



## **Event-based control and estimation**

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### **Abstract:**

There is a growing deployment of wireless networks in industrial control systems. Lower installation costs and easier system reconfigurations for wireless devices can have a major influence on the future application of distributed control and monitoring. There is however a lack of theory for understanding if and how the allocation of communication resources should be integrated with the control application.

In this talk, we will discuss how the access scheme for the wireless medium can influence the closed-loop performance of the networked control system. It will be argued that the underlying scheduling-control problem has a non-classical information structure. Appropriate models for medium access control protocols will be introduced. It will be shown how these protocols can be tuned for various wireless control applications. We will also see that by making event-triggered transmissions based on decisions taken locally at the sensor and actuator nodes, it is possible to improve the design and to limit the use of the communication resources. The talk will be illustrated by several examples from ongoing projects with Swedish industry. The presentation is based on joint work with several collaborators.

### **About:**

Karl H. Johansson is Director of the KTH ACCESS Linnaeus Centre and Professor at the School of Electrical Engineering, Royal Institute of Technology, Sweden. He is a Wallenberg Scholar and has held a six-year Senior Researcher Position with the Swedish Research Council. He is Director of the Stockholm Strategic Research Area ICT The Next Generation.

He received MSc and PhD degrees in Electrical Engineering from Lund University. He has held visiting positions at UC Berkeley (1998-2000) and California Institute of Technology (2006-2007). His research interests are in networked control systems, hybrid and embedded systems, and applications in smart transportation, energy, and automation systems.

He has been a member of the IEEE Control Systems Society Board of Governors and the Chair of the IFAC Technical Committee on Networked Systems. He has been on the Editorial Boards of several journals, including *Automatica*, *IEEE Transactions on Automatic Control*, and *IET Control Theory and Applications*. He has been Guest Editor for special issues, including the one on "Wireless Sensor and Actuator Networks" of *IEEE Transactions on Automatic Control* 2011. He was the General Chair of the ACM/IEEE Cyber-Physical Systems Week 2010 in Stockholm and IPC Chair of many conferences. He has served on the Executive Committees of several European research projects in the area of networked embedded systems. In 2009, he received the Best Paper Award of the IEEE International Conference on Mobile Ad-hoc and Sensor Systems.

In 2009, he was also awarded Wallenberg Scholar, as one of the first ten scholars from all sciences, by the Knut and Alice Wallenberg Foundation. He was awarded an Individual Grant for the Advancement of Research Leaders from the Swedish Foundation for Strategic Research in 2005. He received the triennial Young Author Prize from IFAC in 1996 and the Peccei Award from the International Institute of System Analysis, Austria, in 1993. He received Young Researcher Awards from Scania in 1996 and from Ericsson in 1998 and 1999. He is a Fellow of the IEEE.