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*Nash Bargaining Exchange Networks: Fast Convergence of Natural Dynamics.*

Bargaining networks model the behavior of a set of players who need to reach pairwise agreements for making profits. Nash bargaining solutions in this context correspond to solutions which are stable and balanced. Prior work showed that if such solutions exist, then they can be calculated in polynomial time, but left open the question of whether there exists a local dynamics modeling the behavior of real-world players which can converge quickly to the Nash bargaining solution. In this work, we introduce a natural single-stage local dynamics, and prove that this dynamics converges quickly in a precise sense. Our proof introduces techniques from functional analysis which we believe should be useful in a variety of related problems. (Received August 17, 2010)