COMPUTING THE NASH EQUILIBRIUM FOR LQ GAMES ON POSITIVE SYSTEMS ITERATIVELY[*]

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Abstract

We consider the nonsymmetric Riccati equation arising in two player linear quadratic differential games for positive linear systems with an open loop information structure. The Newton method for computing the Nash equilibrium point is derived by Jank and Kremer in 2004. We transform the Newton method into the alternately linearized implicit Newton iteration following the existing papers in this subject. However, we reorganize this alternately linearized implicit Newton iteration based on the specific characteristic of the considered Riccati equation. Thus, we derive an alternately linearized implicit decoupled iteration. The convergence properties of the proposed alternately linearized implicit decoupled iteration are investigated and a sufficient condition to apply the method is derived. The performance of the proposed algorithm is illustrated on some numerical examples.

MSC: 15A24, 15A45, 60H35, 65C20.

keywords: Open loop Nash equilibrium, generalized Riccati equation, stabilizing solution, nonnegative solution.