

The Evolutionary Robustness of Forgiveness and Cooperation

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A fundamental problem in evolutionary game theory is to explain how cooperation can emerge in a population of self-interested individuals as typically occurs in the prisoner dilemma. Axelrod attributes the reason of emergence of cooperation to the shadow of the future: the likelihood and importance of future interaction.

Since Axelrod, one approach to test the efficiency or robustness of a strategy and further to derive optimal strategies is the evolutionary dynamics (a processes where individuals with low scores die and those with high scores flourish).

A natural question is which strategies or type of strategies are selected by the dynamics equations; in other words, which are the natural attractors and which type of strategies are uniformly selected independently of the strategy set.

We will show that in the context of the evolutionary dynamics associated to the prisoner dilemma, it is possible to identify strategies with uniform local basin of attraction independent of any initial population (provided that “the shadow of the future’ is relevant and “mistakes are allowed’). It also proved, as was conjectured by Axelrod, that those strategies are “ nice, retaliating, and forgiving” .