IEEE MIAMI SECTION

IAS IEEE INDUSTRY APPLICATIONS SOCIETY Linking Research to Practice

IEEE Miami Section DLP Invited Seminar Announcement

"Real-Time Simulation Technology for Power Electronics"

Speaker: **Prof. Fei Gao.**

Date: **April 7th, 2023.**

Lecture: **11:00 AM to 1:00 PM, Room EC-3930.**
Zoom:
https://fiu.zoom.us/j/92361748808?pwd=Q2lHVnRZaUw3UUtYWUhTbGFaSkZRZz09

Abstract:

This lecture explores the use of real-time simulation and Hardware-in-the-Loop (HIL) techniques as critical tools in the design, modeling, testing, and validation of modern power electronic systems. Real-time simulation differs from offline simulation in that it relies not only on logical and arithmetic calculations, but also on the physical time at which these calculations are produced. However, achieving high-accuracy real-time simulation and HIL for modern power electronics remains a significant challenge due to the high switching frequency and on-off characteristics of power electronic components. Mathematical models incorporating these components can lead to real-time simulation problems, such as limited simulation time step size and large memory requirements for circuit topology storage. Meeting strict time constraints requires the development of specific real-time simulation techniques.

This lecture first provides a general introduction to real-time simulation and HIL technology, followed by an overview of state-of-the-art modeling approaches for power electronic switches and electric network formulations of power electronic systems. Advantages and drawbacks of these approaches are discussed with commercial solution examples. Additionally, the main hardware platforms (CPU and FPGA) for real-time simulation models are compared. Finally, a simple example is provided to demonstrate the implementation of a Floating Interleaved Boost Converter (FIBC) model in a real-time simulation platform for controller HIL applications using the previously presented techniques.

Speaker's Bio:

Prof. Fei Gao is currently the Deputy Director of the French CNRS research institute FEMTO-ST (750 researchers) and a Full Professor at the School of Energy and Computer science of the University of Technology of Belfort-Montbeliard (UTBM). He received from UTBM the PhD degree in renewable energy with distinguished Youth Doctor Award in 2010. His main research fields include fuel cells for transportation and real-time simulation technology for modern power electronics and energy systems. Prof. Gao is a Fellow of IEEE and IET. He is the recipient of 2020 "IEEE J. David Irwin Early Career Award" from IEEE Industrial Electronics Society, 2022 "Leon-Nicolas Brillouin Award" from SEE France, and 2022 industrial "Sustainable Future Visionary Award" from Typhoon HIL. He is the Editor-in-Chief of IEEE Industrial Electronics Technology News, the Assistant Deputy Editor-in-Chief of IEEE Transactions on Transportation Electrification, and an Associate Editor of 4 IEEE Transactions. He currently serves as the Technical Activities Committee Chair of IEEE Transportation Electrification Community, the Vice-Chair of the Technical Committee on Electrified Transportation Systems of IEEE Power Electronics Society and the Secretary of Industrial Automation and Control Committee of IEEE Industry Application Society.

For more information, please contact:

Prof. Osama Mohammed, mohammed@fiu.edu

Mr. Ahmed Soliman, asoli051@fiu.edu **Mr. Ketulkumar Polara, kpola009@fiu.edu**