems associated with the usage of optimal multipliers in the Newton-Raphson power flow

Undergraduate Research: Department of Electrical Engineering, Louisiana Tech University, 2002-2003 (research advisor: Dr. Steven Rovnyak)

- Statistical analysis of phasor measurement unit data to identify power system events

Industrial Experience

PowerWorld Corporation, Champaign, IL, 2003, 2005, 2006

- Enabled interoperability between the Simulator software package and MATLAB, Visual Basic, and VB.NET programming languages
- Developed a distributed computing client and server to enable parallel solution of different power system operating conditions
- Implemented an advanced flat start algorithm to improve power flow convergence

Entergy Systems Operation Center, Pine Bluff, AR, 2002

- Designed methods for allocating scheduled power production across multiple generators based on negotiations between Entergy and generation companies

Education

Ph.D. in Electrical Engineering at the University of Illinois at Urbana-Champaign (UIUC), under the supervision of Dr. Thomas J. Overbye, completed in October 2008. Thesis title: *Event Detection and Visualization Based on Phasor Measurement Units for Improved Situational Awareness*

M.S. in Electrical Engineering at UIUC, under the supervision of Dr. Thomas J. Overbye, completed in May 2005. Thesis title: *A Comparison of the Optimal Multiplier in Polar and Rectangular Coordinates*

B.S. (summa cum laude) in Electrical Engineering with a minor in Mathematics at Louisiana Tech University, completed in May 2003.

Journal Publications

J. E. Tate and T. J. Overbye, "Line outage detection using phasor angle measurements", *IEEE Transactions on Power Systems*, vol. 23, no. 4, pp. 1644-1652, November 2008.

J. E. Tate, T. J. Overbye, J. Sebestik, and G. C. Reese, "Interactive lessons for pre-university power education", *IEEE Transactions on Power Systems*, vol. 23, no. 3, pp. 824-830, August 2008.

J. E. Tate and T. J. Overbye, "A comparison of the optimal multiplier in polar and rectangular coordinates", *IEEE Transactions on Power Systems*, vol. 20, no. 4, pp. 1667-1674, November 2005.

Conference Publications

J. E. Tate and T. J. Overbye, "Double line outage detection using phasor angle measurements", invited paper, *IEEE Power and Energy Society General Meeting*, July 2009. (accepted for publication)

J. E. Tate and T. J. Overbye, "Extracting steady state values from phasor measurement unit data using FIR and median filters", *IEEE 2009 Power System Conference and Exposition*, March 2009.

J. E. Tate, J. Sebestik, and T. Overbye, "Collaboration and dissemination efforts related to pre-university power lessons", invited paper, *IEEE Power Engineering Society General Meeting*, July 2008.

J. E. Tate and T. J. Overbye, "Contouring for power systems using graphical processing units", *41st Hawaii International Conference on System Sciences*, January 2008.

C. M. Davis, J. E. Tate, and T. J. Overbye, "Wide area phasor data visualization", *39th Annual North American Power Symposium*, October 2007.

C. M. Davis, J. E. Tate, H. Okhravi, C. Grier, T. J. Overbye, and D. Nicol, "SCADA cyber security testbed development", *38th Annual North American Power Symposium*, September 2006.