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Mandelbrot Law of Evolving Networks

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(Submitted on 23 Jul 2011 (v1), last revised 14 Feb 2012 (this version, v2))

Degree distributions of many real networks are known to follow the Mandelbrot law, which can be considered as an extension of the power law and is determined by not only the power-law exponent, but also the shifting coefficient. Although the shifting coefficient highly affects the shape of distribution, it receives less attention in the literature and in fact, mainstream analytical method based on backward or forward difference will lead to considerable deviations to its value. In this Letter, we show that the degree distribution of a growing network with linear preferential attachment approximately follows the Mandelbrot law. We propose an analytical method based on a recursive formula that can obtain a more accurate expression of the shifting coefficient. Simulations demonstrate the advantages of our method. This work provides a possible mechanism leading to the Mandelbrot law of evolving networks, and refines the mainstream analytical methods for the shifting coefficient.

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