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Online Robust Model Predictive Control for Linear Fractional Transformation Systems Using Linear Matrix Inequalities

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Abstract : In this paper, the problem of robust model predictive control (MPC) for discrete-time linear systems in linear fractional transformation form with structured uncertainty and norm-bounded disturbance is investigated. The problem of minimization of the cost function for MPC design is converted to minimization of the worst case of the cost function. Then, this problem is reduced to minimization of an upper bound of the cost function subject to a terminal inequality satisfying the l₂-norm of the closed loop system. The characteristic of the linear fractional transformation system is taken into account, and by using some mathematical tools, the robust predictive controller design problem is turned into a linear matrix inequality minimization problem. Afterwards, a formulation which includes an integrator to improve the performance of the proposed robust model predictive controller in steady state condition is studied. The validity of the approaches is illustrated through a robust control benchmark problem.

Keywords : linear fractional transformation, linear matrix inequality, robust model predictive control, state feedback control
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