Introduction

The model of projective simulation (PS) is a novel approach to artificial intelligence. The PS model is based on a random walk process and is a natural candidate for quantization. The performance of the PS agent was studied in a number of discrete toy-problems. In this work we analyse the PS model further in more complicated scenarios. We consider two well-studied benchmarking problems, the “grid-world” and the “mountain-car” problem, which challenge the model with large and continuous input space. The performance of the PS model is compared with those of existing models and we show that the PS agent exhibits competitive performance also in these tasks.

The PS model - Brief summary

The PS model is represented by the network of clips:

\[ p^{(t)}(c_t | c_{\text{old}}) = \frac{h^{(t)}_{c_t}}{\sum_k h^{(t)}_k} \]  
\[ p^{(t)}(c_t | c_{\text{old}}) = \frac{\gamma^{(t)}_{c_t}}{\sum_k \gamma^{(t)}_k} \]  

The PS model - learning curves

A performance of an agent in this task is evaluated by the number of steps it makes before reaching the goal at each trial.

\[ p^{(t)}(c_{\text{new}} | c_{\text{old}}) \text{ by Eq. 1, } \eta=0.07 \]
\[ p^{(t)}(c_{\text{new}} | c_{\text{old}}) \text{ by Eq. 2 (softmax), } \eta=0.12 \]

Grid World

The grid-world environment is a maze in which an agent should learn an optimal path to a fixed goal. The world is divided into discrete cells in which the agent can reside (Fig. 2).

Mountain car

In the mountain-car task, defined in [5], an agent drives a car on a surface between two hills, where a goal awaits at the top of the right hill, as shown in Fig. 6.

References