Computation of the Equilibrium Point for Discrete-time Linear Stochastic Systems

Ivan Ivanov

Faculty of Economics and Business Administration

Sofia University "St. Kliment Ohridski", Bulgaria

i_ivanov@feb.uni-sofia.bg

The linear optimal control problem of linear systems subject to Markov jumps and/or multiplicative noises is considered and the computation of an optimal control strategy is commented. This kind of models has found many applications in engineering and finance as, for instance, in nuclear fission and heat transfer, population models and immunology, portfolio optimization (O. Costa, de Oliviera, Optimal mean-variance control for discrete-time linear systems with Markovian jumps and multiplicative noises, Automatica 48(2012), 304–315), etc., and several results related to the control of these systems have already been derived. The challenge of the applications is that the weighting matrices in the linear quadratic models are assumed to be singular or indefinite.

The realization of the optimal control strategy depends on the stabilizing solution of some appropriate systems of Riccati-type coupled equations, i.e. a set of generalized discrete-time algebraic Riccati equations has to be solved. The LMI approach for computing the stabilizing symmetric solution of this system is studied. We construct two new modifications of the standard LMI approach and we show how to apply these new modifications to the investigated problem. Computer realizations of all modifications are compared. Numerical experiments are given where the new LMI modifications are numerically compared. Based on these experiments the main conclusion is that the new LMI modifications are faster than the standard LMI approach.