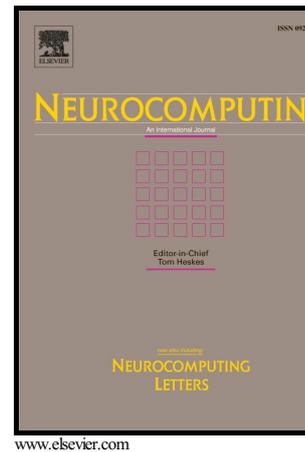


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Delay partition method for the robust stability of uncertain genetic regulatory networks with time-varying delays [☆]

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Abstract

The robust stability analysis for genetic regulatory networks with parameter uncertainties and time-varying delays is investigated in this study. Firstly, some new variables are defined to deal with the uncertain parameters. Then, we improve the Lyapunov-Krasovskii functional by partitioning the interval time-varying delays into non-uniformly subintervals and decomposing integral intervals accordingly. In this way, the bounds of time delays can be estimated more accurately. Besides, two modulus have been introduced in the delay derivative terms to obtain better delay-derivation-dependent stability criteria. Furthermore, we have employed Jensen's inequality together with convex combination method to handle integral terms to render less conservative conditions. Finally, the stability criteria turn out to be feasible and effective via numerical examples.

Keywords: Genetic regulatory network; Parameter uncertainty; Time-varying delay; Linear matrix inequality; Lyapunov-Krasovskii functional.

1. Introduction

In the past few years, genetic regulatory networks (GRNs) have attracted considerable attention for their extensive applications in various fields including engineering areas, biological and biomedical sciences. However, in the practical systems, the convergence of GRNs can be easily destroyed by time delays [1–21, 26, 27, 29–31], parameter uncertainties [2, 4, 10–13] and so on [14–21]. Hence, the stability analysis for GRNs with time delays and parameter uncertainties is urgent to study.

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