Learning Efficient Nash Equilibria in Distributed Systems

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Abstract. An individual's learning rule is *completely uncoupled* if it does not depend on the actions or payoffs of anyone else. We propose a variant of log linear learning that is completely uncoupled and that selects an efficient pure Nash equilibrium in all generic *n*-person games that possess at least one pure Nash equilibrium. In games that do not have such an equilibrium, there is a simple formula that expresses the long-run probability of the various disequilibrium states in terms of two factors: i) the sum of payoffs over *all* agents, and ii) the maximum payoff gain that results from a unilateral deviation by *some* agent. This *welfare/stability trade-off criterion* provides a novel framework for analyzing the selection of disequilibrium as well as equilibrium states in *n*-person games.

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