Symposium on Optimization and Control
IEOR, IIT Bombay

Talks and Abstracts

21–22 February, 2012

Vivek Borkar

Dynamic Models of Coordination

This will be an overview talk about the kind of dynamic models that have been used to capture coordination by multiple autonomous agents.

Debraj Chakraborty

Controller Optimization over Polynomial Stability Region

Regional constraints on pole locations of LTI systems translate to non-convex sets in the space defined by coefficients of the characteristic polynomial. Hence, most controller design problems, which are essentially optimization over the coefficients of the closed loop system, turn out to be non-convex. Some recent research have tried to approximate the non-convex polynomial stability region with various convex sets. We use these results to synthesize the following controllers with exact and regional pole placement constraints: (i) a minimum norm state feedback controller (ii) a state feedback controller with minimum number of sensors for state measurements (iii) a minimum order controller. All these problems have similar formulation and can be solved with various convenient optimization techniques.

Debashish Chatterjee

On Some Recent Results in Optimization Based Control

Optimization based control comprises a library of control synthesis techniques that allow online These techniques afford inclusion of a large class of state-action constraints in a natural and seamless fashion such that the online computations are tractable. As such, they occupy a key area among control synthesis methods that have been adopted by the industry. In this talk we shall consider simple cases that have been solved satisfactorily, and expose related research problems. computation of controllers.

Joydeep Dutta

Variational Inequalities—Gap Functions and Error Bounds

Variational inequalities studied in the finite dimensional setting is one of the most exciting areas of optimization. It is not only a generalization of convex programming but has many other applications including that in mechanics.

One of the ways to view a variational inequality is to view it through an equivalent optimization problem. This is achieved by introducing the notion of a gap function or a merit function. The gap function becomes the objective function of such an optimization problem. However it has been observed that gap functions play a much pivotal role in developing error bounds for variational inequalities.

In the first part of this talk we shall show how different types of gap functions can be developed for variational inequalities and generalized variational inequalities (variational inequalities with set-valued maps). Then we shall discuss how various error bounds can be developed with them. We will also briefly the current excitement surrounding the stochastic variational inequalities and stochastic complementarity problems their related merit functions.

Arpita Sinha

Team Decision Theory

Rahul Vaze

Competitive Ratio Analysis of Online Algorithms in Energy Harvesting Communication System

We consider the optimal online packet scheduling problem to minimize the time by which all packets are delivered in a single-user energy harvesting wireless communication system, where energy is harvested from natural renewable sources with arbitrary future energy arrival instants and amounts (with no distribution information as well). The most general case of arbitrary energy arrivals is considered where neither the future energy arrival instants or amount nor their distribution is known. For a minimization problem, the utility of an online algorithm is tested by finding its competitive ratio or competitiveness that is defined to be the maximum of the ratio of the gain of the online algorithm with the optimal offline algorithm over all input sequences. We propose a 'lazy' transmission policy that chooses its transmission power to minimize the transmission time assuming that no further energy arrivals are going to occur in future. The lazy transmission policy is shown to be strictly two-competitive. We also derive an adversarial lower bound that shows that the competitive ratio of any online algorithm is at least 1.325.
