

Dynamics of Adaptation Governed by Intrinsic Motivation

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The effects of intrinsic motivation on the dynamics of learning processes are investigated. The intrinsic motivation is understood as the desire for gaining knowledge stimulated by the inherent joy from the learning process on its own rather than for future benefits. To emphasize the impact of intrinsic motion a simple model of a single agent adapting to unknown environment is considered. The surrounding system is represented as a collection of elements and the agent can migrate from one to another choosing freely any element to move to at each time step. When the agent gets an element he increases his awareness about its properties affecting the probability of its further selection. The agent choice is assumed to be governed by two stimuli, extrinsic and intrinsic. The first one inspires the agent to optimize the choice via trial-and-error search. To gain awareness about the elements of the environment the agent accumulates in his memory the rewards obtained from choosing a specific element at each moment of time. Due to the second stimulus the agent is biased towards those elements he has less information about. It is shown that the intrinsic motivation can induce an instability and periodic dynamics of the learning process which is always stationary in the case under consideration for the rational agent. The opposite effect, it turns out, can arise as well. Namely, the instability of the Nash equilibrium induced by the rational agent behavior is suppressed by the strong intrinsic motivation. The obtained results enable us to pose a question about the constructive role of intrinsic motivations in complex dynamics of social and economic systems.