Neural.Orb

Exploration of Deep-Q Networks in a Physical Space

a project by

Tabor Henderson

thetabor@gmail.com
git://thetabor

tech stack

♥ Python 3.6
Keras
Theano
TensorFlow
SKImage
Jupyter Notebook
pygame.camera
Python.Swarms
kulka
PyBluez
tqdm
Lubuntu

robots

Sphero Sprk

background

DQNs	**Deep-Quality** Networks	*Neural Network Training Technique*

DeepMind demonstrated their early successes with DQNs in 2013. They accomplished "superhuman" level performance on many Atari games, and then developed the AlphaGo network which recently beat the No. 1 ranked player in the world at a Go summit.

Training	**Rewards** provided by environment	

Rewards give the agent feedback about its environment. By learning to predict these rewards, the DQN agent can discover strategies without direct guidance.

project goals

Simulation	**Demonstrate** DQN learning	*Proof of Concept*

Using the Python.Swarms cellular automata engine, I built methods for training and deploy supervised and DQN learners. The DQNs take much long to train. However, they can respond to changes in their environment.

Navigation	**Deploying** to a physical space	*Application*

The Sphero robotic ball provides a perfect platform for a DQN experiment. By scoring the Sphero's distance from the center of an image, I'm training it to chase that spot. Results are positive, but training is very slow.

Cooperation	**Training** complex behavior	*Potential next step*

Finding ways to train cooperative behavior opens many possibilities. This requires solving a compounding of all the challenges already navigated for a single agent.

references

1	**Deep Reinforcement Learning: Pong from Pixels**	*blog*

Andrej Karpathy

2	**Keras plays catch, a single file Reinforcement Learning example**	*github.io*

Eder Santana

3	**Demystifying Deep Reinforcement Learning**	*University of Tartu*

Tambet Matiisen

4	**Playing Atari with Deep Reinforcement Learning**	*NIPS Deep Learning Workshop 2013*

Volodymyr Mnih, Koray Kavukcuoglu, David Silver, Alex Graves, Ioannis Antonoglou, Daan Wierstra, Martin Riedmiller