Generalized Nash games and replicator dynamics

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Abstract

In this talk I plan to introduce an evolutionary generalized Nash game (eGN). Generalized Nash games were introduced in the 50s, and represent models of noncooperative behaviour among players whose both strategy sets and payoff functions depend on strategy choices of other players. Among these games, a specific class is represented by evolutionary games, which consist of populations where individuals play many times, against many different opponents, with each contributing a relatively small contribution to the total reward. Given strategies $\{1, \ldots, n\}$, an individual of type i is one using strategy i, where x_i is the frequency of type i individuals in the population. Thus the vector $x = (x_1, \ldots, x_n)$ in the unit simplex is the state of the population. Interaction between players of different types can be described by linear or nonlinear payoffs. One known dynamic evolution of such a game is described by a replicator dynamics. However, assuming constraints imposed on the strategy sets of players (upper limits on resources for instance) the classic replicator dynamics is not appropriate anymore. In these cases we show that we can reinterpret the game dynamics of an eGN differently. The new dynamics and its relation to evolutionary steady states is investigated. We will include examples so the audience can follow the concepts throughout the talk.