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Stochastic Kronecker graphs. (English) Zbl 1223.05279

Summary: A random graph model based on Kronecker products of probability matrices has been recently proposed as a generative model for large-scale real-world networks such as the web. This model simultaneously captures several well-known properties of real-world networks; in particular, it gives rise to a heavy-tailed degree distribution, has a low diameter, and obeys the densification power law. Most properties of Kronecker products of graphs (such as connectivity and diameter) are only rigorously analyzed in the deterministic case.

In this article, we study the basic properties of stochastic Kronecker products based on an initiator matrix of size two (which is the case that is shown to provide the best fit to many real-world networks). We will show a phase transition for the emergence of the giant component and another phase transition for connectivity, and prove that such graphs have constant diameters beyond the connectivity threshold, but are not searchable using a decentralized algorithm.

MSC:
05C80 Random graphs (graph-theoretic aspects)

Keywords:
random graphs; web graphs; Kronecker graphs; connectivity; small world networks

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References:

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