LABORATOIRE DES SIGNAUX & SYSTEMES

SUPELEC, Gif-sur-Yvette, France

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Half Day HYCON-NEWCOM Workshop on

" Networked Control and Wireless Communications"

Friday September 8, 2006

Program:

Room: Salle des Séminaires, Escalier B, 4ème Etage.

8h30 - 9h00	Welcome coffee
9h00 - 9h15	Opening of the Workshop F. Lamnabhi-Lagarrigue (CNRS) , F. Santucci (Universita' degli Studi di L'Aquila)
9h15 - 9h45	*Overview of NoE HYCON WP4d "Networked Control"* F. Santucci (Universita' degli Studi di L'Aquila) K.-H. Johansson (KTH) M.D. Di Benedetto (Universita' degli Studi di L'Aquila)
9h45 - 10h15	"On performance and scalability issues in the consensus problem" R. Carli, F. Fagnani, C. Fischione, K. H. Johansson, A. Speranzon, S. Zampieri (KTH)
10h15 - 10h45	"Modeling of adaptive behaviours in control over wireless networks" M.G. DiBenedetto, A. D'Innocenzo, G. Pola , C. Rinaldi, F. Santucci (Universita' degli Studi di L'Aquila)
10h45 - 11h00	Coffee break
11h00 - 11h15	Overview of NEWCOM "Wireless Communications" P. Duhamel (LSS)
11h15 - 11h45	Optimal Admission Control for Flow-Aware Networking Architectures in the Wireless Networked Control Environment: An Hybrid System Approach C. Cárdenas, (ENST Paris)
11h45 – 12h15	"Centralized and Distributed Source Localization by a Network of Sensors Using Guaranteed Set Estimation" M. Kieffer (LSS)

Abstracts

"Overview of NoE HYCON WP4d Networked Control

F. Santucci, K.-H. Johansson, M.D. Di Benedetto
Universita' degli Studi di L'Aquila, KTH

Abstract: An overview of major goals and integration/research activities currently running within the WP will be provided, with particular emphasis on the case studies a) Hybrid control of multi-robot systems over distributed wireless communication for industrial automation, and b) Distributed and hybrid control of resources in wireless networks for control applications. The two case studies include the relevant algorithmic components that would enable definition and development of an advanced platform concept for wireless networked embedded control. Furthermore, we will provide insights on a test case and experimental setups for validation, with a mention to the Networked Control laboratory of the EECI.

"On performance and scalability issues in the consensus problem"

R. Carli, F. Fagnani, C. Fischione, K. H. Johansson, A. Speranzon, S. Zampieri
KTH

Abstract: Motivated by a rapidly growing number of applications with networked robots and other vehicles, fundamental limits on the achievable collaborative behavior are studied for large teams of autonomous agents. In particular we study in detail a problem in which a group of agents is supposed to agree on a common state without any centralized coordination. Due to the dynamics of the individual agents and their varying connectivity, this problem is an extension of the classical consensus problem in computer science. It captures a crucial component of many desirable features of multi-robot systems, such as formation, flocking, rendezvous, synchronizing and covering. Analytical bounds on the convergence rate to consensus are derived for several system configurations. It is shown that static communication networks that exhibit particular symmetries yield slow convergence, if the connectivity of each agent does not scale with the total number of agents. On the other hand, some randomly varying networks allow fast convergence even if the connectivity is low.

"Modeling of adaptive behaviours in control over wireless networks"

M.G. Di Benedetto, A. D'Innocenzo, G. Pola, C. Rinaldi, F. Santucci
Universita' degli Studi di L'Aquila

Abstract: The main problem in control over wireless networks is conceiving a joint control algorithm and communication system design to optimize a given cost function. To solve this problem, we propose a theoretical framework derived from the Platform Based Design (PBD) methodology. According to the PBD principles, we first map control specifications to communication network specifications involving a set of values of the communication parameters such as quantization noise, coding, modulation scheme, and power level. Then, a communication scheme is chosen according to the communications specifications so that the control specifications are satisfied. To do so, we use a hybrid system formalism that models the dynamical behavior of the communication scheme to capture the mixed continuous-discrete characteristics of the configuration parameters

"Optimal Admission Control for Flow-Aware Networking Archiectures in the Wireless Networked

Control Environment: An Hybrid System Approach"

ésar Cárdenas,
ENST Paris

Abstract: From the data network point of view networked control can be considered as another type of network traffic. As such, it has their own quality of service requirements that are related to the class of systems to be controlled. As in packet networks, networked control traffic can be also classified in order to develop better traffic controls for managing the network resources. On the other hand, several quality of service (QoS) architectures for packet network applications have been proposed. One of the most promising approaches that showed its ability to capture how an individual user experiences the QoS in packet networks is the Flow-Aware Networking (FAN) approach which can be simplified as the coupling of admission control and scheduling. The scheduling is the responsible to ensure fairness while admission control is the responsible to maximize resource utilization. The presentation will discuss if the FAN architecture is an adequate QoS architecture for networked control, how to implement it and how to design an optimal admission control in a wireless networked control environment using the hybrid system approach.

"Centralized and Distributed Source Localization by a Network of Sensors Using Guaranteed Set Estimation"

M.Kieffer,
LSS-SUPELEC

Abstract:This talk is about source localization in a network of sensors from readings of signal strength. Contrary to previously published results, the source signal strength and path loss exponent are not assumed known a priori. The measurement errors are assumed bounded, with known bounds. The problem is then solved both in a centralized and in a distributed context using bounded-error parameter estimation techniques and interval analysis. Simulation results with realistic measurements are provided.