

Evolution of Cooperation with a Knowledgeable Mutant

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ABSTRACT

How a society manages to solve the problem of cooperation in a prisoners-dilemma situation has been a major theme in economic theory. In the present paper, we develop an evolutionary model with a structural mutant called a knowledgeable (or cautious) dove, which is a dove in nature but one programmed to invest in gaining the ability to identify hawks and therefore avoiding their exploitation. We show that cooperative behavior can persist within a large class of admissible and compatible dynamics in the long run, either in the form of an asymptotically stable mixed population equilibrium or in the form of a stable cycle. Discussing other conceivable mutants, we argue that this persistent result is robust, which also matches our everyday observations regarding both the persistence and differentiation of cooperative behavior quite well.

Key Words: Prisoners' dilemma, cautious dove, dynamic, attracting sets, persistence of cooperation

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智慧性變種與合作行爲之進化

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摘 要

經濟理論的一個中心命題是，社會如何解決在“囚徒難局”（prisoners' dilemma）下的合作問題。本篇文章將一個可稱為“智慧性”（或“小心的”）鴿子的結構型行爲變種引進一基本進化模型，此新型的特異處在於它每次與人交易時都要投入精力以辨別其交易夥伴的本性以避免被剝削。我們可以證明，合作行爲可以以長期穩定的混員均衡點或是穩定周期的形式持續存在，且此結果適用於較大的一組滿足“可允性”及“可容性”條件的動態方程。值得注意的是，我們的結果要求所有合作與不合作方式都持續出現，這與現實觀察頗符。

關鍵詞：囚徒難局，謹慎的“鴿子”，動態下的穩定共生，合作長在