

Advanced topics in Deep Reinforcement Learning

Week 4 slides

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Advanced Topics in Reinforcement Learning, , Gottfried Wilhelm Leibniz University Hannover

Exploration in multiagent domains

- Challenges of multiagent domain
 - Reward influenced by other actors as well
 - Multiagent policies required including direct or indirect predictions of the other agents
 - Degree of interaction varies strongly over different environments

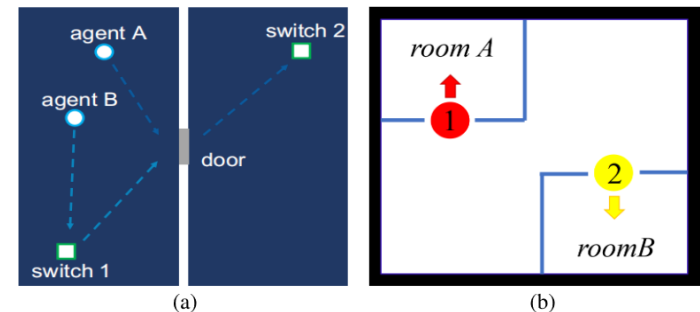


Fig.1: Double switch door lock problem. Possible trajectory (a) and schematic representation of the problem (b).

Exploration in Deep Reinforcement Learning: From Single-Agent to Multiagent Domain, 2023

Exploration in multiagent domains

- Most exploration strategies stay the same
- Unused incentives
 - Information gain due to varying shares of information are generated by other agents
- Novel incentives
 - Influence on other agents

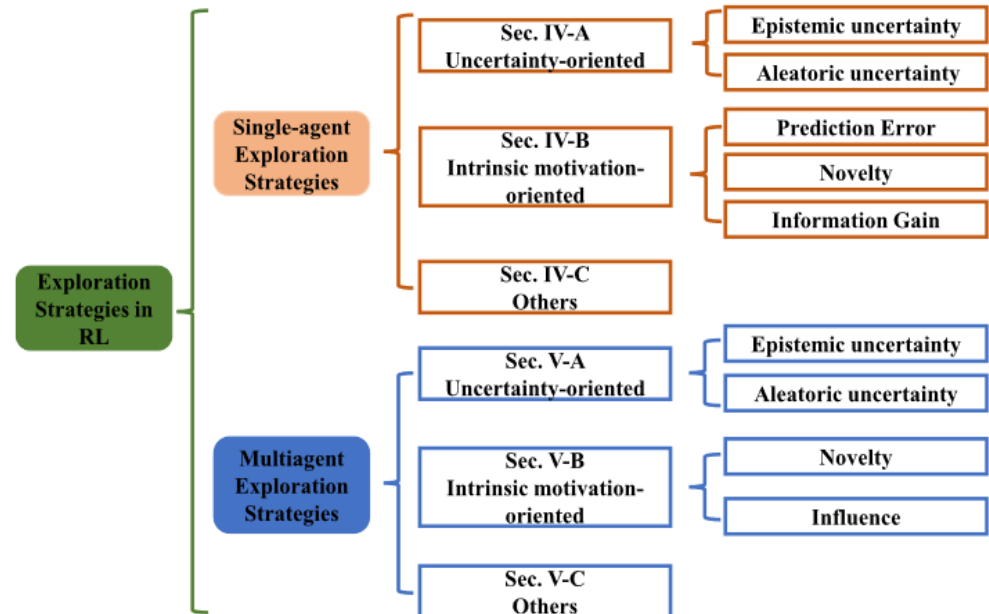


Fig.2: Exploration strategies. Exploration in Deep Reinforcement Learning: From Single-Agent to Multiagent Domain, 2023

- Formation-Aware Exploration in Multi-Agent Reinforcement Learning
 - Avoid redundancies and increase exploration efficiency

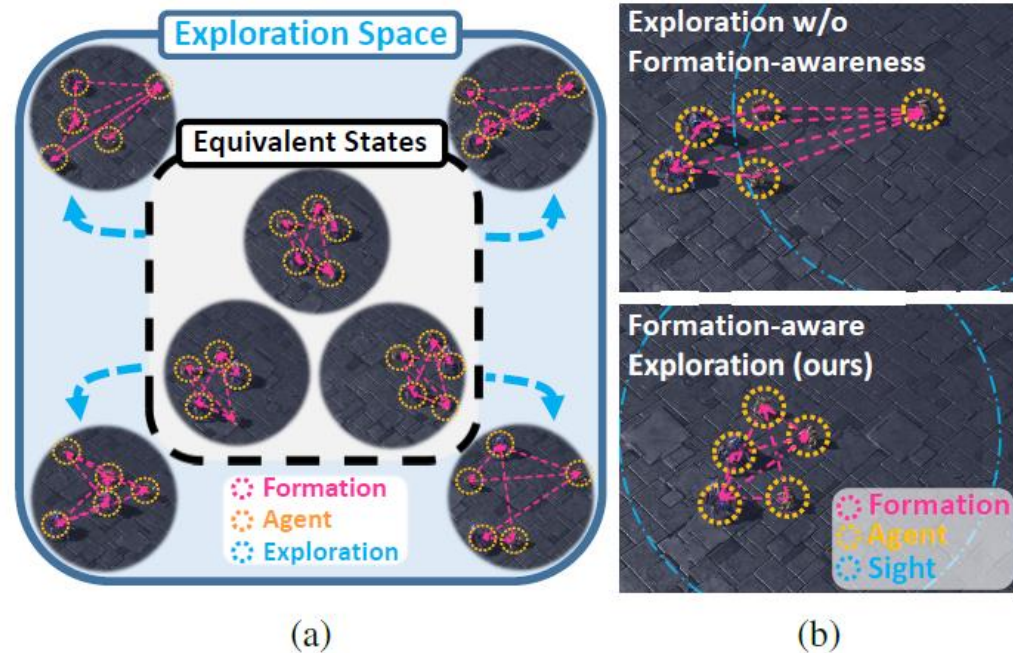


Fig.3: Double switch door lock problem. Possible trajectory (a) and schematic representation of the problem (b).

FoX: Formation-Aware Exploration in Multi-Agent Reinforcement Learning, 2024

Exploration in multiagent domains

- Formation-Aware Exploration in Multi-Agent Reinforcement Learning
 - Avoid redundancies and increase exploration efficiency
 - Improves performance over wide range of specific domains

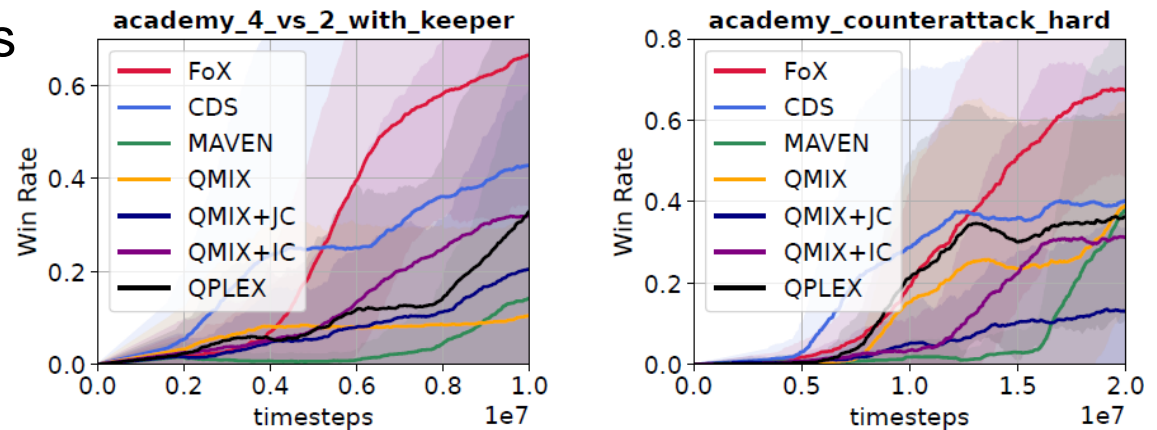


Fig.4: Performance in the Google Research Football (Kurach et al. 2020) environment.
FoX: Formation-Aware Exploration in Multi-Agent Reinforcement Learning, 2024

References

- Hao, Jianye, et al. "Exploration in deep reinforcement learning: From single-agent to multiagent domain." *IEEE Transactions on Neural Networks and Learning Systems* (2023)
- Ellis, Benjamin, et al. "Smacv2: An improved benchmark for cooperative multi-agent reinforcement learning." *Advances in Neural Information Processing Systems* 36 (2024)
- Jo, Yonghyeon, et al. "FoX: Formation-aware exploration in multi-agent reinforcement learning." *Proceedings of the AAAI Conference on Artificial Intelligence*. Vol. 38. No. 12. 2024