Invitation - 24 avril, 14 h, local 2078 - Conférence "Hardware-in-the-loop (HIL) testing of EVs and HEVs" d'Alain Bouscayrol [IEEE]

Tourigny, Nathalie

Envoyé :10 avril 2017 16:51

Bonjour,

Vous êtes invités à la conférence IEEE « HARDWARE-IN-THE-LOOP (HIL) TESTING OF EVS AND HEVS » de Professeur Alain Bouscayrol, le 24 avril, à 14 h au local 2078 Ringuet.

Notez que cette conférence sera en anglais.

"HARDWARE-IN-THE-LOOP (HIL) TESTING OF EVS AND HEVS"

Université du Québec à Trois-Rivières, Monday 24 April, 14h-15h30

Room : 2078 Ringuet

within the framework of the Distinguished Lecturer Program of IEEE-VTS

presented by

Professor Alain BOUSCAYROL

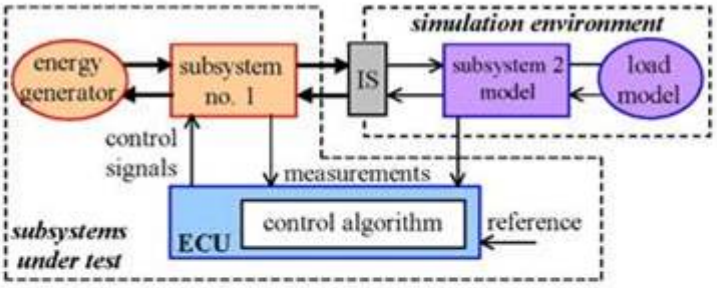
Université de Lille, 1 Sciences and Technologies, L2EP,
http://l2ep.univ-lille1.fr/
MEGEVH, French scientific network on HEVs,

LECTURER

Alain BOUSCAYROL received Ph.D. degree in Electrical Engineering from Institut National Polytechnique de Toulouse, France, in 1995. From 1996 to 2005, he was Associate Professor at University Lille1, Sciences and Technologies, France, where he has been a Professor since 2005.
From 1998 to 2004, he managed the Multi-machine Multi-converter Systems project of GdR-ME2MS, a national research program of CNRS (French National Centre of Scientific Research). Since 2004, he has managed the national network on Energy Management of Hybrid Electric Vehicles (MEGEVH).
His research interests at the L2EP (Laboratory of Electrical Engineering) include graphical descriptions (Energetic Macroscopic Representation) for control of electric drives, wind energy conversion systems, railway traction systems, hybrid electric vehicles and hardware-in-the-loop simulation. His collaborative works with industry on energy management for vehicles include Siemens Mobility, PSA Peugeot Citroen, Nexter Systems and SNCF. He was General Chair of IEEE VPPC 2010 (Vehicle Power Propulsion Conference, Lille. 2010), and co-chair of EPE 2013 ECCE Europe (European Power Electronics and drives, Lille, 2013). In January 2014, he has been nominated Chair of the Vehicle Power Propulsion technical committee by IEEE Vehicular Technology Society (VTS). Since February 2014, he has been appointed Associate Editor of IEEE transactions on Vehicular Technology. Since 2016, has been elected Distinguished Lecturer by IEEE VTS.

HIL SIMULATION

Electrical drives are increasingly used in automotive industry. Rigorous performance evaluation has to be made during equipment development and before implementation on actual systems. In particular, interactions of the drive with the motion part have to be studied thoroughly. Computer simulation of the entire system is an established means to investigate interactions between subsystems to set the technical requirements. Within the past decade, Hardware-In-the-Loop (HIL) simulations became an advanced means for investigative experimentation, model validation and testing before implementation of drives in actual processes. In addition to pure computer simulation, HIL simulation replaces some simulation models of a system by one or several actual components. The rest of the system and processes are simulated in real-time, which typically requires a parallel computing environment with adequate input-output capability for signals of adequate bandwidth. Most recently, incorporating power hardware (i.e. the drive) into an HIL simulation has been introduced by means of high power and high bandwidth power electronic amplification equipment. Due to the flexibility of HIL simulations to test a wide range of operating conditions and scenarios this method will contribute to improving the availability and reliability of drives (machines, power electronics, and/or control) and a better understanding of system interactions before their insertion on the system.
HIL simulation has been intensively used for controller assessment for a long time. The aerospace industry has used this technique since flight control systems is a safety-critical aspect. This methodology yields exhaustive testing of a control system to prevent costly and damageable failures. Moreover, HIL simulations reduce development time and can enable more tests than on the actual system. From 90's, many groups in automotive industry have employed HIL simulation for testing embedded Electronic Control Units (ECU). Indeed, this methodology avoids intense and complex integration tests on the actual vehicle. Thus, the time development can be reduced and a high quality assurance can be obtained. HIL simulation is becoming a standard for ECU development in the automotive industry. HIL simulation is nowadays more and more used to develop new components and actuators in many fields. Vehicle component evaluation, assessment of drive controls, railway traction systems for trains and subways, power propulsion systems for electric vehicles (EVs) and hybrid electric vehicle (HEVs).



HIL simulation of an energy conversion system

CONTENTS OF THE SEMINAR

The seminar is composed of two parts.

The first part will be dedicated to the HIL simulation concepts and the different kinds of HIL simulation:

- Software simulation and Hardware-In-the-Loop (HIL) simulation
- Interest of HIL simulation for vehicle applications
- Signal and power HIL simulation
- Full scale and reduced scale HIL simulation
- Technical requirements for HIL simulation developments
- Organisation of a HIL simulation

The second part will be focused on of HIL simulation of industrial transportation systems:

- signal HIL simulation for testing energy management of an Hybrid Locomotive
- power HIL simulation for testing control of a double parallel HEV
- power HIL simulation for testing supply system of an innovative subway

Example of the Power-HIL simulation of a double parallel HEV [4]

REFERENCES

[1] A. Bouscayrol, "Hardware-In-the-Loop simulation", ***Industrial Electronics Handbook***, second edition, tome "Control and mechatronics", Chapter 33, CRC Press, Taylor & Francis group, Chicago, March 2011, pp. 33-1/33-15, ISBN 978-1-4398-0287-8.

[2] A. Bouscayrol, A. Monti, M. Steurer, "Guest Editorial" of special section on "Hardware-In-the-Loop simulation", ***IEEE transactions on Industrial Electronics***, vol. 57, no. 4, April 2010, pp. 1134-1136 (common paper of L2EP Lille, RTWH Aachen University and Florida State University)

[2] A. Bouscayrol, X. Guillaud, P. Delarue, B. Lemaire-Semail, "Energetic Macroscopic Representation and inversion-based control illustrated on a wind energy conversion systems using Hardware-in-the-loop simulation", ***IEEE transactions on Industrial Electronics***, vol. 56, no. 12, pp. 4826-4835, December 2009.

[3] A. L. Allègre, A. Bouscayrol, J. N. Verhille, P. Delarue, E. Chattot, S. El Fassi, "Reduced-scale power Hardware-In-the-Loop simulation of an innovative subway", ***IEEE transactions on Industrial Electronics***, vol. 57, no. 4, pp. 1175-1185, April 2010 (common paper of L2EP Lille and Siemens Transportation Systems).

[4] T. Letrouvé, W. Lhomme, A. Bouscayrol, N. Dollinger, "Control validation of Peugeot 3⌀8 Hybrid4 vehicle using a reduced-scale power HIL simulation", ***Journal of Electrical Engineering and Technology***, Vol. 8, no. 5, September 2013, pp. 1227-1233 (common paper of L2EP Lille, and PSA Peugeot Citroën within MEGEVH, French network on HEVs, extended version of the Award Paper Prize of IEEE-VPPC 2012).

[5] C. Depature, T. Jokela, W. Lhomme, A. Bouscayrol, L; Boulon, P. Sicard, "Full-Scale Power Hardware-In-the-Loop Simulation of an Electric Vehicle using Energetic Macroscopic Representation", ***IEEE-VPPC'15***, Montreal (Canada), October 2015 (common paper L2EP Lille, Aalto University and Univ. Trois Rivières within MEGEVH, French network on HEVs).

Au plaisir de vous y rencontrer.

Pour

Prof. Loïc Boulon
IEEE Vehicular Technology Society
VP Motor Vehicles
IEEE Section Saint-Maurice
Président du groupe YP

Nathalie Tourigny, secrétaire de direction
Département de génie électrique et génie informatique | École d'ingénierie | UQTR
Bureau 2481 Léon-Provancher, 3351 bd des Forges, Trois-Rivières (Québec) G8Z 4M3
Tél. (819) 376-5011 poste 3905 – Sans frais 1 800 365-0922 poste 3905