Coevolving nonlinear voter model

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We study an adaptive voter model [1, 2, 3] with cooperative interactions between agents, describing evolving opinions and topology of networks simultaneously. In particular, an agent may switch its opinion by adopting its neighbors' opinion or rewire the connections to the same opinion with the probability p [1]. In addition, the opinion of an agent relies on the opinions of its neighbors in a nonlinear way such as volatility in language dynamics [4, 5] and social pressure in social impact theory [6, 7]. We consider a nonlinear voter model which is a number α of randomly chosen neighbors influence a voter to change its opinion or connections [4, 5, 8]. We find that the model undergoes a phase transition between connected and fragmented networks (see Fig. 1), with different mechanisms depending on the degree of non-linearity α. The network splits into two ordered clusters with different opinions when $p > p_c$ regardless nonlinearity. However, when $p < p_c$, the network becomes a single connected component with either two opinions coexisting phase ($\alpha \leq 1$) or consensus phase ($\alpha > 1$).

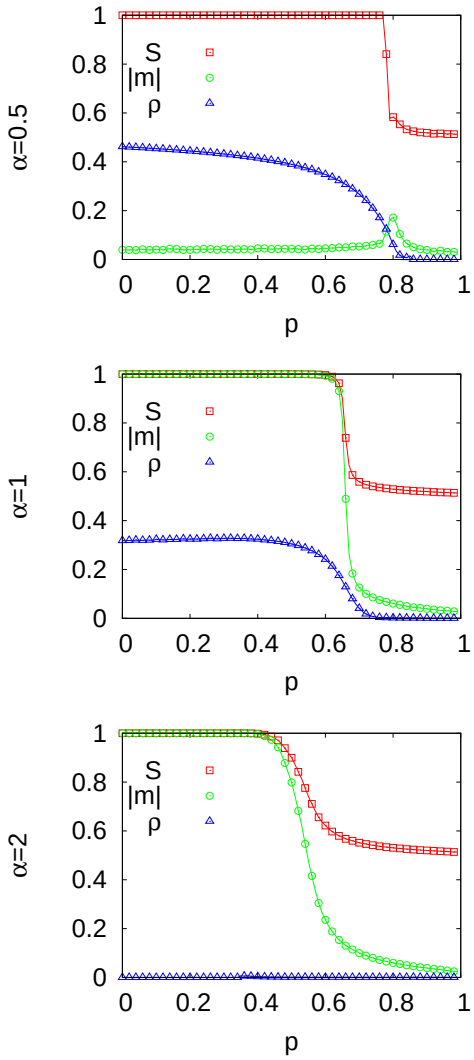

Figure 1: Size of the largest component S, link magnetization ($m = |k_{++} - k_{--}|$), and density ρ of active link as a function of p for $\alpha = 0.5, 1, 2$ on random regular networks with $k = 8$ and $N = 10^3$.

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