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TRAFFIC DRIVEN MODEL FOR WEIGHTED NETWORKS

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Abstract. We propose an evolutionary weighted model for technological networks based on the interplay of traffic and infrastructure of the network by introducing a strength coupling mechanism. The model gives many statical properties such as evolution of strength, distribution of strength, degree and weight supported by empirical evidence. In particular, the model generates nontrivial degree-strength correlation observed in real-world networks. Interestingly, all properties are adjusted depending on a single parameter that represents the speed of total weight growth of the network.

Keywords. complex network, weighted network, traffic driven, evolution dynamics, strength-degree correlation, power-law distribution

AMS (MOS) subject classification: 05C90, 94C15.

1 Introduction

In the past few years, the studies of evolutionary dynamics in complex networks have triggered great interest from the community of physicists. Prototypical examples of real systems cover as diverse as the Internet [1], World-Wide Web [2], airport networks (AN) [3,4], protein interacting networks [5], and so on. The infrastructure of these networks exhibits many general and nontrivial properties such as small-world [6] and scale-free phenomena [7]. These interesting phenomena demonstrate that there perhaps exist some intrinsic and common mechanisms that lead to the evolution of such complex networks. In this perspective, lots of models have been proposed to explain the evolutionary dynamics of networks. Among them, two most famous models are introduced by Barabási, Albert (BA) and Watts, Strogatz (WS) characterizing the scale-free and small-world features, respectively. However, networks are far from the boolean structure, thus purely topological characterization will miss the important attributes often encountered in real-world systems. Most recently, the availability of completely weighted empirical

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