Pure Scalar Equilibria for Normal-Form Games

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Abstract : A scalar equilibrium (SE) is an alternative type of equilibrium in pure strategies for an n-person normal-form game G. It is defined using optimization techniques to obtain a pure strategy for each player of G by maximizing an appropriate utility function over the acceptable joint actions. The players' actions are determined by the choice of the utility function. Such a utility function could be agreed upon by the players or chosen by an arbitrator. An SE is an equilibrium since no players of G can increase the value of this utility function by changing their strategies. SEs are formally defined, and examples are given. In a greedy SE, the goal is to assign actions to the players giving them the largest individual payoffs jointly possible. In a weighted SE, each player is assigned weights modeling the degree to which he helps every player, including himself, achieve as large a payoff as jointly possible. In a compromise SE, each player wants a fair payoff for a reasonable interpretation of fairness. In a parity SE, the players want their payoffs to be as nearly equal as jointly possible. Finally, a satisficing SE achieves a personal target payoff value for each player. The vector payoffs associated with each of these SEs are shown to be Pareto optimal among all such acceptable vectors, as well as computationally tractable.

Keywords : compromise equilibrium, greedy equilibrium, normal-form game, parity equilibrium, pure strategies, satisficing equilibrium, scalar equilibria, utility function, weighted equilibrium
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