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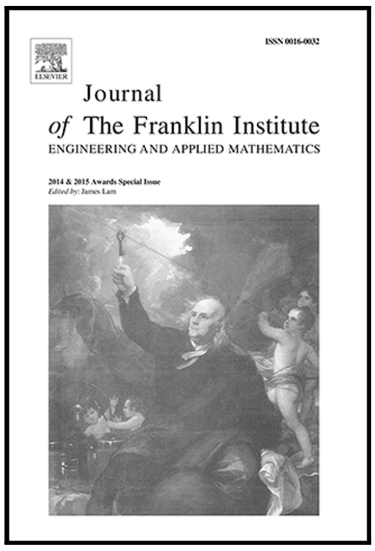

Uniform upper bound of the second largest eigenvalue of stochastic matrices with equal-neighbor rule

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PII: S0016-0032(17)30308-3
DOI: 10.1016/j.jfranklin.2017.06.015
Reference: FI 3033

To appear in: *Journal of the Franklin Institute*

Received date: 11 July 2016
Revised date: 11 November 2016
Accepted date: 19 March 2017

Please cite this article as: Chao Huang, Changbin Yu, Uniform upper bound of the second largest eigenvalue of stochastic matrices with equal-neighbor rule, *Journal of the Franklin Institute* (2017), doi: 10.1016/j.jfranklin.2017.06.015

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Uniform upper bound of the second largest eigenvalue of stochastic matrices with equal-neighbor rule

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Abstract

Given the number of vertices only, we provide a uniform upper bound of the second largest eigenvalue (SLE) of stochastic matrices induced from rooted graphs under the equal-neighbor rule, by acquiring a tight upper bound of its scrambling constant (SC). Furthermore, with the concept of canonical form of rooted graphs, we find the least connective topology of rooted graphs in the sense of SC. When more information on the graph topology is available, a more accurate bound is also provided. Our result is applied to estimate the convergence rate of consensus protocols studied in system and control literature.

Keywords: Stochastic matrix, Second largest eigenvalue, Graph theory, Multi-agent system

2010 MSC: 00-01, 99-00

1. Introduction

Nonnegative matrices, stochastic matrices, and algebraic graph theory are closely related topics and have been studied over decades with fruitful results (see e.g. [1]). Over the past decade, these theories have been successfully applied to the research field of system and control, e.g., distributed coordination of multi-agent systems. For a closer look at this direction the readers are rec-

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