Co-evolution of strategy and structure in complex networks with dynamical linking

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Abstract

In most analytic studies of social networks carried out to date, networks have links which remain unchanged at all times. Hence, individuals have no control over the number, frequency or duration of their interactions with others. Here I introduce a model in which individuals differ in the rate at which they seek new interactions with others, making rational decisions modeled as general symmetric two-player games. Once a link between two individuals has formed, the productivity of this link is evaluated. Links can be broken off at different rates. I provide analytic results for the limiting cases where linking dynamics is much faster than evolutionary dynamics and vice-versa, and show how the individual capacity of forming new links or severing inconvenient ones maps into the problem of strategy evolution in a well-mixed population under a different game. For intermediate ranges, I investigate numerically the detailed interplay determined by these two time-scales and show that the scope of validity of the analytical results extends to a much wider ratio of time scales than expected.