

Stochastic games with the average reward

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Abstract

A stochastic game is a dynamic non-cooperative game which is played at time moments in N . At every time moment t , the game is in one of finitely many states. In the current state, each player chooses an action from his finite action set independently of his opponents. The tuple of the chosen actions determines a payoff to each player and a probability distribution according to which a new state of the game is chosen for time moment $t + 1$. Thus, a play results in an infinite sequence of payoffs to each player. We assume that each player evaluates his payoff sequence by taking its long-term average.

We first examine the special case of two-player zero-sum games. In these games, the value and nearly-optimal strategies are known to exist (Mertens and Neyman, 1981). We present several examples to demonstrate the main features, including the intriguing game called "The Big Match".

In the second part, we discuss the general case, in which it is still not clear whether approximate Nash-equilibria always exist. This well-known open problem has a long history, starting with Gillette's question in 1957, and remains a fascinating challenge.