Reinforcement Learning - Exercise 1 - Solution

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1 Formulating Problems

a) The game of chess

States The position of all pieces on the board. A chess board is a 8x8 grid, in the beginning with 16 white and 16 black pieces. The state space is therefore quite large (an upper bound from around $\approx 10^45$, see `https://tromp.github.io/chess/chess.html`).

Actions The possible moves of the current player. The number of possible moves is limited by the number of pieces on the board and the rules of chess.

Reward Signal

- win, lose or draw the game (by checkmate)
- evaluate the current position of the board (e.g. material advantage, positional advantage)

b) A pick and place robot

States

- position and orientation of the axes
- is holding something
- source of objects and destination

Actions

- pick
- place
- repeat

Reward Signal

- successfully pick and place an object
- time to pick and place an object
- lost an object

c) A drone which should stabelize in air

States

- tilt angle

Actions

- adapt speed of individual rotors

Reward Signal

- time in air
- minimize the tilt angle
- minimize steering (and energy consumption)

d) Playing tetris

States

- position of the falling block
- position of the other blocks
- preview of next block

Actions

- move block left/right
- rotate block

Reward Signal

- clear a row
- lose the game