

MARKOV CHAIN SMALL-WORLD MODEL WITH ASYMMETRIC TRANSITION PROBABILITIES*

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Abstract. In this paper, a Markov chain small-world model of D.J. Higham is broadened by incorporating asymmetric transition probabilities. Asymptotic results regarding the transient behavior of the extended model, as measured by its maximum mean first passage time, are established under the assumption that the size of the Markov chain is large. These results are consistent with the outcomes as obtained numerically from the model.

The focus of this study is the effect of a varying degree of asymmetry on the transient behavior which the extended model exhibits. Being a quite interesting consequence, it turns out that such behavior is largely influenced by the strength of asymmetry. This discovery may find applications in real-world networks where unbalanced interaction is present.

Key words. Asymmetry, Small-world, Ring network, Markov chain, Mean first passage time.

AMS subject classifications. 05C50, 15A51, 60J20, 60J27, 65C40.

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