A Game -Theoretic Model for a Stochastic Linear Quadratic Tracking Problem

Vasile Drăgan[1,2], Ivan G. Ivanov[3] and Ioan-Lucian Popa [4,5]

[1] "Simion Stoilow" Institute of Mathematics, Romanian Academy, P.O.Box 1-764, RO-014700, Bucharest; Vasile.Dragan@imar.ro

[2] Academy of the Romanian Scientists, Romania

[3] Faculty of Economics and Business Administration, Sofia University "St. Kl. Ohridski", 125 Tzarigradsko chaussee blvd., bl. 3, Sofia 1113, Bulgaria; i_ivanov@feb.uni-sofia.bg

[4] Department of Computing, Mathematics and Electronics, Faculty of Computing and Engineering, "1 Decembrie 1918" University of Alba Iulia, Romania; lucian.popa@uab.ro

[5] Faculty of Mathematics and Computer Science, Transilvania University of Braşov, Iuliu Maniu Street 50, 500091, Braşov, Romania

Abstract:

In this paper, we solve a stochastic linear quadratic tracking problem. The controlled dynamical system is modeled by a system of linear Itô differential equations subject to jump Markov perturbations. We consider the case when there are two decision makers and each of them wants to minimize the deviation of a preferential output of the controlled dynamical system from a given reference signal. We assume that the two decision makers do not cooperate. Under these conditions, we state the considered tracking problem as a problem of finding of a Nash equilibrium strategy for a stochastic differential game. Explicit formulae of a Nash equilibrium strategy are provided. To this end, we use the solutions of two given terminal value problems (TVPs). The first TVP is associated to a hybrid system formed by two backward nonlinear differential equations coupled by two algebraic nonlinear equations. The second TVP is associated to a hybrid system formed by two backward linear differential equations coupled by two algebraic linear equations.