基于改进型离散 **Wirtinger** 型不等式的

时变时滞系统稳定性分析

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摘　要：针对离散时变时滞系统的稳定性问题，采用改进型离散 Wirtinger 不等式方法进行研究，获得了一个保守性更低的稳定性判据.首先构造了一个新的辅助向量函数，利用正定矩阵的二次型都是正值的特性，提出了改进型 Wirtinger 不等式，获得了比传统的方法如离散 Jensen 不等式、离散 Wirtinger 不等式更好的求和逼近结果.在此基础上，构建了合适的 Lyapunov-Krasovskii 泛函，应用改进型离散 Wirtinger 不等式从而获得有更低保守性的稳定性判据，最终利用两个数值仿真完成验证.验证结果表明，利用新方法得到的时滞上界要大于现有的不等式方法，更接近理论值，从而表明了本文方法的有效性和优越性.

关键词：线性离散时滞系统；改进型离散 Wirtinger 不等式；稳定性分析；Lyapunov-Krasovskii 泛函法

Stability analysis of time-varying delayed systems based on

improved discrete wirtinger-based inequality

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Abstract：In view of the stability analysis of linear discrete systems，an intense research has been conducted by adopting an improved discrete Wirtinger-based inequality. A new stability criterion of linear discrete systems with interval time-varying delay is derived， which yields less conservative stability conditions. By definition of a novel auxiliary function， we propose a better integral inequality and receive a tighter stability condition as compared to the recently results such as discrete Jensen inequality， discrete Wirtinger-based inequality. Based on the new inequality， we construct a dedicated Lyapunov-Krasovskii functional and obtain a tighter estimation of the derivative of Lyapunov-Krasovskii functional in terms of the new inequality. Finally， two numerical examples are given to demonstrate the efficiency of our new methods.

Key words： linear discrete time-varying delayed systems; improved discrete Wirtinger-based inequality; stability analysis; Lyapunov-Krasovskii functional

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