

SC42050 Literature Assignment

Learning from Demonstration

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In robotics, programming physical tasks can be very daunting when the desired motion behaviors are non trivial. Learning from demonstration is a good way to approach this problem. Aiming to implementing this idea, Schaal (1997) evaluates various techniques of reinforcement learning (RL) for two robotic applications. Please read (Schaal, 1997) and carefully answer the following questions:

1. Do a small literature review and present the update equations for the RL methods utilized or referenced in the paper, such as: Temporal Difference Learning (TD), Q-Learning and Actor-Critic methods.
2. The author mentions in (Schaal, 1997) that he tests two different dynamical systems: a pendulum swing up and a cart pole balancing. What are the main differences and similarities between these two systems? In your opinion, could have the author used only one of the systems to demonstrate all of the proposed algorithms?
3. Show how to obtain the optimal action (5) from equation (4).
4. Try to enumerate the main problems of the current RL framework when faced with the control of highly complex continuous dynamical systems.

References

Schaal, S. (1997). Learning from demonstration. In *Advances in Neural Information Processing Systems*, pages 1040–1046.