

Analysis of Q-Learning on Artificial Neural Networks for Robot Control Using Live Video Feed

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Abstract : Training of artificial neural networks (ANNs) using reinforcement learning (RL) techniques is being widely discussed in the robot learning literature. The high model complexity of ANNs along with the model-free nature of RL algorithms provides a desirable combination for many robotics applications. There is a huge need for algorithms that generalize using raw sensory inputs, such as vision, without any hand-engineered features or domain heuristics. In this paper, the standard control problem of line following robot was used as a test-bed, and an ANN controller for the robot was trained on images from a live video feed using Q-learning. A virtual agent was first trained in simulation environment and then deployed onto a robot's hardware. The robot successfully learns to traverse a wide range of curves and displays excellent generalization ability. Qualitative analysis of the evolution of policies, performance and weights of the network provide insights into the nature and convergence of the learning algorithm.

Keywords : artificial neural networks, q-learning, reinforcement learning, robot learning

Conference Title : ICMLC 2017 : International Conference on Machine Learning and Computing

Conference Location : Vancouver, Canada

Conference Dates : August 07-08, 2017