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Title: Combining Hindsight Experience Replay with Hierarchical Reinforcement Learning.

Objective:

Combine Hindsight Experience Replay (HER) with a recent idea in hierarchical reinforcement learning (HRL).

Methods:

Hindsight Experience Replay (or HER for short) could be combined with hierarchical reinforcement learning (HRL). HER is an algorithm for reinforcement learning that specializes in learning from failure. When a failure occurs, instead of just recording the actions taken lead to a failure, it records that the actions could have led to a success if the goal was in a different place.

Instead of applying HER just to goals, it could also be applied to actions generated by a higher-level policy. For example, if the higher level asked the lower level to achieve goal A but instead goal B was achieved, we could assume that the higher level asked us to achieve goal B originally.

Evaluation:

All environments are released as part of OpenAI Gym and use the MuJoCo physics engine for fast and accurate simulation. Also, a Baselines implementation of Hindsight Experience Replay is given by OpenAI. OpenAI has used these environments to train models which work on physical robots, such as the Fetch Robot.

References:

(1) Multi-Goal Reinforcement Learning: Challenging Robotics Environments and Request for Research. https://arxiv.org/pdf/1802.09464.pdf
(2) Hindsight Experience Replay. https://arxiv.org/pdf/1707.01495.pdf
(3) Hierarchical Actor-Critic, https://arxiv.org/abs/1712.00948
(4) Prioritized Experience Replay. https://arxiv.org/pdf/1511.05952.pdf
(5) A Distributional Perspective on Reinforcement Learning. https://arxiv.org/pdf/1707.06887.pdf
(6) Equivalence Between Policy Gradients and Soft Q-Learning. https://arxiv.org/pdf/1704.06440.pdf
(7) Machine Learning Shared Hierarchies. https://arxiv.org/pdf/1710.09767.pdf
(8) Domain Randomization for Transferring Deep Neural Networks from Simulation to the Real World. https://arxiv.org/pdf/1703.06907.pdf