CONTINUOS CONTROL PROJECT - REPORT

The 20 agents are trained to reach one desired location via DDPG, an algorithm derived from DQN optimized for continuous action spaces.

Each agent receives a reward of +0.1 for each step that its hand is in the goal location.

Training lasts as long as the desired score (the average no-discounted return over 20 agents and last 100 episodes) is not higher than 30; in any case, training is stopped if the desired score is not achieved in 200 episodes.

Each episode consists of 1000 steps at most.

For each step, every agent picks the *best action* predicted for its current state according to a collective model and actuates it (one action is a tuple of torque values). More details are below.

The action is followed by 'reaction' of the environment expressed by the next state (new positions/velocities) and one reward (positive in new position is in the target location)

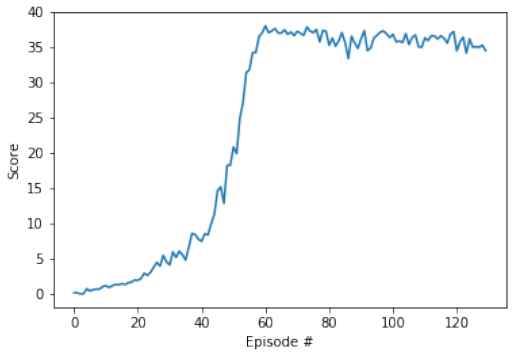
The SARS sequences (current state, action, reward and next state) collected by all agents is hence 'memorized' in a collective memory buffer (the buffer can store at most 10.000 sequences) and the 'experience' of 128 randomly picked sequences from the buffer (as soon as available), is used to train the collective model.

The model basically consists of two deep neural networks: one - the ‘actor’ - is trained to estimate the *best action*, the other – the ‘critic’ - is trained to estimate the value (future expected rewards) of the action suggested by actor; in turn, this value is used to train the actor in estimating which the best action is in any state.

Two additional clones of the models (target models) slowly track the previous ones (the parameters are slightly shifted in their direction, 1‰ at each iteration) and are employed to the improve convergence properties of the training algorithm.

The training consists of stochastic gradient descent and back-propagation (learning rate is 1e-4 for the actor, 4e-4 for the critic).

With the described algorithm and hyperparameters, the agent has achieved the desired score in roughly 60 episodes (and has kept it in the next 100 episodes):



Future work may be dedicated to improve performances by using D4PG.