BIOGRAPHICAL SKETCH

Ismael Abdulrahman was born in Iraq. His current interests are wide-area measurement systems, power systems dynamic analysis, power system modeling and simulation, intelligent systems and control, and applications of geographic information systems in power systems.

EDUCATION

Ph.D., Engineering
Tennessee Technological University
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M.Sc., Electrical Engineering
University of Sulaimani, 2009
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B.Sc., Electrical Engineering
Al-Mustansiriya University, 2003
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Partial support for this student was provided from the College of Engineering and Tennessee Tech University from the allocated “Carnegie funds”.

College of Engineering

TENNESSEE TECH

The Department of

Electrical & Computer Engineering

Announces the Dissertation Defense

of

Ismael Abdulrahman

In Partial Fulfillment of the Requirements

For the degree of

Doctor of Philosophy

Thursday, Oct. 3, 2019 at 11:30 a.m.

Held at

Brown Hall, Room 236

115 W 10th Street

Tennessee Tech

Cookeville, TN 38505

FIELD OF STUDY

Power Systems

DISSERTATION TOPIC

WIDE–AREA BASED POWER SYSTEM MODELING, OPTIMIZATION, CONTROL, AND VISUALIZATION CONSIDERING OPTIMAL PMU PLACEMENT AND ADAPTIVE TIME-DELAY COMPENSATION

EXAMINING COMMITTEE

Dr. Ghadir Radman, Chairperson

Dr. Rabie Belkacemi

Dr. Indranil Bhattacharya

Dr. Charles Van Neste

Dr. Ahmed Elsawy

ABSTRACT

The new applications of wide-area measurement system (WAMS) technology and phasor measurement unit (PMU) make it convenient to monitor, control, and visualize the dynamic behavior of interconnected power systems with an excellent accuracy, high sampling rate, and time-stamped and global measurements.

In this work, four distinct approaches are developed for wide-area based power system modeling, optimization, control, and visualization.

To study such a power system, a complete package of programs is developed in MATLAB and Simulink for time-domain simulation, modal analysis, participation factor analysis and visualization, and controller optimal location and signal selection using residue analysis. These programs can be used for research studies and for educational aims. A new model is proposed to solve the algebraic loop problem in Simulink.

The second part of the study is to develop a wide-area based controller to compensate the continuously changing latency of controller remote signal using adaptive neuro-fuzzy inference system (ANFIS).

The third part of the study is to develop a novel strategy to incorporate the impact of zero-injection-buses (ZIB) into the optimal location of PMU for observability analysis needed for WAMS studies.

Lastly, the application of geographic information system (GIS) is investigated for wide-area power system spatial analysis and visualization. Several maps, layers, and geodatabases were created for this purpose. Several synthetic large-scale power systems were employed in this study including Tennessee and Texas synthetic power systems.