Lipschitz continuity and approximate equilibria. (English) Zbl 1455.91064
Algorithmica 82, No. 10, 2927-2954 (2020).

Summary: In this paper, we study games with continuous action spaces and non-linear payoff functions. Our key insight is that Lipschitz continuity of the payoff function allows us to provide algorithms for finding approximate equilibria in these games. We begin by studying Lipschitz games, which encompass, for example, all concave games with Lipschitz continuous payoff functions. We provide an efficient algorithm for computing approximate equilibria in these games. Then we turn our attention to penalty games, which encompass biased games and games in which players take risk into account. Here we show that if the penalty function is Lipschitz continuous, then we can provide a quasi-polynomial time approximation scheme. Finally, we study distance biased games, where we present simple strongly polynomial time algorithms for finding best responses in $L_1$ and $L_2$ biased games, and then use these algorithms to provide strongly polynomial algorithms that find $2/3$ and $5/7$ approximate equilibria for these norms, respectively.

MSC:
91A68 Algorithmic game theory and complexity
91-08 Computational methods for problems pertaining to game theory, economics, and finance
91A05 2-person games
91A70 Spaces of games

Keywords:
approximate equilibria; Lipschitz games; penalty games; biased games

Full Text: DOI

References:


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