AIT/IEEE PES Austria Chapter Lecture Series

DIGITAL TWIN OF A DYNAMIC HARDWARE EMULATOR: CHALLENGES AND OPPORTUNITIES

Petr Korba (Professor), Artjoms Obushevs (Researcher), and Sandro Kellermüller (Researcher)
ZHAW Zurich University of Applied Sciences, Switzerland

Tuesday, December 6, 2022, 10:00 - 11:00 (virtual)

Registration

Participation is free but registration is required! Login information for joining the online event will be provided right before the event starts!

Abstract

The ongoing decarbonisation of the electric power system brings new challenges in terms of system dynamics and stability, as the substitution of generation units with rotating masses towards generation units based on power electronics entails a substantial loss of inertia. To meet the new challenges and maintain the reliability of the electrical grid, innovative solutions are required. Therefore, this lecture will present digital twin development challenges and opportunities of a dynamic hardware emulator that can be used for controller hardware in the loop (CHIL) testing and is based on a small-scale laboratory system. To build the simulation model, the parameters of involved synchronous machines, excitation systems, prime movers and transmission lines have been identified and then compared to laboratory measurements to assess the accuracy of the digital twin. Static and dynamic accuracy have been investigated, and an overall good accuracy can be shown with the help of quantification of errors. Furthermore, a case study is presented where the digital twin was used to design a controller to damp inter-area oscillations with the help of wide area measurements. This controller was then implemented and tested within the dynamic hardware emulator in the laboratory.

About the Speakers

Petr Korba received the Dipl.-Ing. degree in electrical engineering from Czech Technical University, Prague, Czech Republic, in 1995, and the Dr.-Ing. degree from the University of Duisburg, Germany, in 1999. He was a Member of Academic Staff with the Institute of Science and Technology, The University of Manchester, in 2001. He joined ABB Switzerland Ltd. He held different positions in the business unit power system automation. He worked as a Principal Scientist with ABB Corporate Research Ltd., for more than ten years. Since 2008, he has been a Lecturer with ETH Zurich. He was a Professor of electric power systems with the Zurich University of Applied Sciences, in 2012, where he is currently the Head of the Electric Power Systems Group and the Deputy Head of the Institute of Energy Systems and Fluid Engineering. He is also the Co-Director of the Swiss Competence Centre of Energy Research (SCCER, Grids and Components).

He has published over 100 articles in international journals and at international conferences in the field of automatic control and electric power systems. He also authored and co-authored over 100 US and European patents and patent applications and was nominated for the Best European Patent Award for achievements in the wide-area monitoring and control of electrical power systems in 2011.

Artjoms Obushevs (Member, IEEE) received the BSc, MSc, PhD degree in electrical engineering from the Riga Technical University, in 2008, 2010 and 2014 respectively. Since 2018, He is a Research Associate in the Electric Power Systems and Smart Grids group at the Institute of Energy Systems and Fluid Engineering of the Zurich University of Applied Science ZHAW in Winterthur, Switzerland. His main research is focused on methods of mathematical modelling of electrical networks and systems elements; development of power systems planning; dynamic optimization methods and decision systems. Author and Co-Author of more than 50 peer-reviewed journal and conference papers in the field of power systems.

Sandro Kellermüller received the BSc and MSc degrees from Zurich University of Applied Sciences (ZHAW), Winterthur, Switzerland, in 2019 and 2022, respectively. In 2019 he joined the research group Electric Power Systems and Smart Grid Lab at ZHAW as a research assistant. Sandro Kellermüller focuses on the development of control schemes for modern power systems including Hardware-in-the-loop and laboratory testing.

Organizers

This event is jointly organized by the IEEE PES Chapter Austria, the IEEE IAS/PELS/IES Joint Chapter Austria, and the AIT Austrian Institute of Technology - Center for Energy.

Location

Webinar (virtual)

Contact

Thomas Strasser (thomas.i.strasser@ieee.org)

Supporters

This talk is supported by the Federal Ministry of Austria for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) via the IEA Research Cooperation - IEA Action Network "Intelligent Energy Systems": International Smart Grid Action Network (ISGAN TCP).