The applications of stochastic regulation H∞ control to HIV therapy

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Abstract

In this study, a nonlinear stochastic differential equation model is used to describe the interactions of the immune system with human immunodeficiency virus (HIV) under intrinsic parametric fluctuation and the extrinsic modular disturbance. A robust H∞ regulation control is proposed for chemotherapy in an early treatment setting of HIV to achieve a desired steady state under intrinsic parametric fluctuations and external disturbances. The effect of intrinsic parametric fluctuations and external disturbances on the regulation error is minimized to achieve the optimal H∞ robust regulation. In order to avoid solving the Hamilton-Jacobi inequality (HJI) for H∞ robust regulation of HIV therapy. The fuzzy dynamic model is employed to interpolate several linear stochastic differential equations to approximate H∞ nonlinear stochastic equation model to simplify the design procedure of H∞ robust regulation control. Based on fuzzy interpolation, we use a set of linear matrix inequalities (LMIs) to replace the HJI so that the H∞ robust regulation control of HIV therapy can be designed via the help of robust control tool box of matlab. Finally, a simulation example is given to illustrate the design procedure and to confirm the performance of the proposed stochastic H∞ robust regulation control for HIV therapy.

Keyword：HIV therapy, stochastic regulation H∞ control