Reinforcement Learning on a Real Robot via OffWorld Gym

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What?

Teaching a wheeled robot to move to a target in a real physical environment.

The environments are set up by OffWorld Gym.
How?

- Reinforcement Learning (RL) to train the robot.
- Input is high dimensional data: the RGB + depth from a camera image.
- Virtual simulation and a real environment.
- Real environment is in Pasadena, California (no physical access to the robot).
Why?

As the OffWorld Gym team itself states: “...the ultimate goal is to learn to train physical agents to operate in the real world.”

The opportunity to dive into reinforcement learning and immediately apply the learnt skills.
Methods

- **Environment**
  - Gym, Offworld
  - Depth camera image
  - Continuous action space

- **Coding**
  - Python, Conda, Jupyter notebook

- **RL library**
  - Tensorflow Agents

- **Agents**
  - Sac (Soft Actor-Critic)
  - Td3 (Twin Delayed Deep Deterministic Policy Gradients)
Results - Td3

Avg Reward per episode

Avg Steps per episode
Results - Sac

SIMULATION

Data in training set:
4,000 episodes (20% with reward)
50,000 random steps

REAL LIFE

Data in training set:
2,323 episodes (35% with reward)
16,853 steps

https://github.com/Karl-Git-Hub/offworld-gym/
Results of the strategy

Get the examples and sim/real environments working.

Start training the robot using different algorithms.

Compare the results of the algorithms and pick the best one.

Make the robot move by itself to the **monolith**!
Lessons learned

- Own a GPU
- Lengthy environment setup
- Tuning and training is time consuming
- Assessing agent performance from training metrics is really hard
- Seeing a successful end result is very gratifying!
Results - Sac

https://youtu.be/CaGCZbbm1Kc
Thank You!

Results - Soft Actor-Critic