

Première réunion du chapitre IEEE Control System France et du groupe SDH du GdR Macs

Jeudi 7 octobre 2010, 10h–17h

Salle B312 (138 places)

Telecom ParisTech (ENST Paris)
46 Rue Barrault – 75013 Paris
Metro 6 : Corvisart.

1. Présentations

Titre : Source seeking control using AUV's Fleets under communication constraints,
Auteur: C. Canudas de Wit (GIPSA-Lab)

Titre : Sufficient Conditions for Flocking via Graph Robustness Analysis?
Auteurs: Samuel Martin, A. Girard

We consider a multi-agent system consisting of mobile agents with second-order dynamics. The communication network is determined by a standard interaction rule based on the distance between agents. The goal of this paper is to determine practical conditions (on the initial positions and velocities of agents) ensuring that the agents asymptotically agree on a common velocity (i.e. a flocking behavior is achieved). For this purpose, we define a new notion of graph robustness which allows us to establish such conditions, building upon previous work on multi-agent systems with switching communication networks. Though conservative, our approach gives conditions that can be verified a priori.

Titre : OPINION DYNAMICS WITH DECAYING CONFIDENCE: APPLICATION TO COMMUNITY DETECTION IN GRAPHS
Auteurs : C. Morarescu, A. Girard

Abstract: We study a class of discrete-time multi-agent systems modeling opinion dynamics with decaying confidence. We consider a network of agents where each agent has an opinion. At each time step, each agent exchanges its opinion with its neighbors and updates its opinion by taking into account only its neighbors opinions that differs from its own opinion less than some confidence bound. This confidence bound is decaying: an agent gives repetitively confidence only to its neighbors that approach sufficiently fast its own opinion. Essentially, the agents try to reach an agreement with the constraint that it has to be approached no slower than a prescribed convergence rate. Under that constraint, global consensus may not be achieved and only local agreements may be reached. The agents reaching a local agreement form communities inside the network. In this paper, we analyze this opinion dynamics model: we show that communities correspond to asymptotically connected component of the network and give an algebraic characterization of communities in terms of eigenvalues of the matrix defining the collective dynamics. Finally, we apply our opinion dynamics model to address the problem of community detection in graphs. We propose a new formulation of the community detection problem based on eigenvalues of normalized Laplacian matrix of graphs and show that this problem can be solved using our opinion dynamics model. We provide experimental results that show that our opinion dynamics model provides an approach to community detection that is not only appealing but also effective.

Titre : Chattering-free digital sliding-mode control with state observer and disturbance rejection

Auteurs: V. Acary, B. Brogliato, Y. Orlov

A novel discrete-time implementation of sliding-mode control systems is proposed, which fully exploits the multivaluedness of the dynamics on the sliding surface. It is shown to guarantee a smooth stabilization on the discrete sliding surface in the disturbance-free case, hence avoiding the chattering effects due to the time-discretization. In addition when a disturbance acts on the system, the controller attenuates the disturbance effects on the sliding surface by a factor h (where h is the sampling period). Most importantly this holds even for large h . The controller is based on an implicit Euler method and is very easy to implement with projections on the interval $[-1,1]$ (or as the solution of a quadratic program). The zero-order-hold (ZOH) method is also investigated. First and second order perturbed systems (with a disturbance satisfying the matching condition) without and with dynamical disturbance compensation are analyzed, with classical and twisted sliding-mode controllers.

Titre : Stabilité Robuste des systèmes affines commutés.

Auteurs: Pascal Hauroigné , P. Riedinger, C. lung

The problem of robust and guaranteed stability is addressed for the class of switched affine systems without common equilibrium. One characterization of this class is a cyclical behavior in steady state. From the existence of a Control Lyapunov Function for a relaxed control problem, three sampled state feedback strategies are investigated in this paper. The main result shows that attracting sets for the whole system trajectories can be computed by solving simple optimization problems. In addition, Input to State Stability results are formulated guaranteeing robust margin with respect to parameters, sampled frequency and/or switching time uncertainties. Most of the DC-DC power converters enter in this framework and the case of a buck-boost converter is used as illustrative example.

2. Vie du groupe et discussion sur la création du chapitre IEEE Control System France