Stochastic Prisoner's Dilemma

January 1, 2020

Game Rules

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D	b_1	0

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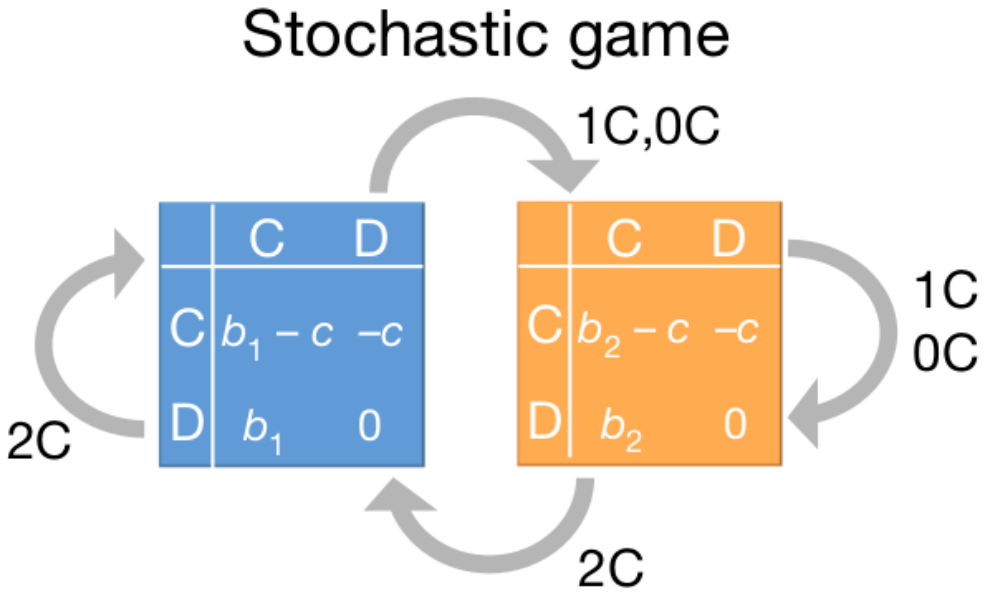

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   $WSLS = [CC- > 1, CD- > 0, DC- > 0, DD- > 1]$

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5. ϵ chance to screw up.

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2. L learns from R, with $\rho = \frac{1}{1+e^{-\beta(\Pi_R - \Pi_L)}}$.
3. Or Mutates with γ

Projects

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4. "What happens when an unstoppable force meets an immovable object?"

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3. Team Work!

References

1. C Hilbe, imsa, K Chatterjee, MA Nowak, Evolution of cooperation in stochastic games, Nature 559 (7713), 246
2. Laura Hindersin, Bin Wu, Arne Traulsen, and Julian Garca, Computation and Simulation of Evolutionary Game Dynamics in Finite Populations
3. Fudenberg, D. & Imhof, L. A. Imitation processes with small mutations. J. Econ. Theory 131, 251262 (2006).
4. Hilbe, C., Martinez-Vaquero, L. A., Chatterjee, K. & Nowak, M. A. Memory-n strategies of direct reciprocity. Proc. Natl Acad. Sci. USA 114, 47154720 (2017). 38. Stewart,