ECE GUEST SPEAKER

Jakob Stoustrup
Aalborg University

Advanced control of energy related infrastructure

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Abstract:
In pursuit of solutions for a sustainable energy system, control engineering has several key roles to play. It is generally recognized that an energy system that includes substantial contributions from PV systems and wind farms, will have to leverage synergy between different types of energy related infrastructure (electricity, heating/cooling, gas, the water/energy nexus, transportation, etc.). The synergy will be instrumented by storage and conversion technologies, but orchestrated by advanced control systems that do not exist today. Furthermore, usage of e.g. power and heat on the consumer side needs to be coordinated, also through advanced control. Finally, the electricity system itself needs to be instrumented with entirely new types of control, where especially the distribution system is in need for new control architectures.
In this talk, we will present examples of current research at all three types of roles for advanced control related to challenges for a sustainable energy system. This talk will present some of the challenges for power distribution systems along with some solutions. Further, results from our research on integrating power and heat solutions will be presented. Finally, research on consumer side control challenges will be presented with a case study for heat and power control of shopping malls.

Bio:
Jakob Stoustrup has received M.Sc. (EE, 1987) and Ph.D. (Applied Mathematics, 1991) degrees, both from the Technical University of Denmark. From 1991-1996, Stoustrup held several positions at Department of Mathematics, Technical University of Denmark. From 2006-2013 he acted as Head of Research for Department of Electronic Systems, Aalborg University. From 2014-2016, Stoustrup was Chief Scientist at Pacific Northwest National Laboratory, USA, leading the Control of Complex Systems Initiative. From 1997-2013 and since 2016, Stoustrup has acted as Professor at Automation & Control, Aalborg University, Denmark. In 2017 Stoustrup was appointed as Vice Dean at the Technical Faculty of IT and Design, Aalborg University.

Dr. Stoustrup has acted as Associate Editor and Editorial Board Member of several international journals. Served as General Chair, Program Chair, and IPC member for several international conferences. Member of the IEEE CSS Board of Governors. Past Chairman of IEEE CSS/RAS Joint Chapter. Chair for IEEE CSS Technical Committee on Smart Grids. Chair for IFAC Technical Committee SAFEPROCESS, and Member of IFAC Technical Board. Received the Statoil Prize, the Dannin Award for Scientific Research and several conference paper awards. He received the Chivalric Order of the Dannebrog for his research contributions. Member of the European Research Council as well as the Danish, Norwegian and Swedish Research Councils. He is a member of The Danish Academy of Technical Sciences, where he has acted as Board Member.

Stoustrup's main contributions have been to robust control theory and to the theory of fault tolerant control systems. With co-workers, he has proposed a novel Plug-and-Play Control framework. Published approx. 300 peer-reviewed scientific papers. Apart from the theoretical work, he has been involved in applications in cooperation with 100+ industrial companies, including acting as CEO for two technological startup companies.