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A new Q learning algorithm for multi-agent systems. (Chinese. English summary)

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Summary: Due to the presence of other agents, the environment of Multi-Agent Systems (MAS) cannot be simply treated as Markov Decision Processes (MDPs). The current reinforcement learning algorithms which are based on MDPs must be reformed before they can be applicable to MAS. Based on an agent's independent learning ability this paper proposes a novel Q -learning algorithm for MAS – an agent learning other agents' action policies through observing the joint action. The policies of other agents are expressed as action probability distribution matrices. A concise and yet useful updating method for the matrices is proposed. The full joint probability of distribution matrices guarantees the learning agent to choose his/her optimal action. The convergence and performance of the proposed algorithm are analyzed theoretically. When applied to RoboCup, our algorithm showed high learning efficiency and good generalization ability. Finally, we briefly point out some directions of multi-agent reinforcement learning.

MSC:

[68T05](#) Learning and adaptive systems in artificial intelligence

[68W05](#) Nonnumerical algorithms

Keywords:

[multi-agent systems](#); [reinforcement learning](#); [Q-learning](#)

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