

Masterarbeit

Investigation and Implementation of Reinforcement Learning Algorithms on a Robot Arm

Generalizing the operation of robots in dynamical environments regardless of the task complexity is one of the ultimate goals of robotics researchers. Learning from demonstration approaches supported by transfer learning and user feedback offer a remarkable solution to achieve generalization. The main idea behind such approaches is teaching robots new skills with human instructors and training parametric models with data from demonstrations to achieve and update the desired skills under changing conditions. Recently, skill transfer with deep reinforcement learning techniques even allow for training directly with a real robot.



Source: Panda robot

Project assignment

- Literature survey of reinforcement learning in the scope of learning from demonstration for robotic arms
- Selection of existing reinforcement learning algorithms and adaptation to the robot
- Comparison of the implemented algorithms on a teleoperation task
- Documentation of results

Requirements

- Studying at Computational Engineering, Mechatronics, Medical Engineering or Electrical Engineering
- Prior experience with programming in Python, Machine Learning
- Prior experience with ROS would be beneficial

References

Cansev, M. E., Xue, H., Rottmann, N., Blik, A., Miller, L. E., Rueckert, E., & Beckerle, P. (2021). Interactive Human–Robot Skill Transfer: A Review of Learning Methods and User Experience. *Advanced Intelligent Systems*, 2000247.

Denz, R., Demirci, R., Cansev, M. E., Blik, A., Beckerle, P., Rueckert, E., & Rottmann, N. A high-accuracy, low-budget Sensor Glove for Trajectory Model Learning.

Gu, S., Holly, E., Lillicrap, T., & Levine, S. (2017, May). Deep reinforcement learning for robotic manipulation with asynchronous off-policy updates. In 2017 IEEE international conference on robotics and automation (ICRA) (pp. 3389-3396). IEEE.

Start: immediately

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